International Core Journal of Engineering Volume 6 Issue 1, 2020
ISSN: 2414-1895 DOI: 10.6919/ICJE.202001_6(1).0023

Design of weak current control system for express sorting

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Abstract

In view of the rapid development of the express industry, the express logistics system is faced with the problems of large sorting volume, slow sorting speed and low efficiency.This paper designs an automatic sorting system, mainly including qr code identification system design, microcontroller programming, low to high voltage control system design, etc., through the use of qr code recognition chip of qr code image recognition, tracking and data sent to the wireless transmitting module, microcontroller receive processing through wireless receiving module, control gear motor drive the sorting mechanism of objects for sorting, automation, high efficient and accurate sorting.

Keywords

Intelligent logistics sorting, Camera image acquisition, Two-dimensional code recognition chip, wireless transmission.

1. Introduction

In traditional logistics transportation, the types and risks of transportation, the transportation links in the logistics process and the service of logistics enterprises all affect the cost and quality of logistics transportation.According to relevant data, the logistics cost in the United States only accounts for 9% of the total operating cost, while the logistics cost in China accounts for more than 20%, which has become the biggest problem hindering the development of China's express delivery industry.

At present, with the development of the Internet and the rapid development of the logistics industry, more and more logistics enterprises begin to try to use the automatic sorting system to quickly sort express packages to improve the delivery speed. The automatic sorting system can effectively help logistics enterprises to quickly and effectively sort express packages to the corresponding delivery area.However, at present, the sorting system of many logistics companies can only be completed manually, with low sorting efficiency and slow sorting speed.This paper studies a lot of existing control systems.On this basis, the research design is carried out, which provides a foundation for the development of more advanced equipment in the future.This design will be committed to solve a lot of human resources waste in the logistics sorting, sorting violence and other problems.

2. The overall design of sorting system

As shown in figure 1, digital information on the package is collected through the camera or other sensors (such as CCD), and the digital information is encoded, modulated and transmitted to the wireless module, which encodes and transmits the digital information.The receiving end receives the weak signal through the antenna, and the weak signal is amplified, demodulated and corrected to transmit the correct digital information to the single-chip microcomputer for processing.When the infrared detection device detects the sorting position of the object passing through the conveyor belt, it sends a signal, and the microcontroller receives the signal interruption and sends a signal to control

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the sorting mechanism. The small signal then drives the sorting mechanism by amplifying the voltage and current

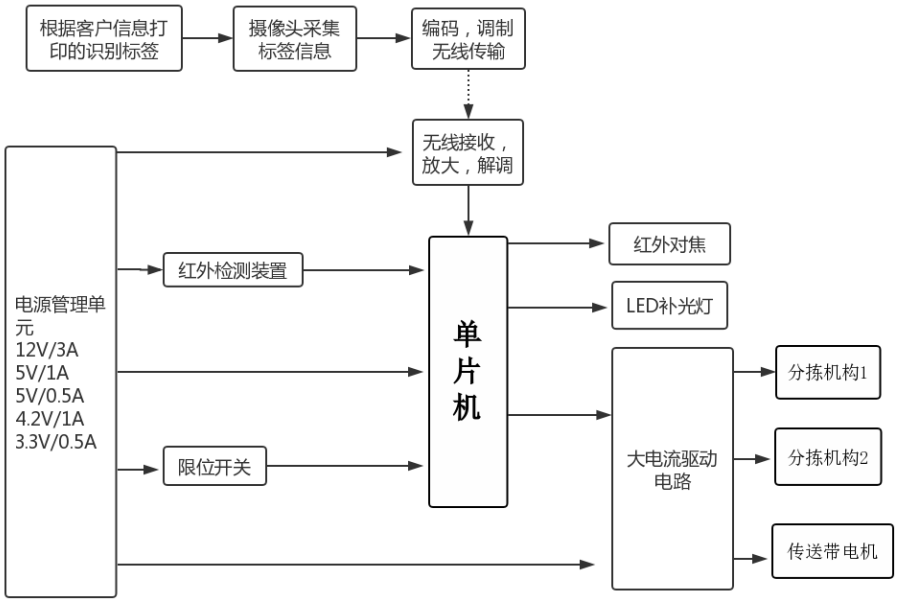

Figure 1 block diagram of logistics sorting system

2.1 The two-dimensional code identification label is adopted for the goods

Advantages of qr code labels:

Uniqueness: the system entrusts each product with a unique anti-counterfeiting code and identifies it on the product or package. Just like each person has a unique id number, the product can be counterfeited and copied but the code cannot be copied.

Convenience: consumers do not need to learn special recognition skills, just scan the two-dimensional code through the phone, can see the two-dimensional code stored text information, very convenient.

Low cost: digital security label production is very simple, only we common stickers, coated paper and laser labels printed on the two-dimensional code level can be, the increase in cost is minimal.

Unity: this mark mark can be used for any kind of goods on the use of nationwide logistics network to establish a national monitoring network at any time monitoring, unified management.

Timeliness: each object will be recorded and verified by the system in each sorting process, including time, address and so on.According to the number of times of a certain object's digital query, and the source of the query number, you can judge where the article is located, so as to judge the area of the object, you can timely provide accurate clues to inform consumers, accurate and timely logistics information tracking.

Two-dimensional code storage capacity, can be encrypted, can be composed of Chinese characters, letters, Numbers and other information.In addition, the qr code of express companies can be compiled uniformly, which is convenient and efficient and can greatly improve the accuracy of express information transmission.

The main types of QR codes are: QR Code,PDF417,Data Matrix.

In order to accurately record customer information and facilitate consumers to quickly and conveniently query logistics information, the sorting system in this paper adopts two-dimensional code label as the design label.

2.2 The identification tag USES a camera

According to the acquisition optical size, field of view Angle, maximum frame rate, sensitivity, signal-to-noise ratio, dynamic range, pixel area, price, ease of use and other factors, the following two cameras meet the requirements.

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The OV7670 image sensor, small in size and operating voltage, offers all the features of a single VGA camera and image processor.Through the control of SCCB bus, it can output all kinds of 8-bit influence data of the whole frame, sub-sampling and window.The product's VGA images reach up to 30 frames per second.The user has complete control over image quality, data format and transmission.All image processing processes including gamma curve, white balance, saturation and chroma can be programmed through the SCCB interface.0V7670 image sensor applies unique sensor technology to improve image quality and obtain clear and stable color images by reducing or eliminating optical or electronic defects such as fixed pattern noise, tail rest, floating and so on.

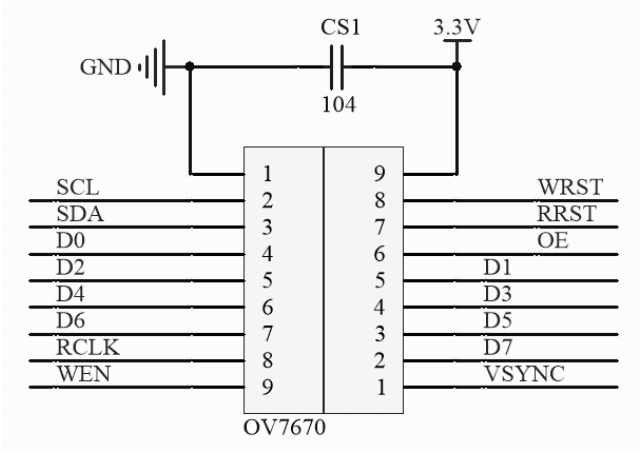

Figure 2 wiring diagram of OV7670 camera

2.3 Wireless signal transmission design

Bluetooth module is a kind of PCBA board integrating bluetooth function, which is used for short distance wireless communication. According to functions, it can be divided into bluetooth data module and bluetooth voice module.Bluetooth module refers to the basic circuit set of chips integrated with bluetooth function, which is used for wireless network communication. It can be roughly divided into three types: data transmission module, remote control module and so on.General modules have properties of semi-finished products, which are processed on the basis of chips to make the subsequent application easier.

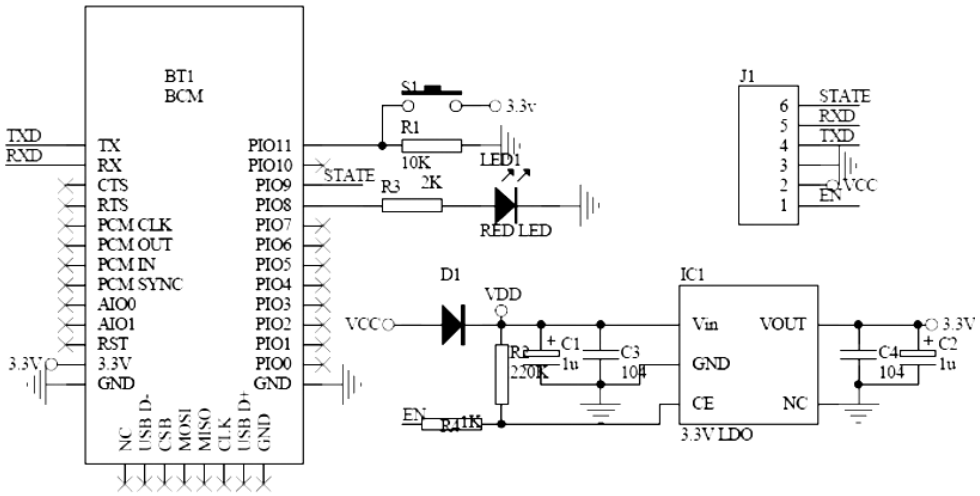

Figure 3 circuit diagram of bluetooth module

Bluetooth module as replace the data cable short distance wireless communication technology, bluetooth support point to point and point to multipoint communication, wirelessly all sorts of data and voice equipment of the plant into a tiny nets (Pico - net), a few tiny mesh can be further realize interconnection, forming a distributed network (scatter - net), in which these connections between devices to realize fast and convenient communication.This paper introduces bluetooth interface,

ISSN: 2414-1895 DOI: 10.6919/ICJE.202001_6(1).0023

which is transmitted to the receiving end through bluetooth interface. Similarly, DSP carries out D/A transformation for the digital signal received by bluetooth, which becomes an analog signal.

The sending and receiving of bluetooth signal is realized by bluetooth module.This bluetooth module is the wireless signal transceiver chip that the company has recently launched in compliance with bluetooth V1.1 standard. The main features include: DigitalRadioProcessor DRP, numerical control oscillator, on-chip rf transceiver switch switch, built-in ARM7 embedded processor, etc.When receiving the signal, the transceiver switch is set in the receiving state. After receiving the rf signal from the antenna, it is directly transmitted to the baseband signal processor through the bluetooth transceiver.Baseband signal processing includes downconversion and sampling, and adopts zero if structure.The digital signal is stored in RAM(capacity of 32KB) for the ARM7 processor to call and process. ARM7 outputs the processed data from the encoding interface to other devices. The signal sending process is the reverse process of signal receiving.The host interface can provide a duplex universal serial port, which can easily communicate with MCU and DSP buffer serial port.

IO port corresponding to the module:

VCC: Module power supply positive pole,+5V。

GND：Module power negative,GND。

TXD：The sender, generally represented as its own sender, must connect to the RXD of another device for normal communication

RXD: receiver, generally expressed as its own receiver, normal communication must connect to another device's TXD.Normal communication when the TXD itself always connect device RXD!Since collect spontaneous: normal communication TXD RXD connect other devices, so if you want to receive their send data as the name implies, is receiving themselves to send data, is directly connected to the RXD TXD itself, that is, used to test whether the sending and receiving of normal itself, is the most simple test method is the fastest, when problems arise first do this test to determine whether the product failure.Also called loop test.

Level logic:

TTL level: usually the data is represented by binary, and it is stipulated that +5V is equivalent to logic "1" and 0V is equivalent to logic "0", which is called TTL signal system and positive logic

RS232 level: adopt -12v to -3v, equivalent to logic "0", logic level from +3V to +12V, equivalent to logic "1", negative logic

Module features:

The core module USES hc-05 to extract the interface from the module, including VCC,GND,TXD,RXD,KEY pin and bluetooth connection STATE. The output is low when not connected, but high when connected.Led indicates bluetooth connection status, flash means no bluetooth connection, slow flash means AT mode, double flash means bluetooth connection and open port.The backplane is equipped with anti-reverse diode with 3.3v LDO, the input voltage is 3.6~6V, the current is about 30mA when unpaired and about 10mA after paired, and the input voltage shall not exceed 7V.Interface level 3.3v, can be directly connected to a variety of microcontroller (51, AVR, PIC, ARM, MSP430, etc.), 5V microcontroller can also be directly connected, without MAX232 can not go through MAX232!Open space effective distance of 10 meters (power grade CLASS 2), more than 10 meters is possible, but the connection quality of this distance is not guaranteed.After pairing, it can be used as a full-duplex serial port without knowing any bluetooth protocol. It supports 8-bit data bit, 1-bit stop bit, and can set parity communication format. This is also the most common communication format.You can enter AT command mode to set parameters and query information by pulling up 34 feet.Compact size (3.57cm*1.52cm), factory patch production, to ensure the quality of patch.And set of transparent heat shrink tube, dust beautiful, and have a certain anti - static ability.Switch to host or slave mode via the AT command, and connect to designated devices to support standard baud rates from 4800bps to 1382400bps.

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To sum up, in terms of communication distance, communication data structure and convenience of the program, we choose bluetooth module as the transmission module of this wireless design.

2.4 Single MOS PWM drive circuit design

The experimental model USES a homemade decelerating motor conveyor belt. We need to adjust the speed of the conveyor belt, so we need to use a single MOS tube drive circuit to control the rotation of the motor by generating PWM wave with a single chip to generate PWM wave with large current and voltage.PWM is pulse width modulation, or pulse waveform with variable duty cycle. Pulse width modulation is a digital coding method for analog signal level.With the use of a high resolution counter, the duty cycle of the square wave is modulated to encode the level of a specific analog signal.PWM signal is still digital, because at any given moment, the full amplitude of dc power supply is either completely (ON) or completely (OFF).The voltage or current source is added to the simulated load by a repetitive pulse train ON or OFF.On is when the dc power supply is added to the load, off is when the power supply is disconnected.Any analog value can be encoded using PWM as long as the bandwidth is sufficient.PWM control technology is to the semiconductor switch device on and off control, make the output end get a series of amplitude equal and width is not equal pulse, with these pulse to replace sine wave or other required waveform.The width of each pulse is modulated according to certain rules, which can not only change the output voltage of the inverter circuit, but also change the output frequency. Duty cycle refers to the proportion of the power-on time relative to the total time in a pulse cycle.Duty RaTIo has the following meaning in telecommunications: for example, an impulse train with a pulse width of one micron and a signal period of four microns has a Duty RaTIo of 0.25.Duty cycle refers to the time ratio of the effective level within a cycle.The duty cycle of square wave is 50% and 0.5, indicating that the time taken up by the positive level is 0.5 cycles.

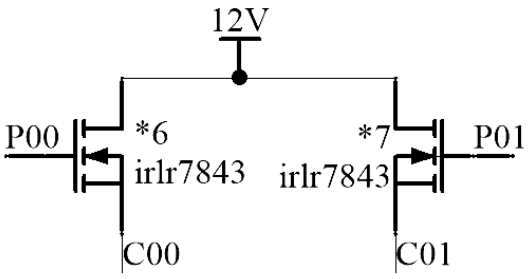

Figure 4 PWM wave control circuit

Pulse width modulation is a kind of analog control mode, which modulates the bias of transistor base or MOS gate according to the change of corresponding load, so as to realize the change of transistor or MOS tube conduction time, so as to realize the change of output of switching stabilized power supply.This method can keep the output voltage of the power supply constant when the working condition changes, which is a very effective technique to control the analog circuit by using the digital signal of the microprocessor.

PWM control technology, with its advantages of simple control, flexibility and good dynamic response, has become the most widely used control mode of power electronics technology.As the development of today's science and technology has no boundaries between disciplines, the combination of modern control theory or the realization of resonant wave switching technology will become one of the main directions of PWM control technology development.It modulates the bias of transistor base electrode or MOS gate electrode according to the change of corresponding load, so as to realize the change of transistor or MOS tube conduction time, so as to realize the change of switch stabilized power supply output.This method can keep the output voltage of the power supply constant when the working condition changes, which is a very effective technique to control the analog circuit by using the digital signal of the microprocessor.

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3. Sorting system programming

The main program includes opening serial interrupt, configuring the corresponding register, initializing all parameters, initializing the sorting mechanism, declaring some necessary functions, discriminating the data received from serial port, and performing different sorting processes for different data.When receiving the interrupt signal transmitted from the infrared tube, the sorting process starts to run. The sorting process is divided into full speed start to prevent the blocking, rotation and burning of the deceleration motor. Main program: the main program by judging from the wireless transmission module information is correct, through different information processing mechanism, wait for infrared laser tube monitoring to block movement to the right position, delay 1 ms, shake to prevent voltage fluctuations, dust or other reasons such as interference, confirm finished sorting device is up and running, sorting deceleration motor is divided into a left sorting, turn right and sorting.When sorting is complete, reset the data information.Prevent interference with the next instruction.The following is part of the main program:

```
if(Data[0]=='2')// Determine incoming information
{
if(p15==0)      //Determine whether the infrared pair tube is detected
                {
Delay10ms(1);// delayed
                if(p15==0) // Eliminate shaker to prevent voltage fluctuation or other external factors
                  {
                  tub(2,1);   // The sorting motor turns to the left
                  Data[0]='0';     // After sorting, initialize the data information
                  }
                }
            }
```

4. Conclusion

This paper studies a lot of parcel sorting system, and designs an intelligent sorting system on this basis, including bluetooth communication design, control circuit design, control circuit board design and control program compilation.Through field experiments, the intelligent sorting system can realize the automatic sorting of parcels with different addresses, which not only improves the sorting efficiency, but also reduces the sorting error rate.

Acknowledgements

This work was financially supported by Key laboratory of process equipment and control engineering, sichuan province(GK201605).

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