Design of Control System for Inkjet Printer

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Abstract. The ink jet printer not only focused on the professions such as beer, drink and the mineral water, but also start to develop in electric, non-staple foodstuff, cigarette and the battery industries. This thesis is primarily designed for ink jet printer control system. The design is to make PC104 receive the security code from Network, spurt the code and save the file after transmitting to the ink jet printer. We transmit the file to the manufacturers to ensure the accuracy of the security code, It is helpful for users to inquire about information, ensure the authenticity of goods and prevent shoddy goods.

In this thesis, we use Visual Basic to achieve serial communications, network communication, data exchanging and file storage. We use VB serial communication components-MSComm to transmit data; use the Winsock controller for net communication, to establish communication with remote computer through TCP; use VB Timer controller to ensure the normal connection of net and achieve the set for file's memory. Because the PC104 has characteristics of small, cheap and embedded. Jet printing tasks which is ordered by system are accomplished successful by the PC104 controller in this thesis.

Keywords: Ink Jet Printer, PC104, Serial Communication VB, Mscomm Control, Timer

1. Introduction
Ink-jet printer is a special equipment for printing design characters and digital on various objects, it is an integrated high-tech product. This equipment is widely used in food industry, cosmetics industry, medicine, automobile parts processing industry, wire and cable industry, such as aluminum pipe industry, tobacco industry, and other fields, can also be used to spray print production date, batch number, bar code and logo, anti-counterfeiting mark, and wording in Chinese custom or changeable information, is to promote modern powerful packaging equipment[1].

The design of this paper is to control the code spurt machine so that it can receive the anti-counterfeiting marks sent from the field. The hardware adopts PC104, because the CPU module of PC104 includes all the standard functions of PC/AT. Using VB to control over its programming, can accept field signals coming through the network, convenient completed the task of system requirements.
2. PC-104 Embedded Control System
In order to realize serial communication, PC series and its compatibles are configured with a large-scale integrated communication component universal asynchronous receiver and transmitter (UART). PC104 INDUSTRIAL PC asynchronous communication adapter is the interface between industrial PC and microcomputer, MODEM, peripherals asynchronous communication.

Application of PC104 module [2].
(1) Several separate PC/104 modules can be used as a separate system;
(2) PC104 module can be embedded into a larger system as a member;
(3) PC/104 modules of various classes can be stacked together to form a system, which becomes a separate module stack.

UART has a series of internal registers, through which the communication function is realized. After initialization if UART sends hold register is empty, Use the CPU's input/output instructions to output this data to the UART's send hold register. According to the requirements set at initialization time, UART adds the corresponding "start bit", "data bit" and "stop bit" to the corresponding register from the CPU, and then sends the binary bit serial to the serial communication line according to the set baud rate. Similarly, UART can automatically receive serial data from the communication line, take out valid data, and then convert it into data characters and store it in the received data register. Remote control can be achieved by using serial port[3].

The basic function of the serial port is to realize the encoding conversion between CPU and serial devices. When the data is sent through the serial port, the byte data is converted into the serial bit, and when the data is received, the serial bit is converted into the byte data. When the communication distance is close, it is suitable to use cable to connect the standard RS232 port directly. If the distance is too far, you need to attach a MODEM. The most simple and commonly used are three wire system TXD, RXD, GND, that is, PC and PC104 send data line TXD and receive data RXD cross connect. The GND of the ground wire of the two is directly connected software handshake is adopted, while other signal lines (such as handshake signal lines) are not used, which can not only achieve the scheduled task, but also simplify the circuit design and save costs. PC104 controller has the advantages of small volume, simple operation and moderate price. PC104 is selected in the design to successfully complete the control of the code spraying machine [4].

![Figure 1. Signal converters between PC104 and PC](image)

3. Procedures Relating to the Design Attributes MSComm
In the design process to use the MSComm many important attributes, which are commonly used attributes.
1) Commport attributes. Setting up communication links or return to port. The procedures must be designated by the use of serial ports. Windows will automatically use the system to set the communications port for communication with the outside world. Procedures can also use this property to use the port. Communications port can be set to 1 to 16, will have more than 16 error messages. To ensure the normal communication control operation, communication ports normal, reference control panel P P equipment management system for the port project, generally only COM1 and COM2 ports two options[5].

2) Settings attributes. For the establishment of initialization parameters. Put on a string or to the transmission data rate and testing spaces, stop data spaces and spaces four parameters. Its format to "BBBB, P, D, S," BBBB which indicates that the data transmission speed (baud rate), P for calibration, data-D said, S median means stop [6]. Default value of "9600, N, 8, 1," said the use of communication ports per second to 9,600 spaces speed data transmission, not parity. Each data element is eight, stop for a place. Transmission rate can be 110, 300, 6 00, 1200, 2400, 9600, 14400, 19200, 28800, 38400, 56000, 128000, 256000. After four of them as reserved for the use of high-speed transmission devices. can be tailored to specific communications equipment and the appropriate requirements for the baud rate. Settings set up after the completion of the transmission and acceptance of this string will set up later. RS 232 communication use of the two sides must be set up, with each other normally smooth communications, Otherwise, the two sides could not correctly receive the transmission of data signals.

4. Design of Control Program

Paper is mainly to ink jet printer control system design, the purpose is to through the industrial computer PC104 accept network anti-counterfeiting code, coming through the serial port to spurt the code machine, and then achieve spurs India and to save the file, eventually transmitted to producers through the network, which is beneficial to the user query, guarantee the authenticity of goods to prevent counterfeit and shoddy goods[7]. This article chooses Visual Basic language to carry on the programming design, thus realizes the network communication, the serial communication, the data exchange, the file storage, the timing transmission and so on function [8].

Control board program plan to preliminarily set the functions required by the system:
- (1)Network connection is the setting of IP address and port;
- (2)Serial communication;
- (3)Automatic acquisition and setting of system time from the server;
- (4) Get data from the network and generate files and save them. Each text file contains 1,000,000 16-bit bar codes in size, and the file names increase by natural numbers, with about 2,500 files;
- (5) There are 16 uploaded files, one file is saved every half an hour, and the information is saved for 8 hours in total;
- (6) Relevant provisions of the agreement as shown in Table 1;
- (7) Alarm information: residual barcode alarm.

The timer is used many times in the design and plays a very key role in the design. Timer 1 and Timer 2 to ensure the network connection, timer 3 to ensure the normal work of the code spraying machine anti-freeze, timer 4 start production information that received the production information, the comparison of production time, timer 5 start upload data, 23:30 every day, after the upload margin. Timer 6 check alarm margin, print margin, upload time, save system files [9].
Table 1. Ransportation protocol

| The data type         | The data format                                      |
|-----------------------|------------------------------------------------------|
| Initialization data   | F4F4F4                                               |
| The data type         | 16-Bit security code (16-bit)                        |
| Production information code | MG                                              |
| The blank space       | 12-Bit time (Time of year, month and day)            |
| The blank space       | The blank space (1bit)                              |
| The machine no.       | The machine no.(2-bit)                              |
| Upload data           | F0F0F0                                               |
| 16-Bit security code  | The blank space (16-bit)                            |
| 16b time              | The blank space 1b                                   |
| Production information code | Production information code |

5. Conclusion.
The main content of this paper is to use VB programming, PC104 to control spurting code machine, so that it can accept external security code and printing as required, and can save and regularly send files. The industrial computer PC104 and software VB are used to control the program to meet the requirements. The industrial computer PC104 and software VB are used to control the program to meet the requirements. The PC104 has the characteristics of small volume, plug and play, moderate price, perfect performance and so on, which is suitable for this design. The main reasons for choosing VB are: the author is more proficient in VB; Visual Basic is a kind of object properties, events and methods for programming, with Visual characteristics, easy to learn and master the programming language. The hardware and software adopted in this paper are selected according to the actual conditions and equipment. By taking advantage of their advantages and performance, the control of the code spraying machine is successfully realized, which satisfies the conditions and requirements of the system, and the design is successfully completed[10].

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