Research on key technologies of high resolution printing

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Abstract. A printer is a non-contact printing system which has been widely used and developed in various industries, it does not only solves the identification problem of the industry, but also enhances the actual anti-counterfeiting ability and ensures the healthy operation and development of the industry. This article mainly based on the development status and trend of the printer that integrate into the modern technology to developed a set of ARM+FPGA platform which is mainly using the embedded Linux operating system to achieve the human-computer interaction, providing more convenience for the operators with good stability and reliability to improve the speed at which the actual printing is controlled. The entire interface design is simple and friendly, which can guarantee the beauty and quality of the coding effect.

1. Key technology;
The printer is a non-contact printing system that has been widely promoted in various industries and achieved great application outcome, it has also been widely welcomed by the enterprises. However, due to the relatively short development time of China's inkjet printer technology, the corresponding technology and capital investment are not enough resulting in low resolution of printing, making it difficult to meet up with the basic requirements of rapid social and economic development as a whole, when compared with the foreign countries, as there is no small gap in China's printing technology. Based on this, this paper combines the actual needs of the current enterprise that is mainly for the in-depth analysis and research of the printer control system further reducing the cost of the actual research.

2. The editing and analysis of high-resolution print data:
In the high-resolution printer system, the printing information is divided into six modules according to the application program and then the customized encoding method is determined according to its different modules, including the font selection, barcode selection and two-dimensional code selection. The system will select the corresponding dot matrix data from the vector system and then exist in the array and finally send it to the logic device control nozzle through the data transmission protocol for font printing. In the process of printing data transmission, the transmission is mainly between ARM and FPGA according to the PCI bus protocol, and the bus can be upgraded to a 64-bit bus structure, the speed can also be up to 33/64 MHz according to the needs of different users, PC devices can be divided into master devices and slave devices, including the memory address space, I/O address space, and configuration address space. In this system design process, PCI mainly uses the 32-bit simplified slave mode, and the designer needs to support the address space and internal address space of the base address register respectively, but does not support the burst transmission and system error.

3. The nozzle driving analysis:
(1) Operating principle
The hardware version of the FPGA uses 3.3V power supply mode, as the ARM system mainly uses 5V power supply mode, but the voltage in the nozzle is 11.5V, and the voltage will be different according to different types of nozzles. In this nozzle drive, HP45 nozzles mainly use the thermal foaming technology to heat the tiny heating resistors in order to generate bubbles and then spray them onto the surface of the product and this technology has also become a high-pressure printing technology and the principle of operation is to use the thin film resistor to generate heat. In this nozzle drive, HP45 nozzles mainly make use of thermal foaming technology to heat the tiny heating resistors to generate bubbles and then spray them onto the surface of the product because this technology has also become a high-pressure printing technology and the principle of operation is to use the thin film resistor to generate heat. During the ink ejection process, a lot of tiny bubbles are generated and the bubbles are quickly aggregated into large bubbles for diffusion and the ink droplets are continuously ejected from the nozzles and then disappeared back to the resistors, after the bubble has disappeared, the ink of the nozzle will shrink back under the action of the surface tension, thereby generating suction and then pulling the new ink to replenish it whereby achieving a cyclic printing. At the position close to the nozzle, the temperature will continuously increased due to the continuous heating on the cooling cycle of the ink. So before the temperature is about 30-50 degrees Celsius and to ensure the smooth printing, the operator needs to use the nozzle of the ink circulation system for cooling, but once the printing time is longer even with a cooling system, the temperature will remain in between 40 and 50 degrees Celsius. Therefore, this technology must be sure to use low-viscosity and high-tension ink to ensure that the coding equipment can operate efficiently, continuously and stable.

(2) The operation method, technical route and the flow process

3.1. Overall thinking
In order to ensure the smooth operation of the entire printing system, the appearance design, the mechanical mechanism is optimized, and the advanced system software and hardware circuits are used to realize the visual graphical interface. The technical route is shown in Figure 1:

3.2. Hardware circuit design
In this high-resolution inkjet printer, it mainly includes input equipment, display of equipment, nozzles and ink cartridges, control board, synchronous detection device, power supply, etc., which improves the
internal design and ensures the normal operation of the printing system. The input device is relatively wide, and a keyboard, a mouse, a touch screen, etc. can be used in the actual printing process, the user needs to input the device to edit the content and control the signals required for printing, so that the operation of the control machine can be realized and the display device which mainly uses a liquid crystal screen to display a human-computer interaction interface. The control panel is the core and key of the entire printing system, it is mainly responsible for processing the information edited by the user, and then generating the printed signal in realizing the control of the user input, ensuring that the signal returned by the sensor can be output normally, and the normal operation of the whole system is realized. The control panel is shown in figure 2.

Figure 2 control board structure

According to the actual printing effect, the nozzle realizes which is the final character printing is to ensure normal ink supply and the synchronous detection device which mainly rotates the encoder and the photoelectric sensor, and also can dynamically detect the operating state of the system and then transmits the detection data and information to the control board. In the whole system, the user mainly adopts the method of upper position control, and the communication mainly utilizes Ethernet because the control board mainly uses the Samsung S5PV210 processor to ensure the quality of the printed data transmission. The high resolution inkjet printer is composed as shown in Figure 2.

Figure 3 High resolution inkjet printer composition

Software design:

The software design mainly includes the upper computer software and the data processing printing software which mainly uses the Ethernet TCP protocol to complete the communication work. As shown in Figure 4.
First, the data processing printing software mainly uses data reception, data PCI writing and printing control. The data is received after which the data needs to be stored and processed. As shown in Figure 5.

Second, the data PCI write mainly includes the following contents: the print data of the print head is written into the RAM space inside the FPG through the PCI protocol. Each print data is divided into small units of 16KBytes, and then the two RAMs are read and written by using a polling mechanism, when Buffer0 is printed, Buffer1 is written through PCI, when Buffer0 is printed, it is transferred to Buffer1, in this case, PCI automatically switches to Buffer1 since PCI uses high-speed read/write mechanism the data is then written for completion, the work then effectively improves the efficiency and speed of the printing and ensures the actual printing quality. As shown figure 6.
Third, print logic control. 154 nozzles arranged in a matrix are distributed on each print head, during the printing process, all nozzles are scanned for each print, and then power is applied according to the printed binary data. The current is 1.8us and the voltage is 11.5V, printed in logic control chart. Shown in figure 7.

Figure 6 Data PCI write diagram

Figure 7 printing logic control schematic

4. The advantages of the high-resolution printing key technology implementation.
The implementation of this system has the following advantages. To adopt the Linux system and printing with Windows fonts as the printing content is further enriched, and the user can select the two-dimensional encoding method according to his own needs and with high precision because the system incorporates the circuit cycle technology to improve the ability of the ink droplets and to reduce the ejection to further improve the accuracy of the printing, also to improve on the scanning efficiency, and produce a good results. In the maintenance process, it does not need to use too much manpower and material resources, and the entire ink cartridge is easy to install and replace which is convenient for
maintenance, then the system adopts a multiple sets of nozzle cascading technology and seamless connection technology, which can be used for single nozzles or multiple nozzles to achieve high-speed coding and increase the frequency of ink droplet ejection. In addition, the system mainly uses water-based ink, which reduces the cost of the actual operation and realizes the online replacement of ink cartridges, which is simple and faster.

5. The application prospect analysis of coding technology

Under the background of the rapid development of computer information technology, the awareness of intellectual property protection of Chinese enterprises has continuously improved, and higher requirements and standards have been put forward for coding technology. According to the development trend of current coding technology, it has become not only product identification, but also an important way for enterprises to conduct quality tracking, anti-counterfeiting goods, sales management, and product storage management. Therefore, the development of new coding technology is particularly important. The following ideas mainly discuss the expected application prospects of the coding technology. First, the anti-counterfeiting function is constantly improved and the random code and anti-counterfeiting code printed by the printer can guarantee the uniqueness of the code. The enterprise can print the price and anti-counterfeiting information on the package which can effectively control the entire sales process and which is also beneficial to improve the efficiency of the product management in order to provide good identification services for the enterprise query and customer verification, and also improve on the recognition efficiency. Second, the identification function is constantly improving and the use of advanced coding technology can ensure the clarity of images, text and figures as well as enhance the recognition of products and gives customers a clearer understanding of products and brands.

Third, the application is in production, logistics and market management, the manufacturer use the print technology to print numbers and barcodes on product packaging, this information is dynamically linked to the database system, making it easier for companies to track and query. In the enterprise distribution center, the laser machine can print time and area and establish a complete internal database management system to realize the automation of physical management, and improve on the overall production automation management level. Fourth, to increase on the added value of the product and have a clear logo to allow the consumers to see the brand more clearly and accurately, and also to enhance the brand's recognition that the enterprises can use the advanced coding technology to further shape a good brand image and conduct a unified management and increase on the market sales.

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