ISSN : 0974 - 7435 Volume 10 Issue 23

2014

BioTechnology

An Indian Journal

FULL PAPER

BTAIJ, 10(23), 2014 [14377-14381]

Research of wireless position system based on zigBee

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ABSTRACT

The classification of egg is very important in egg production. Put forward an automatic classification device based on machine vision technology on the basis of research at present situation of egg classification home and abroad. Positioning of the egg body is the key to determine the accuracy of classification. At present, the egg body positioning usually use position sensor as it is connected by cable, it's not convenient to install and use. The study of wireless position sensor based on ZigBee ,design the receiving device of wireless position sensor. Proved by the experiment ,errors of the proposed device was 0. 1% , the maximum transfer distance was 100 m, the transfer distance of sensor node was 50 m, and the loss rate of network passage was 0. 89%. The power consumption was decreased with different collecting frequencies and sleep mode. The proposed device could meet the measuring requirement.

KEYWORDS

Egg classification; Location,wireless sensor; ZigBee

INTRODUCTION

Egg classification is an important parameter of the egg production. The precision of the classification in egg production is directly affect the qualified rate of products. egg classification also determines the price of the products. egg classification has become an important parameter of egg quality assessment[1-2].

Egg classification can microwave remote sensing, optical fiber sensing, Photoelectric method, density method, and raman spectrometry .the establishment of practical egg classification in 1978 leads to the wide use of Photoelectric method in measurement of egg classification[3].

Some academician using Photoelectric method with arm, microcontroller or digital processor to design egg classification instrument. while with the development of the wireless sensor networks, the traditional methods mentioned above can not satisfy the requirements of wireless and network[4].

This paper presents a wireless method to measure egg classification based on ZigBee with CC2430 as more devices,ds18B20 and djs-10 have been used to egg classification, the terminal nodes can collect the data and sent to the coordinator node by network[5].

The method has been mentioned above has the following characteristics:

1)Using software compensation method to eliminate the effect of precision in Photoelectric of egg classification.

2)Using ZigBee network to realize wireless measurement of egg classification.

THE PRINCIPLES OF EGG CLASSIFICATION MEASUREMENT WITH PHOTOELECTRIC

From experiment the conductance ratio Rt can be expressed follows:

$$R_t = \frac{r(s,t,0)}{r(3,5,t,0)} \quad (1)$$

While r(s,t,0) is the Photoelectric ,the r(35,t,0) is calculated by the following empirical formula:

$$r(35,t,0) = 0.0033t^2 + 0.8793t + 28.988 \quad (2)$$

The formula of egg classification is calculated at any as follows:

$$S = S_0 + \Delta S \quad (3)$$

While $$S_0 = \sum_{i=0}^{5} a_i R_t^{i/2}$$

$$\Delta S = \frac{t-15}{1+K(t-15)} \sum_{i=0}^{5} b_i R_t^{i/2} \quad (4)$$

ΔS is the egg classification correction value, which caused by egg location.

The coefficients of ΔS are:b0=0.0005,b1=-0.0056,b2=-0.0066,b3=-0.0375,b4=0.0636,b5=-0.0144,k=0.0162.

The coefficients of S0 are :a0=0.0080,a1=-0.1692,a2=-25.3851,a3=14.0941,a4=-7.0261,a5=2.7081.

From Eq.(2.1),(2.2),(2.3)and(2.4),we can get that:

$$S = \sum_{i=0}^{5} a_i \left\{ \frac{r(s,t,0)}{r(35,t,0)} \right\}^{i/2} + \sum_{i=0}^{5} b_i \left\{ \frac{r(s,t,0)}{r(35,t,0)} \right\}^{i/2} \quad (5)$$

We can get conclusion that the egg classification is directly influenced by egg location, that is because the influence of egg location will leads to the ionization constant of electrolyte increased, so when the egg location is changing, the thermal motion of ionic goes faster and Photoelectric increases, and vice versa[6].

The paper proposed a method to measure egg classification by measuring the Photoelectric value with microprocessor .the voltage and egg classification are related as figure 1.

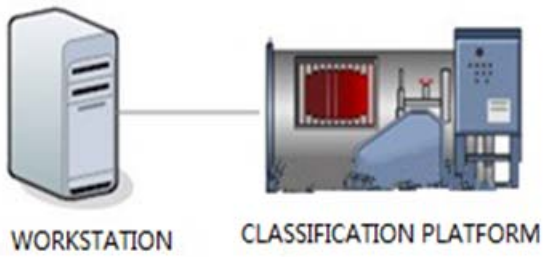

Figure 1 : Egg classification system

We can see that the egg location has a great influence on Photoelectric, so this paper presents wireless method measure egg classification, proposes egg location compensation methods to get a more accurate egg classification. the wireless nodes will collect the data and upload to monitor center automatically.

1.

OVERALL SYSTEM SCHEME DESIGN

2.

The design of power circuit in Photoelectric

This paper presents a Photoelectric method to egg classification, the Photoelectric cell is complex system. the conductance polarization phenomenon will be produced when the Photoelectric cell is power on. as the electrode polarization will be relatively minor when the power source is AC power, this paper proposes an AC power supply with 100HZ to prevent Photoelectric from electrode polarization. The driving circuit of Photoelectric is shown in figure2.

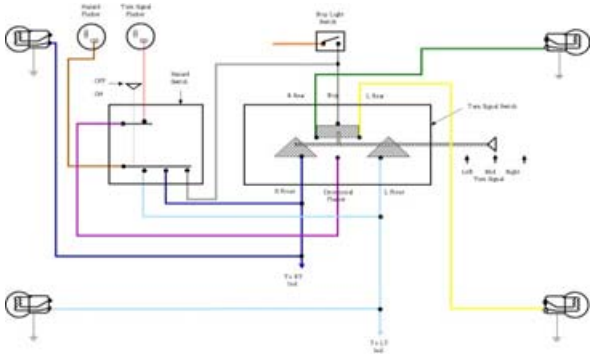

Figure 2 : The driving circuit of Photoelectric with djs-10

Signal conditioning circuit

To obtain Photoelectric, the AC voltage associated with Photoelectric should be transform to DC voltage signal. besides, there is probably introduce high-frequency noise signals, so this paper use the 2-order butter worth filter to filter the high-frequency signal before send to A/D, the amplified AC signal must be rectifier into DC signal, the diode bridge rectifier has been used to realize this function.

Finally, the rectified DC voltage signal is proportional to the measure Photoelectric, which is proportional to the egg classification.

Location acquisition nodes of the circuit principle diagram as shown in Figure 3, the processor ATmeg16 MCU and DS18B20 location sensor composed of location.

Location acquisition circuit; the wireless communication module requires a 3.3 V power supply Electric, so the voltage stabilizing chip using ASM117 step-down power supply; communication The detection circuit comprises a switch K1, nRF2401 wireless module and a red light[7].

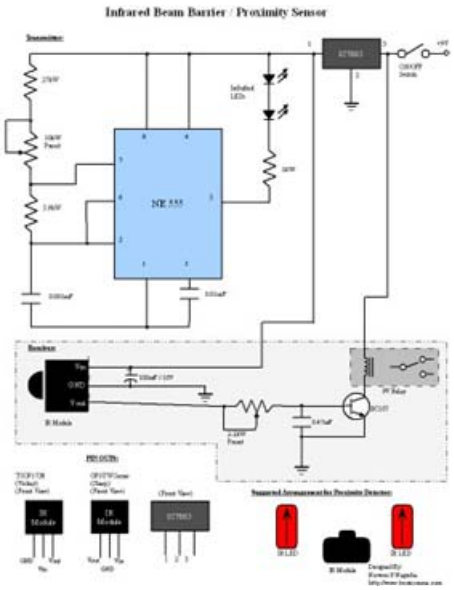

Figure 3 : The circuit of rectifier filter amplifier

Wireless node design

Figure4 shows a block diagram of the wireless node that mainly consists of four modules: Photoelectric measurement m1odule,egg location detection module,RS232 serial communication module, the power management module. the modes have been divided into two types: coordinator and sensor node, the coordinator is used for the network establishment, management and maintenance, and the data collection and storage, the sensor node is mainly responsible for a number of environment parameters (egg location, egg classification)collections, and uploads the data to the coordinate.

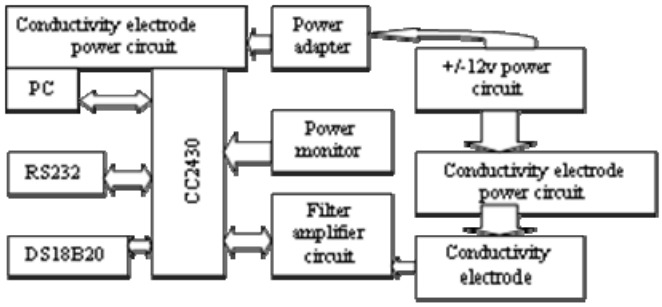

Figure 4 : The structure diagram of wireless nodes

The design of ZigBee network

The node type will be set in the program, when the node is power on, the program will determine the node type: if LPWPAN_COOEDINATOR has been defined, the node will be configured as coordinator, began to create and maintain the network, waiting for other nodes to join in, if LRWPAN_ROUTER has been defined, the node is set to the router, joined the network, responsible for network maintenance, data collection and transmission of message; if LRWPAN_RFD has been defined, the node is set to terminal equipment, joined the network, responsible for data collection. the main program flow chart is shown in figure5,the flow chart of coordinator is shown in figure6.

Building ZigBee module

Assembly The ZigBee module and the position sensor , completed the wireless location system.

Figure 7 : ZigBee wireless module

Figure 8 : wireless location system

TEST AND ANALYSIS RESULTS

The materials used are commercially available egg, test results analysis.

The test was divided into 8 times, Each test 120 egg. The reaction time ,The speed of transmission ,Test time and The accuracy rate of the system as shown in table 1.

TABLE 1 : The result of location test

Test Sequence	Eggs Number	Speed (m/s)	Time (s)	Accuracy (%)
1	120	0.2	20	96
2	120	0.25	18	90
3	120	0.2	20	90
4	120	0.25	18	93
5	120	0.25	18	90
6	120	0.25	18	92
7	120	0.25	18	91
8	120	0.25	18	93

From the test results can be found that, The test speed, test time and the accuracy rate reached a very high level .

RESULT AND DISSCUSS

In product testing device, position sensor is the core component. This paper studies the position sensor based on Zigbee adopts the wirelessconnection technology, has the advantages of low power consumption,high accuracy. After the test, the average power position sensor is lower than 0.3MW, the average precision rate transmission 96%.

CONCLUSIONS

The egg classification monitoring is important in desalination and other industries, while there are many reasons leads to a great error in egg classification measurements:

1 the Photoelectric is affected by many factors, the error Photoelectric will leads to error egg classification.

2 the capacitive and inductive of solution have great influence on the overall characteristics of the circuit.

This paper presents a wireless method to measure egg classification, it mainly analyses the theoretical of the measurements of egg classification, illustrates the effects of egg location on the egg classification measurement, and proposes egg location compensation methods to get a more accurate egg classification. it mainly describes the design of node. The whole system is stability. Reliability, economical and durable. it has the advantage of high precision and anti-interference ability, it can satisfy the accuracy requirements.

Considering research time location control system is relatively small, the ability of the individual level is limited, although the completion of the Subject requirements, but still exist deficiencies, some aspects can work in the future can be improved:

(1) In the node design, adapter using external power supply, in future work, we can design a power supply Circuit, connected with the power can be directly.

(2) With 4 x 4 keys of a remote controller, using STM8S103 as the control chip, the pin number limit, can't extended function. Later you can use PIC16F886 chip, an external LCD display, can display the key value.

the intelligent mobile phone becomes more and more popular now, through the mobile phone WiFi to carry out data interaction with the system.

ACKNOWLEDGEMENT

Hebei higher school science and technology research project (Z2014164), Baoding Municipal Science and technology research and development guide plan (14ZG008). To make an important contribution to the writing and publishing of this paper.

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