Zigbee based intelligent environmental monitoring system designed coop

[1]JunYi Liu

Abstract

In view of the present poultry farming intensity big, disease happens, such as environmental pollution, design the intelligent henhouse environment monitoring system based on zigbee. A detection unit of the system is the main processor cc2430, which coop the sensor detects temperature, humidity, carbon dioxide concentration, light intensity. By zigbee wireless communication module to send data to the controller based on the STM32F103ZET6 PC. After passing the judgment, the host computer to control the corresponding devices, to automatically or manually controlled sheds the environment.

Keywords: environmental monitoring; zigbee; cc2430; STM32F103ZET6; energy saving

1. Introduction

In recent years, with the rapid development of large-scale farming, intensive, industrialized farming industry continues to increase, the increase of infectious diseases. So that coop environment increasingly Effect Health and performance of chicken. Literature[1] describes the establishment and use of detection network, you can use PC monitoring, but it can not control the microclimate environment. Literature[2] monitoring and automatic control, but did not specifically mention how to build automatic control and automatic control systems. Not take into account sheds fecal pollution, energy saving issues. Literature[3] for the environment sensor system, is proposed the use of wireless communication technology, but without the automatic control system and the sensor will be explained. Literature[4] on the present situation of animal building environment monitoring system studies conducted in-depth exposition, fully explain the significance and importance of the system design. Literature[5] on zigbee technology in monitoring system put forward their own concept, but did not give full play to the advantages of technology could not be better to expand the system functionality.

This article is designed based intelligent environmental monitoring system zigbee coop, the system processor to the CC2430 and through zigbee wireless network to communicate with a PC-based controller STM32F103ZET6.Connect PC and PC through USB, and using monitoring platform created by the labview real-time monitoring. The use of sensors to monitor temperature, humidity, carbon dioxide concentration, light intensity inside the chicken coop and other parameters, then transmitted to the host computer for processing, and then monitors the host computer or control actuator operation according to the corresponding indicators

**CorrespondingAuthor:Jian Fang*
(E-mail:757314739@QQ.COM)
College of Electrical Engineering, Jilin Teachers' Institute of Engineering &Technology Changchun 130052 China

to achieve control house environment. When the value is above or below the detection coop environmental standards and can automatically adjust the alarm system to achieve automatic and manual dual-mode control.

2.System Hardware Design

Intelligent henhouse environment monitoring system based on zigbee is mainly composed of zigbee detection system, PC monitoring system, energy conservation and environmental protection system of three parts. zigbee detection system mainly consists of zigbee wireless communications and various sensors. System consists of cc2430 processor to process the detected data, and through the wireless communication to transfer data to the PC monitoring system.

PC monitoring system composed by the the control section and monitoring Platform. By the processor STM32F103ZET6 to determine the data processing to achieve automatic control or manual control purposes to improve the environmental parameters, so that the various indicators remain within the scope of the standard indicators. PC monitoring platform is mainly built by labview virtual instrument technology on the PC. It can be displayed in real time on the environmental parameters and save the data to facilitate remote viewing, set the appropriate standard value, response curves corresponding parameter changes. Mainly by zigbee communication module, monitoring terminal display components.

Energy saving system consists of solar panels, batteries, digester components. All power inside the chicken coop can be provided through the solar panels. Since the coop siting may cause pollution of the surrounding environment, the power supply system to solve the problem of electricity supply coop location is more convenient location. Chicken droppings, etc. stored in the digester can be collected and converted into energy and fertilizer. Effectively reduce the impact of excreta and other open storage area of air and other aspects of the environment, so that the whole house more environmentally friendly. Overall system architecture is shown in Figure 1：

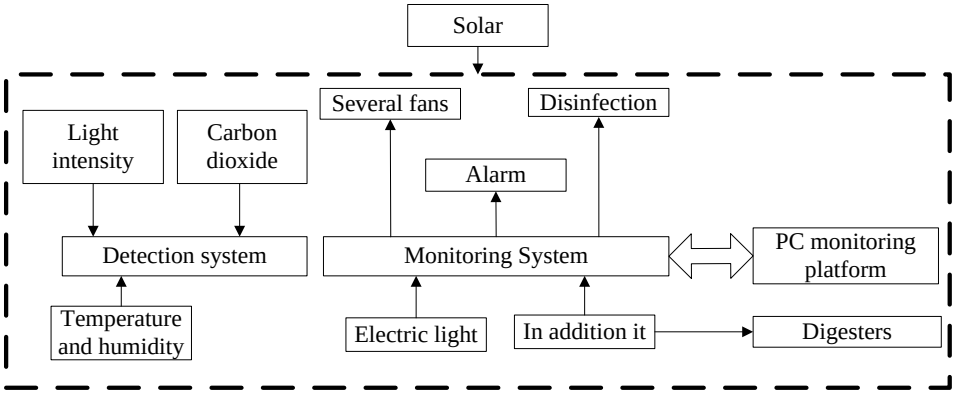

Figure 1: the overall system configuration diagram

2.1 Zigbee Detection System

ZigBee terminal test equipment is responsible for receiving and sending data, sensor data collection and processing, and terminal equipment control administration. work process zigbee detection system: RF chip receives information from the sensors and transmitted to the control system and PC monitoring platform. Terminal device detection system includes a processor unit CC243, temperature and humidity detection means, the carbon dioxide concentration detection means, the light intensity detecting unit, the RF transceiver unit, etc., shown in Figure 2.

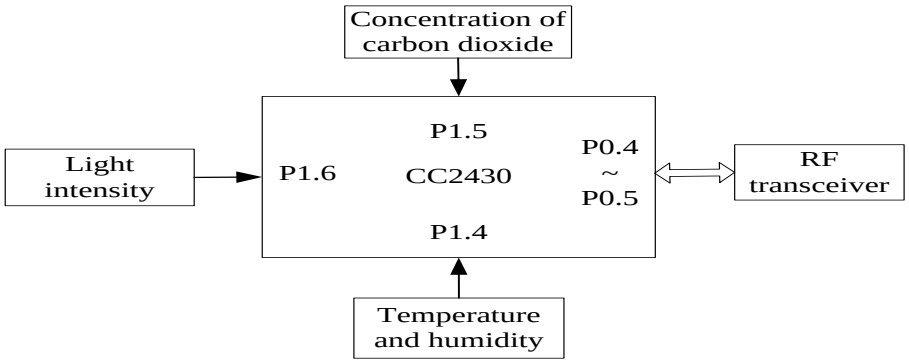

Figure 2: a block diagram of detection system

CC2430 processor unit includes an interface circuit, 3.3V and 1.8V power supply filter circuit, chip crystal oscillator circuit, all of the I / O pin and power pin, reset pin all leads, for use in applications based on the actual situation accordingly the I / O function definition, increase the versatility of wireless modules.

Temperature and humidity detection unit mainly adopts contains has been calibrated digital composite signal output of the temperature and humidity sensor DHT11, DHT11 application-specific modules capture technology and digital temperature and humidity sensor technology, with high reliability and excellent long-term stability.

Carbon dioxide concentration detection unit we use S_100 CO2 capture module, S_100 CO2 infrared carbon dioxide capture module small volume and high precision monitoring equipment suitable for intelligent buildings.

Light intensity detection composed mainly by phototransistor as the light intensity sensor device.

2.2 Monitor Master System Design

Control the main system is mainly on the detection system to determine detected data, the temperature, humidity, carbon dioxide concentration, adjusted light intensity control. By controlling the fan, spray disinfectant, light, bowel system, change the corresponding environmental parameters. By the labview monitoring interface design and the PC constitute monitoring platform, can be real-time display of the detected data, you can view the data of volatility and the monitoring data are stored, to change and setting standard values. As shown in Figure 3.

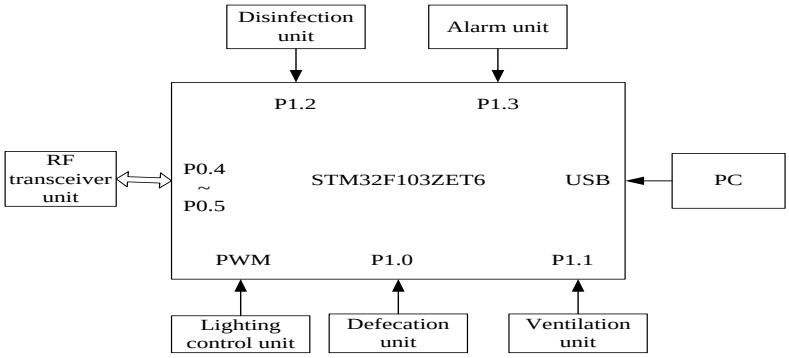

Figure 3: PC monitoring system design

3. System Software Design

3.1 Zigbee Detection System

Zigbee monitoring system's main function is to search within the scope of coverage of network and join the network coordinator created. While using sensor data collected at the scene, sent to the monitoring system via ZigBee network, the main program flow chart shown in Figure 4. First, the system is initialized, then initialize zigbee detect serial information, read the information sent to the host computer to determine whether the transmission is successful, the system determines whether to terminate, continue to read the information, if not terminated.

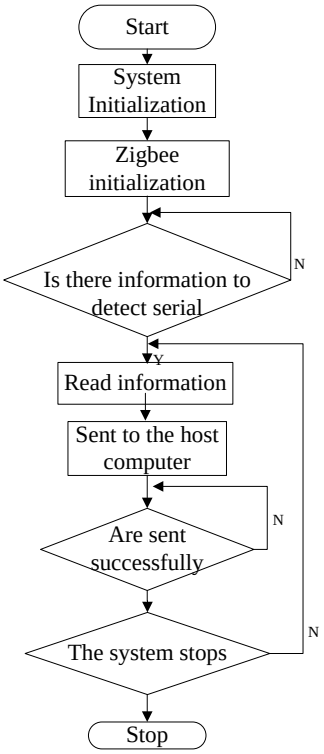

Figure 4:Zigbee detection system flowchart

3.2 Monitoring the main system programming

The program monitors the main system mainly for data transmission detection system to judge and deal with the fan turn, spray disinfectant, light, bowel control systems.Analyzing the work state, the automatic mode or manual mode.The main program flow chart shown in Figure 5. First system initialization, zigbee initialization detects whether to accept the information, determines whether the value exceeds the alarm, data processing and calculation, running the appropriate changes in the system parameters, so as to reach the set range.

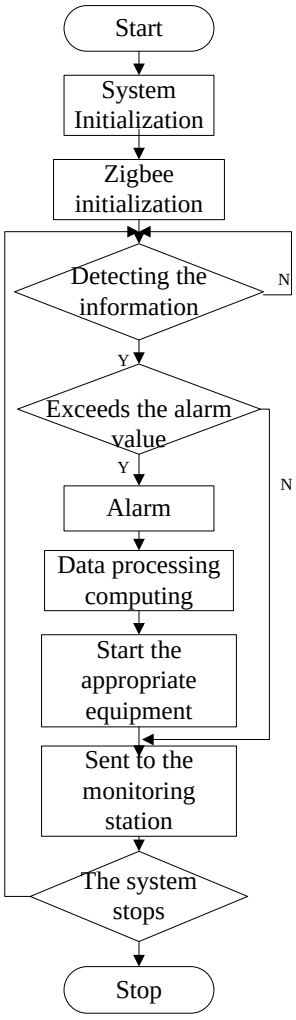

Figure 5: Program flow monitoring system

4. System Testing

PC detection platform is mainly composed by the PC, Pc machine with a graphical display using LABVIEW software development language interface PC monitor, pc's display section will reflect data through intuitive monitoring platform out and standard values can be set for data storage.System testing physical map shown in Figure 6.Figure 7 is a control system for the physical map. When the system measurement, set the carbon dioxide concentration is 500PPM, artificially increasing the concentration of carbon dioxide, real-time monitoring platform to display the corresponding concentration curve and alarm processing.As shown in figure 8.

Figure 6:System Test physical map

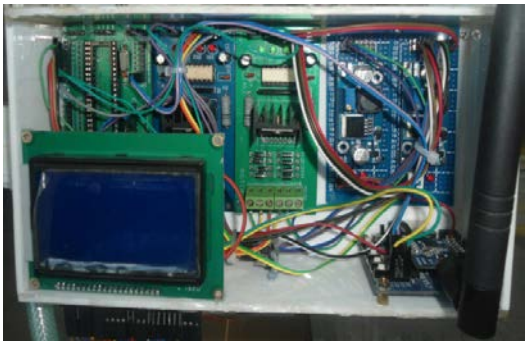

Figure 7:Control System physical map

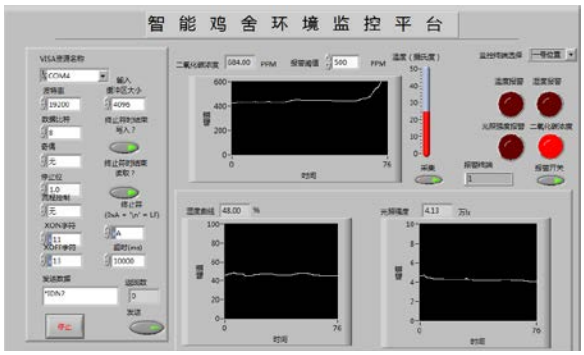

Figure 8:PC interface displays the carbon dioxide concentration in excess of the alarm

The system automatically starts defecation, fecal directly into the digester, start the fan air exchange to the standard range, so that the co2 concentration control level returned to normal, as shown in figure 9.

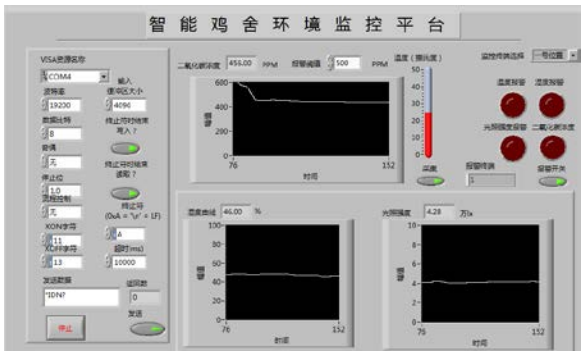

Figure 9:PC interface display automatically adjusts the concentration of carbon dioxide

When light reduced light curve downward trend, real-time monitoring of the curve shown in Figure 10.

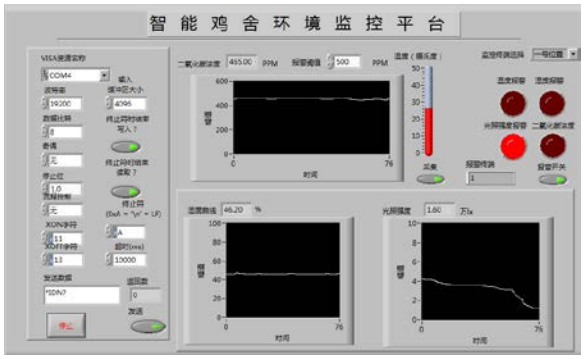

Figure 10:PC interface display automatically adjusts the concentration of carbon dioxide

When the low light intensity, the processor via PWM regulator to increase the brightness of the light intensity light, the effect shown in Figure 11.

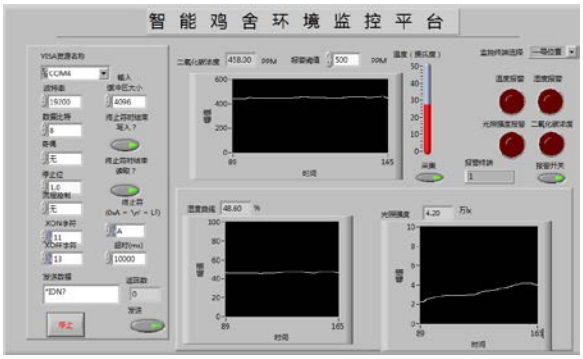

Figure 11:PC interface display automatically adjusts the concentration of carbon dioxide

5. Conclusion

After running shows: The controller is stable, functional, user-friendly, easy to operate, can effectively solve environmental problems closed sheds, sheds little to improve the climate, improve feed utilization, reduce farming costs, to achieve healthy chicken growth has important practical significance, with good promotional value.

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Jun Yi Liu received the B.S. degrees in Automation from Harbin Electric Institute in 1987,M.S. degree in control engineering from Jilin University of Technology in 1995.In 1984,he joined the Jilin Teachers' Institute of Engineering &Technology where he is cuttently a Professor and associate dean .Her current research interests are Smart Meter, Wireless Sensor Technology, intelligent control and their applications.