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The Design and Implement of Monitoring System for Intelligent University Archive Room Based on ZigBee Wireless Sensor Networks

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Abstract. Wireless sensor network is one of the most widely used technology in recent years, IEEE802.15.4 protocol based ZigBee shows great advantage on low-cost, energy efficiency and easy installation. This paper takes a monitoring system based on ZigBee for intelligent university archive room. The proposed system divides and assigns various appropriate components for monitoring temperature, humidity, brightness, flame and smog. It could integrate physical environment sensing information and manage all the device nodes. This paper also proposes a testament of ZigBee wireless communication frame loss rate and functional sensors device nodes to evaluate the system stability and functions.

Keywords: remote monitoring system, university archives room, WSN, ZigBee

1 Introduction

Nowadays, Wireless sensor network is commonly used in various field such medical remote monitoring, military battle field information, smart house monitoring. University archives room has great responsibility for university normal working and management. Most archives are formed by papers with handwriting which make archives so much important [1]. For the consideration of archives safety, this paper proposes a remote monitoring system for college of continuing education and vocational education of Yunnan Agriculture University archives room which contains more than 40,000 students' archives almost 20 years graduates. The current archives room of this college is shown in Fig. 1.

As shown in the picture above, all the archives store in the old file cabinets and wood shelves, which make the archives room safety unstable. It is necessary to develop an environment information remote monitoring system for the responsibility of guaranteeing the safety. The proposed system includes temperature and humidity sensors, brightness sensors, smog sensors and flame sensors with the functions of monitoring the archives room necessary environment information which information do the great influence of the archives preservation.

1.1 Existing Smart Monitoring Technology

The research into field of smart monitoring has done significantly. In recent years, a java based smart monitoring system has continued to receive much attention in the field of smart monitoring. A ZigBee based smart home environment monitoring design [1], proposed a solution to use Wireless Sensor Network (WSN). This proposed design use four devices: a personal computer (PC), a Coordinator, the network router devices and the end sensor devices. The main communication among the coordinator, the network router devices and end sensor devices are ZigBee using IEEE 802.15.4 protocol. And the

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Fig. 1. College of continuing education and vocational education of Yunnan Agriculture University archives room

coordinator connects the PC by USB. This proposed design using ZigBee technology has committed the possibility to use WSN as the wireless communication medium of the smart monitoring system. However, this proposed design only realized the basic home environment monitoring function, and did not provide a remote access to the system.

The introduction provides a brief review of the existing academic research in the field of smart monitoring. And this research lies predominantly in the academic arena, with little available publically industrial research. The steps of smart monitoring system into commercial system have been limited, and where available consumer uptake has been slow.

To focus on the remote access to the smart monitoring system, another design of smart home based on WSN, has installed in some of the recently built residence communities in China [2]. This design offers home gateways which connect the local area network to the Internet. In this proposed design, users can remote access the smart home system to check the real time home environment parameters. Moreover the home gateways based Web service gather all the home environment data and store the data in the central database. However, this proposed design has largely neglected the privacy which the service providers can get access into each home database. For some users, this open architecture raised privacy problem, which may be much greater than the advantages offered by granting third party access.

These researches have done a greater job on contribution to the development of a home gateway. However, this home gateway has focused on the provision of remote connectivity and has largely neglected investigating the integration of existing local wireless network.

1.2 Analysis of the Existing Systems

There are three main categories which limit the adoption of the smart monitoring system by consumers.

Inflexible user interface. These existing systems have offered many kinds of solutions for users to monitor the smart monitoring devices. However, these existing systems limited the users using a single method. Some of these existing systems provided more than one interface to the users always causes the uncomfortable and confusion.

Ignoring the security of the system. These existing systems have largely neglected the safety and the security of the monitoring system. That may cause the potential privacy problems.

Without data accumulated precipitation. These existing systems have the functions of data gathering and processing. However, there are no data accumulated precipitation for further data accumulated precipitation.

1.3 Features of the Proposed System

In this paper presents a flexible, stand alone, low-cost and energy efficiency ZigBee based remote smart monitoring system with data accumulated precipitation. This architecture is designed to reduce the system complexity and provide varying access to the system with good security. This proposed system allows users at university archives room to use any devices which support Java and HTML 5, and the devices can access the Internet to monitoring the university archives room. A coordinator with URAT port which communicating with host-pc can work on the facilitate interoperability between heterogeneous network and support any devices accessing in a consistent interface.

In this propose system, there is a host-PC and database server to check all communication before these commands are worked on the devices. The data server could provide data accumulated precipitation, data accumulated precipitation, and the database server can also be used as B/S server which makes the proposed system more low-cost for real implement. And the host-PC and database server with firewall can guarantee the security of the whole system, through checking the messages by the authorized users [4, 5].

In this paper, section 2 discusses the system architecture and a review of the technology used in this design. Section 3 and Section 4 show the implements of the proposed system as ZigBee network hardware design and software design. And Section 5 describes the system evaluation and the Section 6 provides a conclusion.

2 System Architecture

The proposed system architecture is shown in Fig. 2. This system provides a solution of archives room monitoring system based on ZigBee wireless sensor networks with the characters of low cost, energy efficiency and easy installation. Users can monitor the archives room remotely through internet to get the real-time archive room environment information and alarm information. There are mainly three parts of the proposed system: clients, Host PC and database, and ZigBee wireless sensor networks. ZigBee wireless sensor networks include the coordinator unit and sensor unit. The coordinator unit mainly gathers the information data and manages the device nodes in the networks [4]. The sensor unit provides the function of data acquisition by serval device node with different functional sensors such as temperature, humidity, brightness, smog sensor and flame sensor.

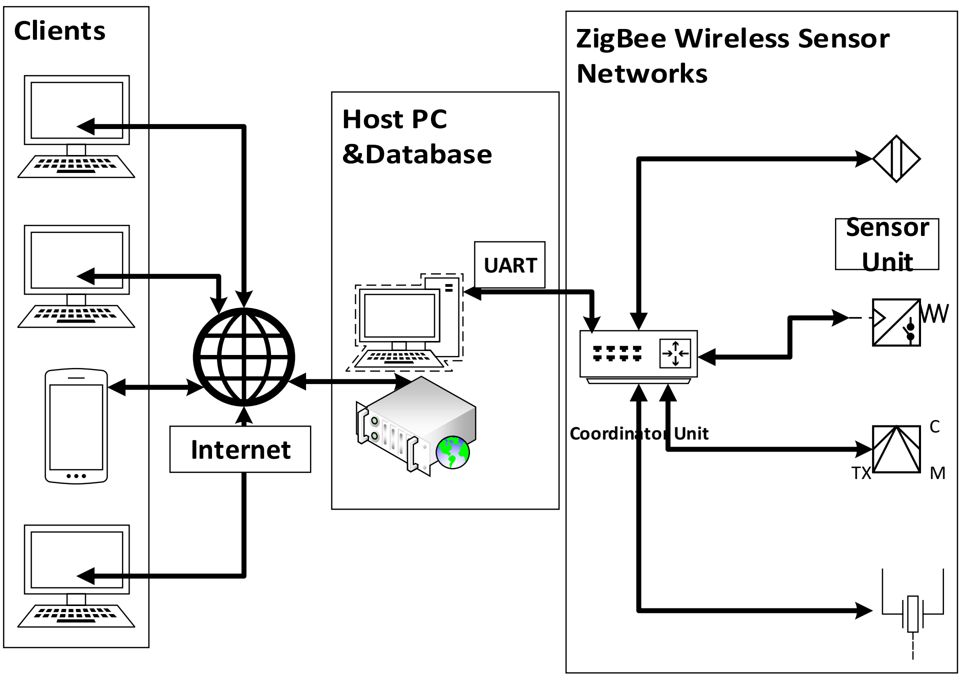

Fig. 2. System architecture

2.1 Clients

As shown in Fig. 2 users login in the monitoring system by clients through internet. Clients provide real-time data from host PC and database. Users can get information anytime, anywhere by using clients.

2.2 Host PC and database

This part of the proposed system provides the functions of gathering archives room environment information by UART, storing the data in the database, providing the interfaces for clients remotely checking the information and the most important function sending alarm information to clients as the archives room having any kind of accidents.

2.3 ZigBee wireless sensor networks

This part includes two units: the coordinator unit and the sensor unit. These two units communicate with each other by ZigBee wireless sensor networks based on IEEE 802.15.4 protocol. The proposed system uses PAN network topology structure which is one coordinator and several device nodes. ZigBee wireless sensor networks full data transportation rate is 250 Kb/s which fully meet the system requirement.

3 Hardware Design

In this section, the proposed paper forced on the design and implements of the hardware which was divided into three parts: the processor module, the coordinator module and the sensor module. The processor module provides the calculation and the core hardware system with the software programming environment. The coordinator unit function is gathering the information data from senor nodes through ZigBee wireless sensor networks with four functional modules as power module, timer module, antenna module and UART module. The sensor unit is mainly responsible for getting the environment information by the four kinds of sensors of the sensor nodes and translating to the coordinators.

3.1 The Processor Module

This paper proposed to use the SoC of CC2430 series chips by TI which is based on C51 system. The C2430 series chips provides free ZigBee protocol stack-Z-Stack and software development tool-IAR Embedded Workbench which is highly compatible with standard C library and providing the optimization for cross-compile. The CC2430 internal structure is shown in Fig. 3. The main characters of C2430 are:

Wide range of voltage;

- High performance C51 core;
- Energy efficiency, 0.9uA cost at sleep mode, 0.6uA at standby mode and 27 mA and 25 mA at sending and receiving working status;
- Providing CSMA/CD;
- Providing RSSI/LQI and DMA functions;
- Providing 128KB programmable FLASH and 8KB RAM;
- Providing RTC wakeup and external interrupt;
- 14bit ADC;
- AES security coprocessor;
- Providing 2 USART, 1 IEEE 802.15.4 standard MAC timer, 1 regular 16bits timer and 2 8bits timer;
- 7*7 RoHS QLP48 pinout;

3.2 The Coordinator Unit

The coordinator unit is mainly responsible for gathering the information data, its main functions are setting the ZigBee network and managing the sensor nodes [5]. There is an additional function of this unit is processing data and transport to the host PC through RS-232 serial port. The hardware design of coordinator unit is divided into four parts which are power module, timer module, antenna module and UART module which is shown in Fig. 4.

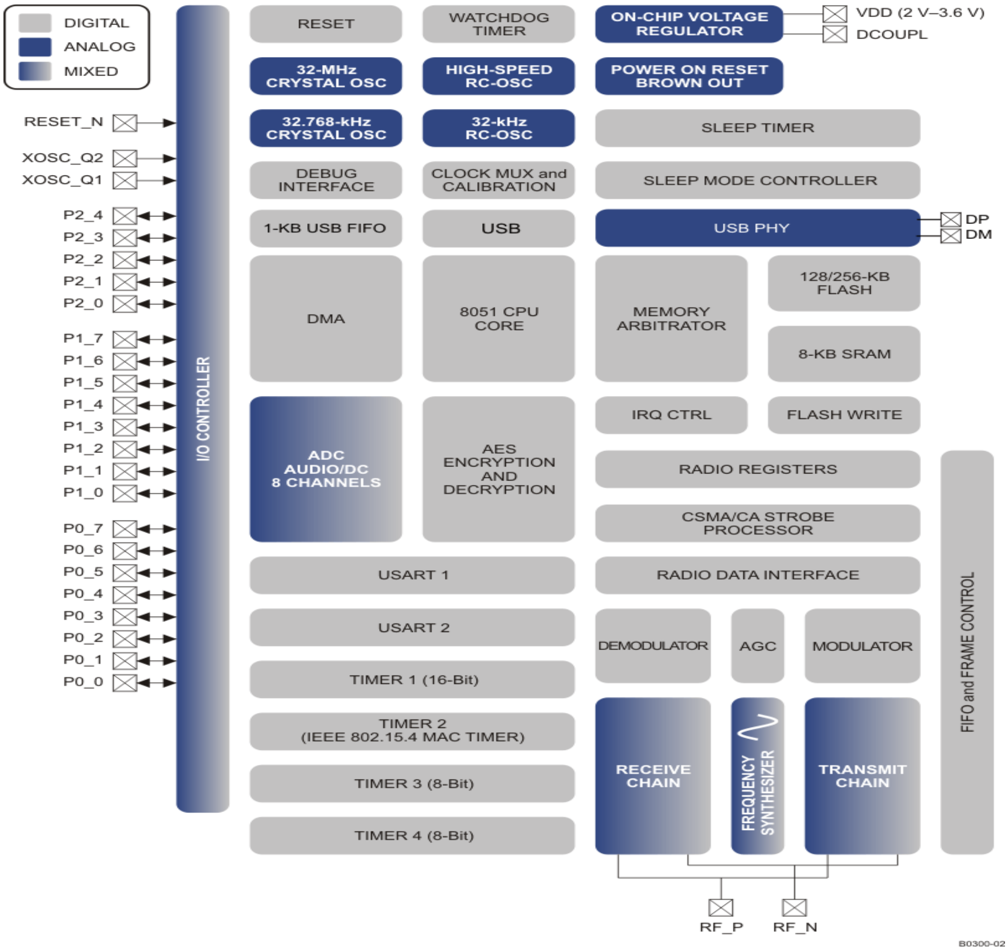

Fig. 3. The Internal structure of CC2430

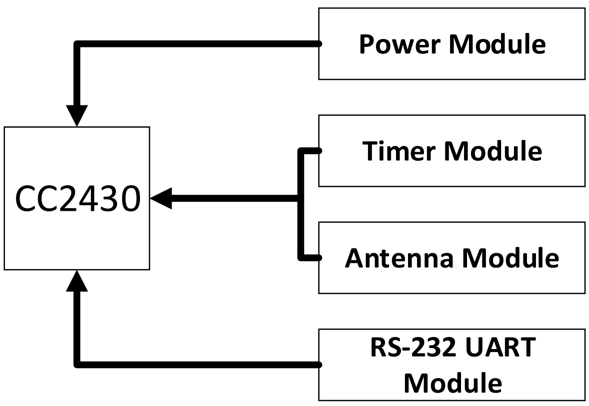

Fig. 4. Principle design of coordinator unit

The power module. For the concern of the power supply stability, this paper proposed using 5 V external DC power which is commonly used. There is a voltage difference between the external 5 V to the system internal working voltage 3.3 V which makes a voltage conversion chip necessary. In this paper, MAX687 is selected for realizing the 5 V to 3.3 V voltage conversion function [6]. MAX687 is the chip with the function of low noise, low voltage difference, the maximum stable 1A output and power supply voltage transient at lower than 0.2 mV, which can cut off the power at the point of the voltage lower than 2.96 V. The hardware design of the power module circuit is shown in Fig. 5. The input voltage is 2.7 V to 11 V. To supply power all of the function units of the coordinator unit, the power module design proposed using PNP triode FZT749 for expanding current output, which could reach 1 A as maximum current output.

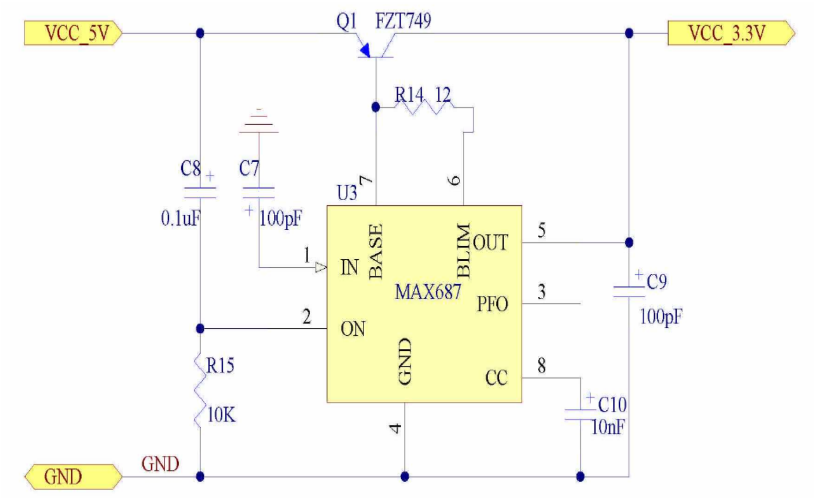

Fig. 5. The hardware design of power module

The timer module. The CC2430 chip provides two different timer frequency, which are 32 MHz regular working timer frequency connected with P19 and P21 Pinout, and 32.768 KHz power consumption working frequency connected with P43 and P44 Pinout. The hardware design of the timer module circuit is shown in Fig. 6.

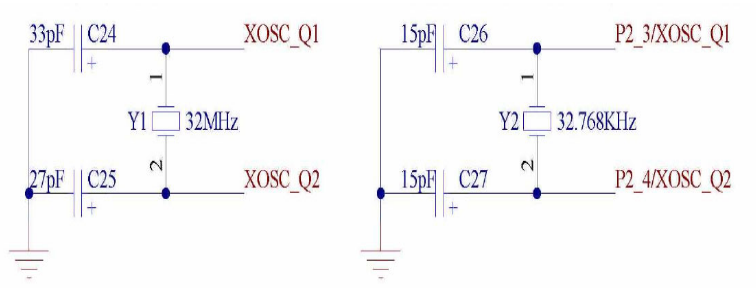

Fig. 6. The hardware design of timer module

The antenna module. To guarantee the communication stability and ZigBee signal intensity, in the proposed system, the ZigBee modules add the SMA antennas in the U.FL ports [7]. SMA antenna gains 2 dBi signal intensity. The SMA antenna connected line, SMA antenna, and combination of SMA antenna and ZigBee module are illustrated in Fig. 7, Fig. 8, and Fig. 9 [8].

Fig. 7. The SMA antenna connected line

Fig. 8. SMA antenna

Fig. 9. The combination

The UART module. The CC2430 Chip provides 2 parts of serial ports, UART0 is chosen to be used as serial communication port. This paper proposes using RS-232 9 pins D mode which is commonly used. It only needs 3 connection with CC2340 which are TXD data sending, RXS data receiving and GND. For the concern of voltage conversion of 3.3 V serial port, MAX3232 chip is also need to realize the function of voltage conversion between TTL to RS-232. The hardware design of UART Module is shown in Fig. 10.

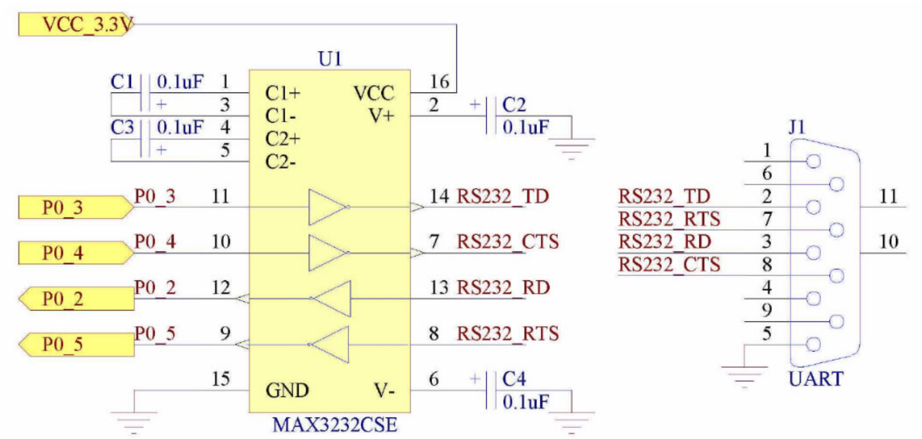

Fig. 10. The hardware design of UART module

3.3 The Sensor Unit

Sensor unit provides the functions of data gathering and sending which is the basic functional nodes of ZigBee wireless sensor networks. The hardware design of sensor unit is mainly divided into 5 parts which are power and power management module, timer module, antenna module and data acquisition module. CC2430 is also used as processor module, the basic hardware design of sensor unit such as timer module, antenna module are the same as coordinator unit. Power and power management module provides working voltage for the data acquisition module and turning off some functional components for the consideration of energy efficiency [8]. Data acquisition module main functions are collecting environment information, transforming Anglo signals to Digital signals and processing and improving currency of the digital signals. The principle design of sensor unit is shown in Fig. 11.

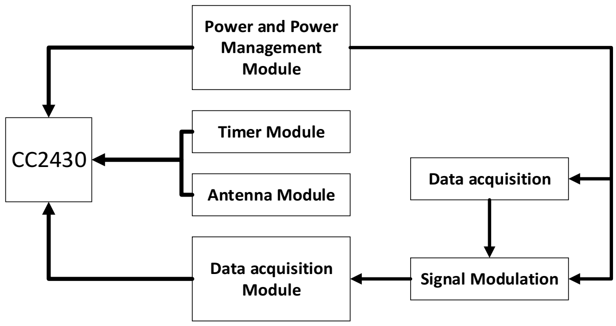

Fig. 11. The principle design of sensor unit

Power and power management module. There are different working voltage of the senor unit components which are 6 V, 9 V, 12 V and 3.3 V of CC2430. For the consideration of energy consumption [9], power and power management module use two separated circuits to provide the needs of all the working voltage. The principle design of these two separated circuits is shown in Fig. 12.

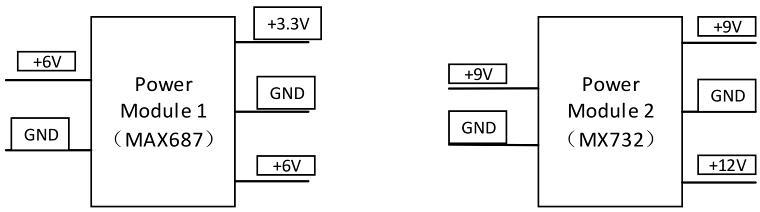

Fig. 12. Principle design of the power management system

Power Module 1 provides 6 V by two series 3 V batteries and transforming to 3.3 V by MAX687 which can support the working voltage of CC2430 and operational amplifier AD8544. Power module 2 provides 9 V by one 9 V battery and transforming to 9 V and 12 V by MAX732 which can support the working voltage of the sensor components. The hardware design of MAX732 is shown in Fig. 13.

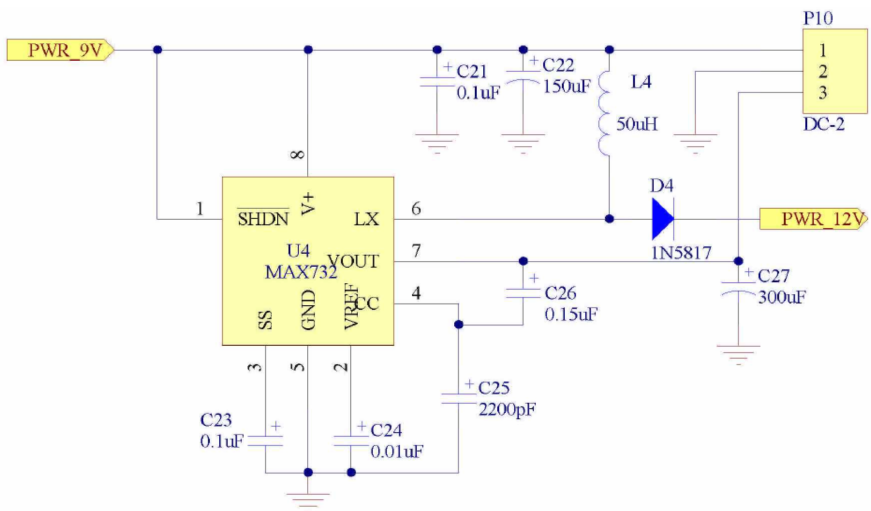

Fig. 13. The hardware design of MAX732

Data acquisition module. The environment information data is collected by digital sensor components which can translate Analog signal to Digital signal of data acquisition module and modulated the digital signals by noise removing, filtering and quantization for the consideration of CC2430 processing [10]. The paper proposes to monitoring the main characters of environment information are temperature and humidity, brightness, smog and flame. To realize these four functions, the proposed design uses four separated sensor components which are SHT11, APDS-9002, LH-91L and Flame-1000.

(1) Temperature and humidity senor SHT11

SHT11 is I2C bus chips which is produced by Sensirion based on CMOSensTM technique with the function of digital output, exemption debug, room-calibration, absohiny from peripheral circuit and full-interchange. The main working characters of SHT11 is shown in Table 1.

Table 1. Main working characters of SHT11

	Temperature	Relative Humidity (RH)
Range	-40°C ~ +123°C	0% ~ 100%RH
Accuracy	±0.5°C (25°C) and ±0.9 (0~40°C)	±3%RH (20%~80%RH)
Response Time	≤ 20 s	≤ 4 s
Resolution	0.01°C	0.03%RH

SHT11 provides two ports SCK and DATA to realize the function of data reading and writing. SCK port responses the communication clock synchronization with CC2430, DATA port responses the data reading and writing. The hardware design of SHT11 is shown in Fig. 14.

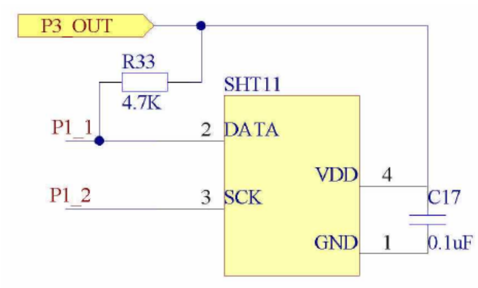

Fig. 14. Hardware design of SHT11

As shown in Fig. 14, the SHT11 chip VCC and GND are parallel connection to a 0.1 uF capacitor as decoupling filter. The SHT11 chip SCK and DATA are connected to P1_1 and P1_2 of CC2430. The 4.7 k resistors R33 are used as pull-up resistors for DATA port.

(2) Brightness sensor APDS-9002

ADPS-9002 sensor is produced by Agilent Technologies which is analog output environment brightness sensor. ADPS-9002 works at the voltage from 2.4 V to 5.5 V and detects the illuminance range from 1 to 5000 which are full functional for the proposed design. The hardware design of ADPS-9002 is shown in Fig. 15.

As shown in the bottom of Fig. 15, the output signal of ADPS-9002 needs to signal amplification as the 1K load resister drives the output signal very weak. R13 is 100 K variable resister, R15 and R14 are 10 K resister [9].

(3) Smog sensor LH-91L

LH-91L is the ion switch type smog sensor which is produced by LongHorn. LH-91L output is open at usual time, the switch turns off and send the alarm when the smog concentration gets to the level. The hardware design of LH-91L is shown in Fig. 16.

(4) Flame senor Flame-1000

Flame-1000 sensor is IR type sensor with analog and digital output which works at 0~5 V. Digital output 0 represents no flame detected and output 1 represents flame detected then sends the alarm. The working characters of Flame-1000 is shown in Table 2.

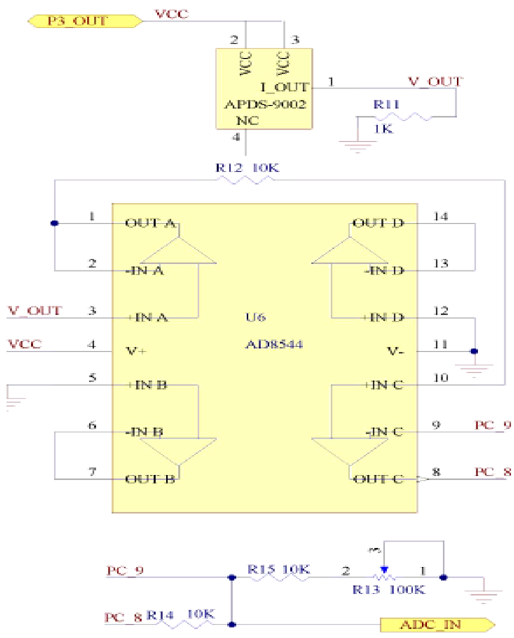

Fig. 15. Hardware design of ADPS-9002

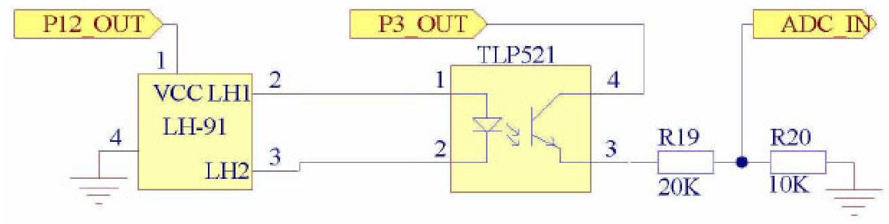

Fig. 16. Hardware design of LH-91L

Table 2. Flame-1000 working characters

Functions	Range
Working Voltage	3~5 V
Wave detected Range	700~1100 nm
Distance	>1.5 m

4 Software Design

In this section, the proposed paper forced on the design and implements of the software which was divided into three parts: establishing ZigBee network, sensor unit software design and coordinator unit software design. Establishing ZigBee network forced on two fucntions which are the management of ZigBee network for coordinator unit and sensor unit initialization and communication. sensor unit software design worked on functions of sensor unit are joining the network, gathering environment information, data processing, and device nodes data sending and receiving. Coordinator unit did the research on managing the ZigBee wireless sensor networks, data receiving and sending, and UART communication.

4.1 Establishing ZigBee Network

As the hardware design of the proposed system are mainly about two parts which are the coordinator unit and sensor unit. The main software design of establishing ZigBee network are about two steps which are management of ZigBee network for coordinator unit and sensor unit initialization and communication [13]. The main working flow of these two separated steps are shown in Fig. 17 and Fig. 18. Firstly, initialize CC2430 which includes the initialization of timer, I/O, system clock, working voltage and stack initialization. Secondly, software initialization includes non-volatile variable initialization and ZigBee stack protocol Z-Stack initialization.

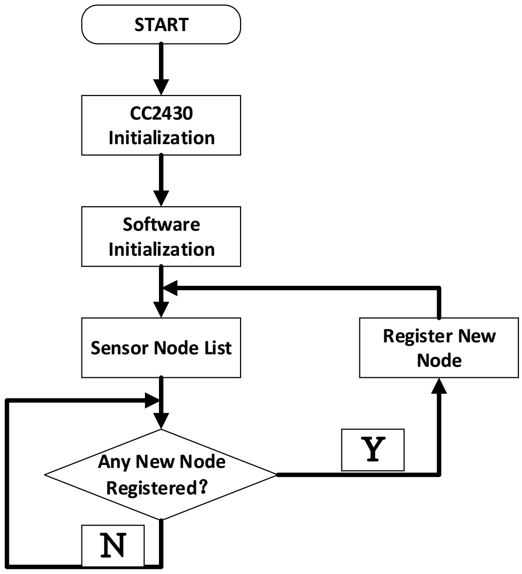

Fig. 17. Management of ZigBee network chart flow

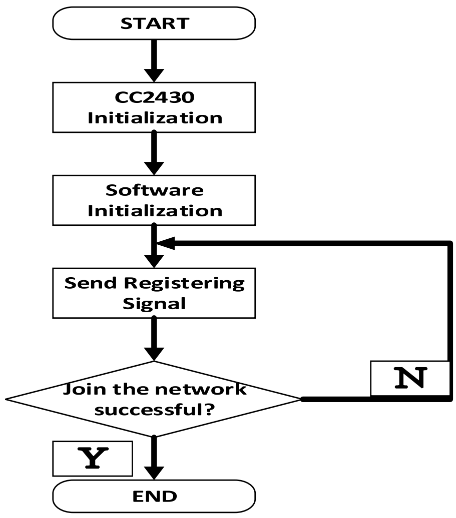

Fig. 18. Sensor node initialization and communication chart flow

c stack Z-Stack for software development. Z-Stack provides task queue array taskEvents[] to store waiting tasks, and function pointer array taskArr[] to process the highest level waiting task from taskEvents[]. The priorities of taskEvents[idx] is determined by index number 'idx'. The value of idx is lower, the priority of the waiting task is higher. The priorities of Z-stack is shown in the definition of taskArr[].

```
Const pTaskEventHandlerFn taskArr[]={
macEventLoop, //MAC task
nwk_event_loop, // Network task
Hal_ProcessEvent, // Hardware abstraction task
#if defined(MT_TASK)
MT_ProcessEvent, // Debugging task(if needs debugging)
#endif
APS_event_loop, //APS task
```

```
ZDApp_event_loop, //Device Application task
TempApp_ProcessEvent //Application task};
```

As shown above, the highest priority is MAC task and the lowest priority is Application task. The main framework of Z-Stack is shown in Fig. 19. At most time, the first five or six tasks which needs debugging are the same for different projects. The only difference of the software development by using Z-Stack is Application task. This character of Z-Stack software development ensures the system stability, code transportation and easy-developing.

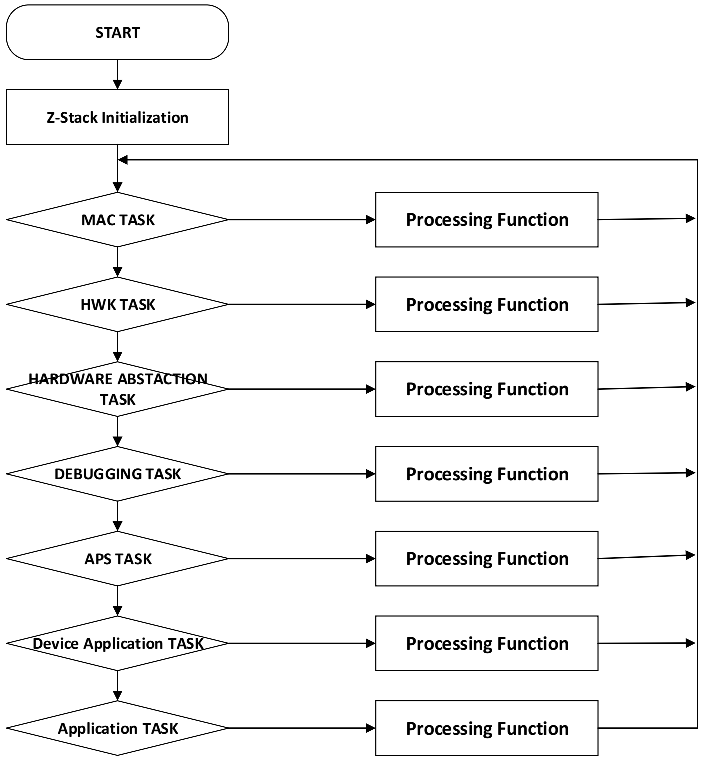

Fig. 19. Main Frame flow of Z-Stack

4.2 Senor Unit Software Design

The main functions of sensor unit are joining the network, gathering environment information, data processing, and device nodes data sending and receiving [14]. As discussed above, the software design mainly about the Application layer of Z-Stack. Sensor unit software design forces on data acquisition, data processing, data transportation and device nodes management. The structure of sensor unit software design is shown in Fig. 20.

(1) Data acquisition module

This module is mainly responsible for environment information data acquisition, transforming analog signals to digital signals by CC2430 A/D function, and data testament.

(2) Data processing module

This module processes the data from data acquisition module and device nodes management module for controlling the device nodes working status and sending the data to data transportation module from data acquisition module.

(3) Data transportation module

This module main function is calling other layer functions of Z-Stack to transport data through ZigBee wireless sensor networks.

(4) Device nodes management module

This module controls all the device nodes working status and working functions.

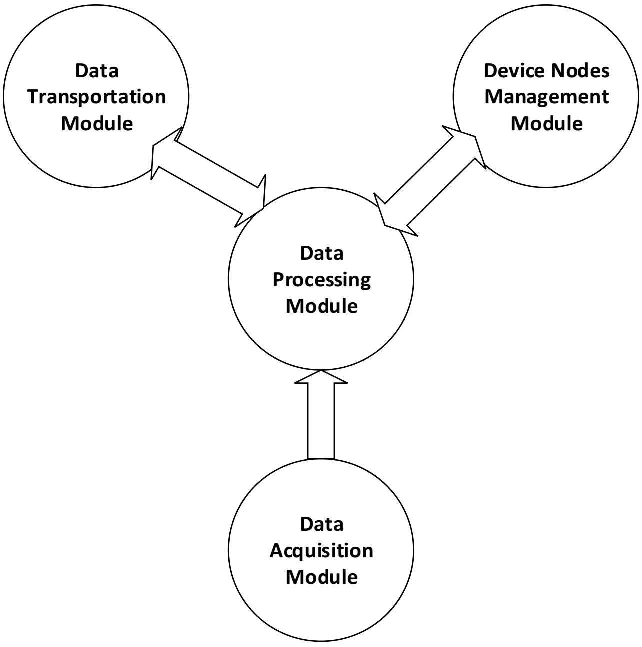

Fig. 20. Sensor unit software design architecture

The main sensor unit software working flow is the same, although the device nodes is different from each other. The main flow chart of sensor unit software is shown in Fig. 21.

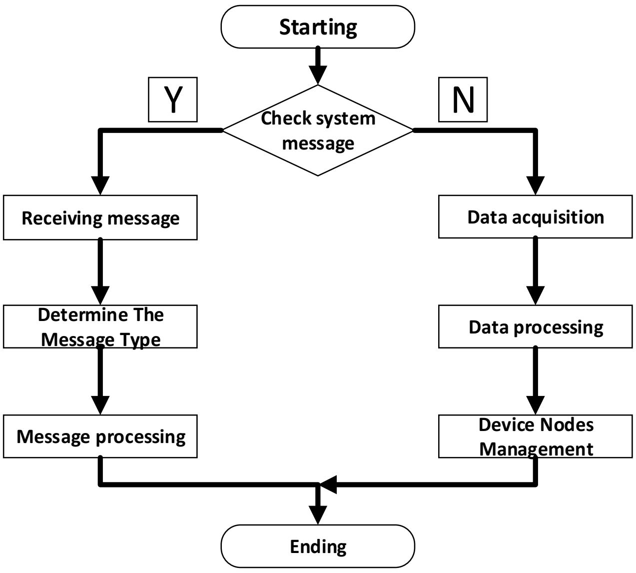

Fig. 21. Sensor unit software working flow

Firstly, check the system information message for the beginning. Secondly, if there is system information message then goes to message processing working flow; if there is no system information message, then goes to device nodes data acquisition working flow [15].

There are two system information message types which are device nodes joining ZigBee wireless sensor networks message and data transporting message. These two Message types processing working flow are shown in Fig. 22.

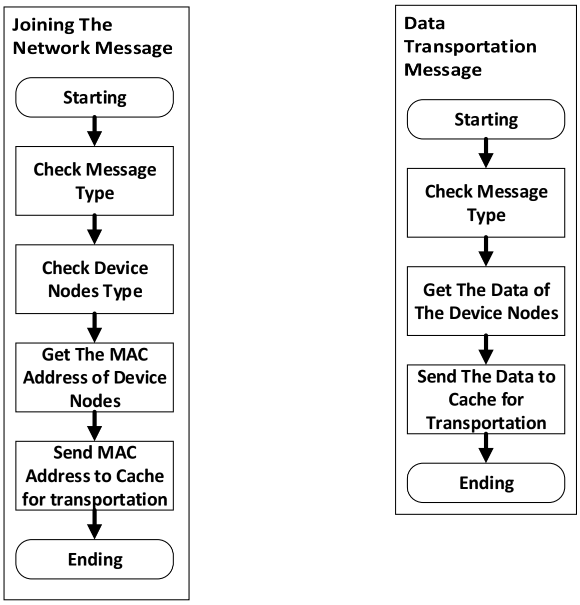

Fig. 22. Message processing Working Flow

As shown in the picture above, device nodes types of the message include the types of information of different sensors such as temperature and humidity sensor SHT11, brightness sensor ADPS-9002, smog sensor LH-91 and flame sensor Flame-1000; and information of device working status such as signal intensity, device nodes battery life and CC2430 control data [16]. This paper takes the temperature and humidity sensor SHT11 as an example to explain the working flow of sensor unit software design. The working flow of SHT11 is shown in Fig. 23.

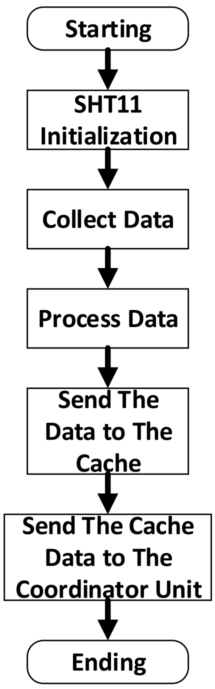

Fig. 23. SHT11 working flow

(1) SHT11 initialization;
(2) Collecting the environment temperature and humidity information from SHT11;
(3) Processing the information data and pack the information data for ZigBee wireless sensor network communication;
(4) Sending the information data package to the data transportation module cache;

(5) Sending the information data to coordinator unit by data transportation through ZigBee wireless sensor networks.

4.3 Coordinator Unit Software Design

Coordinator unit main functions are managing the ZigBee wireless sensor networks, data receiving and sending, and UART communication. With the difference of sensor unit, coordinator unit includes data processing module, wireless communication module, and UART module [17]. Coordinator unit software architecture is shown in Fig. 24.

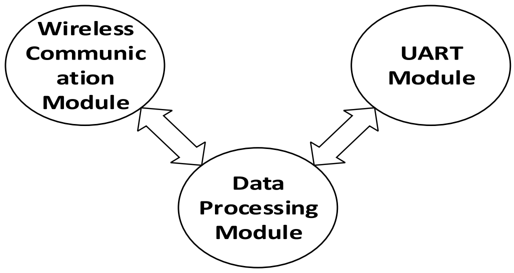

Fig. 24. Coordinator unit software design architecture

(1) Data processing module

This module processes and forwards the commands from host PC to wireless communication module; forwards the data from wireless communication module to host PC.

(2) Wireless communication module

This module sends the controlling and configuration commands to sensor unit through ZigBee wireless sensor networks, and gathers the environment information data from sensor unit.

(3) UART module

This module communicates the coordinator with the host PC by receiving and sending commands and data.

Coordinator unit is mainly responsible for communication, the communication between host PC with coordinator unit through UART and the communication among device nodes and coordinator unit. The software design of Z-Stack application layer is mainly about message processing [18]. There are three types of message which are message of receiving data from device nodes, device nodes configuration message and UART reading data message. The first two types of message processing flow is similar to sensor unit message processing, in this section, this paper mainly discusses the UART reading data message processing flow. The coordinator unit processing message working flow is shown in Fig. 25.

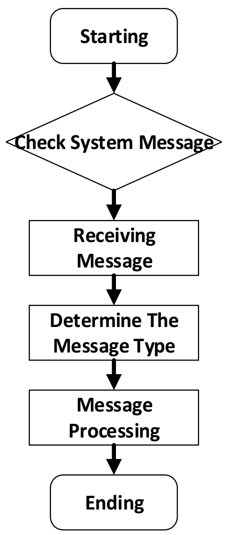

Fig. 25. Coordinator unit message processing working flow

There are two steps of UART reading data message processing flow. The orking flows of these two steps is shown in Fig. 26.

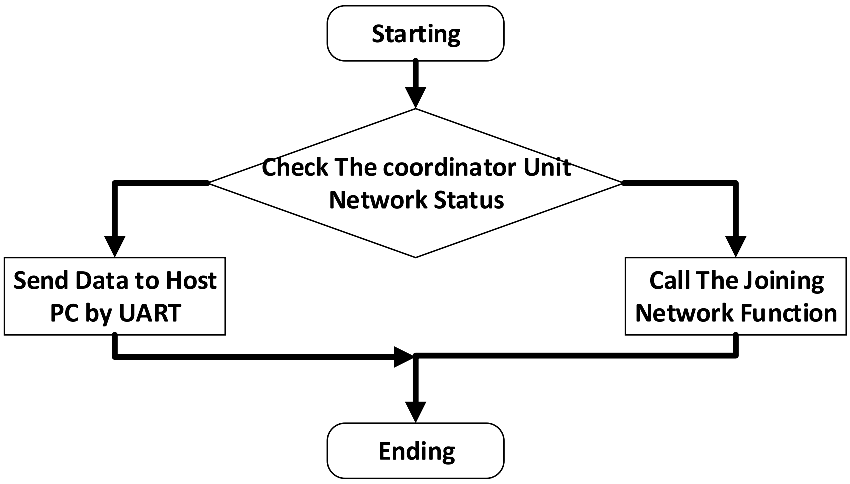

Fig. 26. UART message processing working flow

(1) Check the coordinator unit whether in the ZigBee sensor networks. If not, calls the functions to join the ZigBee wireless sensor networks. If the coordinator unit is in the ZigBee wireless sensor networks, goes to (2).
(2) Send the data to host PC as requested through UART module.

5 Evaluation

This paper proposes to evaluate the system ZigBee wireless communication stability and sensor unit functions [17]. These two parts evaluation have the meanings for system real working status and discovering the system failure.

5.1 ZigBee Wireless Communication Stability Evaluation

To test the ZigBee wireless network communication stability, we used 1 coordinator and 10 device nodes in the archives room. Each end device sent 36 bytes data every 2 minutes. For the test convenience, we marked the 10 end devices from Node 1 to Node 10. And the results are shown in Table 3.

Table 3. Frame loss rate

Node NO.	Actual Sending Frame	Expected Sending Frame	Frame Loss	Frame Loss Rate
Node 1	2680	2685	5	0.19%
Node 2	2683	2685	2	0.07%
Node 3	2677	2685	8	0.298%
Node 4	2678	2685	7	0.26%
Node 5	2683	2685	2	0.07%
Node 7	2676	2685	9	0.34%
Node 8	2680	2685	5	0.19%

As shown in Table 3, the end devices frame loss rate are under 0.3%, because of the Wi-Fi wireless network interference and the walls in the house, as we analyzed. The ZigBee wireless network communication stability met the requirement.

5.2 Sensor Unit Functions Evaluation

This part of evaluation forces on three kinds of sensors SHT11, LH-91L and Flame-1000, host pc gets data from coordinator through ZigBee wireless sensor networks [20].

SHT11 evaluation. To test the SHT11 sensor working function, this paper proposed using one SHT11 device node in one archives room and one air conditioner for heating. The temperature change curve chart is shown in Fig. 27.

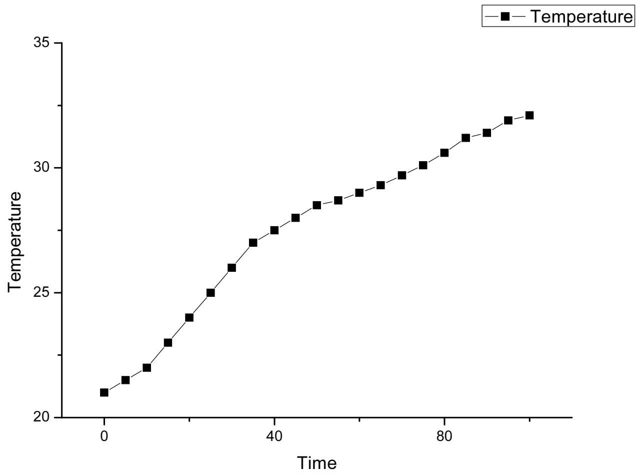

Fig. 27. Temperature change curve chart

As shown in the picture above, the ordinate is the temperature from 0°C to 100°C and the abscissa is the time from 0 minute to 100 minutes [21]. The first 5 minutes, testament keep the environment stayed at normal condition without heating and closed the windows and doors; at 5 minutes, testament opened the air conditioner for heating and set the air conditioner working mode as 32°C and full speed. From 10 minutes, the temperature of the archives room started to heat up a little bit. From 30 minutes, the temperature started growing up more and the temperature is about 25°C. Since 80 minutes to 100 minutes, the temperature did not change so much only about 3°C. To test SHT11 working function reliability, another testament was needed. The testament proposed using the same SHT11 device nodes to monitor the temperature change beside the air conditioner air outlet. The temperature change curve chart is shown in Fig. 28.

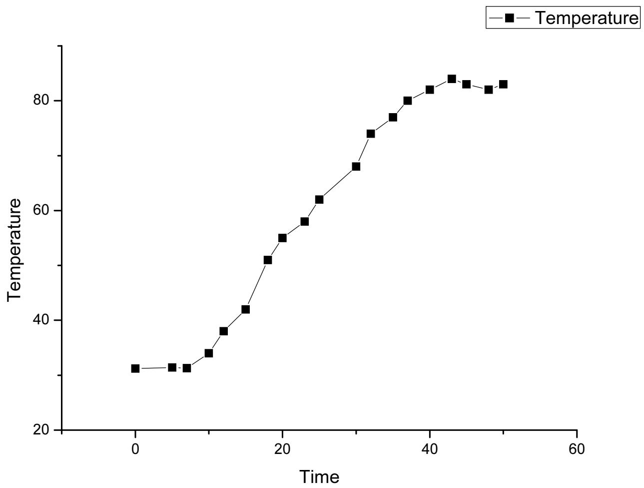

Fig. 28. Temperature change curve chart

As shown in the picture above, the ordinate is the temperature from 0°C to 140°C and the abscissa is the time from 0 second to 50 seconds. The first 10 seconds, testament keep the device nodes away from the heating air outlet, the temperature data did not change so much; since 10 seconds, testament put the device node beside the heating air outlet and the temperature data grown up so quickly; at last 10 seconds stayed at about 83°C.

The evaluation of these two testament, SHT11 working function meets the requirement of the proposed design [22].

LH-91L and Flame-1000 evaluation. To test smog sensor and flame sensor functions, this paper proposed using the flame and smog of the fired papers for simulating the real fire accident. The active alarm distance of smog sensor LH-91L is 12 cm to 15 cm, and the active alarm distance of flame sensor Flame-1000 is 20 cm to 24 cm [23]. For each sensor there are two tests about 10 seconds and 15 seconds. The test results are shown in Table 4 and Table 5.

Table 4. Smog sensor LH-91H test results

Distance		Actives
Test one	Test two	
0 cm~12 cm	0 cm~15 cm	Enable
12 cm~16 cm	15 cm~25 cm	Enable
16 cm ~	25 cm~	Disable

Table 5. Flame sensor Flame-1000

Distance		Actives
Test one	Test two	
0 cm~20 cm	0 cm~20 cm	Enable
20 cm~26 cm	20 cm~26 cm	Enable
26 cm~	26 cm~	Disable

All testaments show the functions of these three types of sensors fully meeting the requirement of the proposed system design.

6 Conclusion

Intelligent university archives room brought new possibilities, this paper proposed a solution for remote monitoring based on ZigBee wireless sensor networks. The main functions of the proposed system are collecting archives room environment information by four kinds of sensor components and gathering all information by coordinator through ZigBee wireless sensor networks. The detailed descriptions of the design and implement of the proposed design are the main part of this paper. To testify the stability and functions of device nodes, a testament is also proposed. This paper expects to contribute towards the development of ZigBee technology for remote indoor environment monitoring. However, the proposed design and implemt of this paper still need to do more research on solving the problem of network congestion with extanded sensors for larger arhives room; the real-time problem and of advanced algorithm for data gathering and processing. For the future work, an advanced design for larger archives room requirment, the B/S mode client’s application and smart phone APP are next steps for the fully functional system which will be used on college of continuing education and vocational education of Yunnan Agriculture University archives room.

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