

Aircraft maintenance tool management system

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Abstract

In recent years, with the development of China's civil aviation transportation industry, make the types and quantities of aircraft maintenance tools have continued to increase, and the management of aircraft maintenance tools has become more complicated. At present, there are still many shortcomings in the management of aircraft maintenance tools. The damage and lack of maintenance tools will greatly reduce the efficiency and quality of aircraft maintenance . In this paper, aiming at the confusion problems of existing aircraft maintenance tool management,a more complete design scheme of the aircraft maintenance tool management system is proposed. First, the QR code image is acquired through data collection, transmission and reception, and then the QR code technology and database are used to complete the digital management of aircraft maintenance tools. Eventually solve the problem of aircraft maintenance tool management confusion.

Keywords

Aircraft maintenance tool management system, QR code, image recognition, database.

1. Preface

In order to ensure the normal and stable development of the aviation industry, more standardized and strict management of aircraft maintenance tools is required. Maintenance of aircraft is a very delicate task. There are hundreds of tools used in maintenance. Some of these tools are frequently used, and some are rarely used. Therefore, it is complicated to perform unified and comprehensive management of these tools. And the huge project ^[1]. When the maintenance personnel lent them for use, it is very likely that these delicate tools will be damaged, or even lost after being lent, and cannot be returned ^[2]. These situations will cause a burden on aircraft maintenance operations. Therefore, aircraft maintenance tool management has become an urgent task to be solved. In view of this, this paper proposes a design plan for aircraft maintenance tool management system to improve the standardization of aircraft maintenance tool management.

2. Working principle and system composition

The aircraft maintenance tool management system is composed of upper computer and lower computer, including image acquisition and lower computer communication subsystem, upper computer communication and image processing subsystem, image recognition and database connection subsystem, database subsystem. When the system is working, the lower computer part first uses the image capture function of the camera to collect the QR code on the maintenance tool, and then compresses the image, and finally the transmission system transmits the processed data to the upper computer part. The upper computer part is based on the Visual Studio programming environment, using the database operating platform to receive

data, through the image recognition subsystem for image restoration and recognition, and then the identified QR code information is handed over to the database subsystem, and the database is operated to obtain maintenance tool information And realize the management of tools. The composition of the aircraft maintenance tool management system is shown in Figure 1.

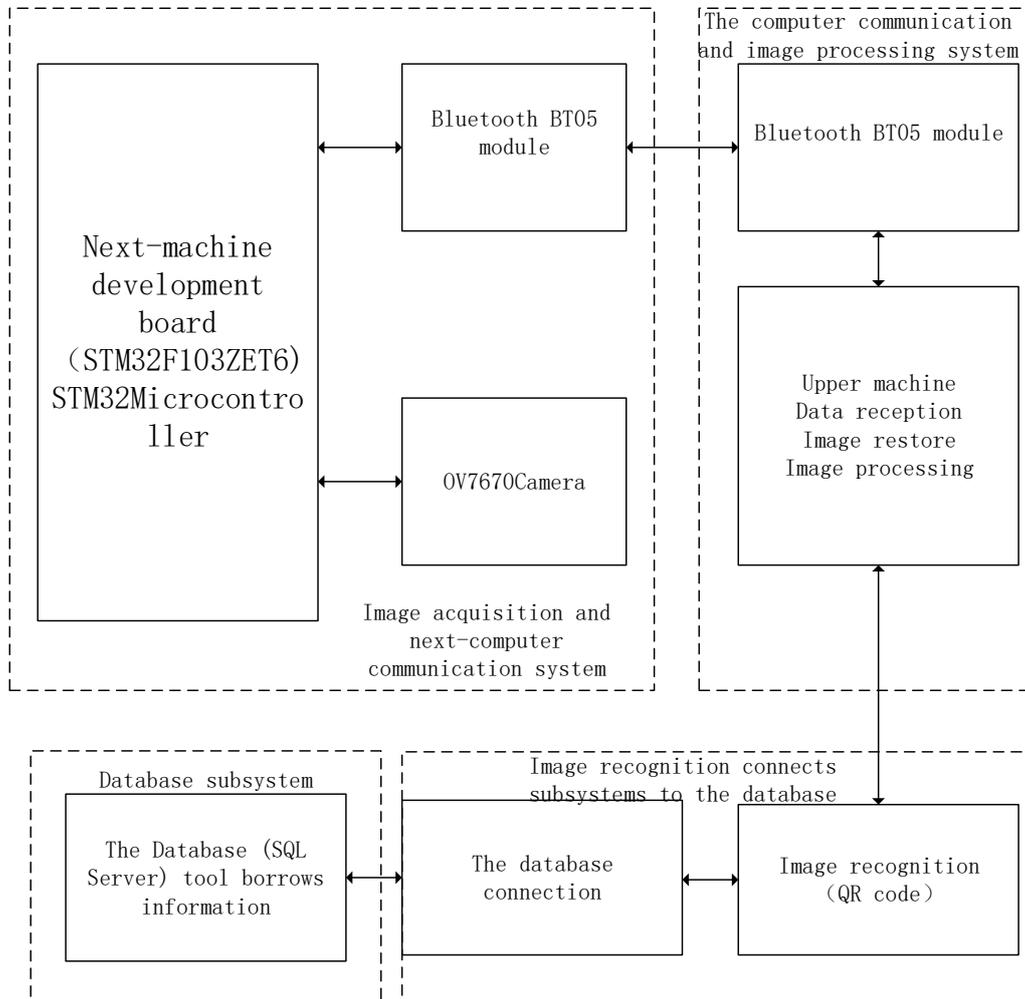


Figure 1 Composition of aircraft maintenance tool management system

3. Subsystem design

3.1. Image acquisition and communication subsystem of lower computer

The processor used in the image acquisition subsystem is the smallest system of the STM32F103ZET6 single-chip microcomputer. First, the OV7670 camera is used to capture the QR code image data. The camera module is fully functional and cost-effective. It can obtain images in multiple formats to meet the system design requirements. Then through the BT05 Bluetooth module for image transmission, image restoration and recognition on the host computer [3]. Place the QR code attached to the tool in front of the camera to take a picture. The image is processed in a series of STM32 single-chip microcomputers. Bluetooth communication is selected as the communication method. The lower computer sends the processed data to the upper computer, and the upper computer receives it. image.

The image acquisition and communication subsystem of the lower computer is divided into four modules: image acquisition, image processing, image transmission and brightness compensation. The central processing core of the lower computer selects the smallest core board of STM32, which can transmit data information to the upper computer through the BT05 Bluetooth module. In the machine. STM32 one-chip computer is shown as in Figure 2.



Figure 2 STM32F103ZET6 microcontroller

3.2. Host computer communication and image processing subsystem

This subsystem belongs to the upper computer part of the aircraft maintenance tool management system and belongs to the software part. By writing a program in C# language on the Visual Studio platform and building an interface, first obtain the original QR code image, and secondly perform gray-scale processing on the QR code image to improve the visual quality of the image. Finally, extract the QR code image information and convert it into data information [4].

3.3. Image recognition and database connection subsystem

The system is based on the Visual Studio platform using C# language programming to achieve, is a part of the upper computer, mainly used to identify the collected QR code image, and then read the QR code information.

The connection between the upper computer interface and the database can be realized on the Visual Studio platform. Choose to connect to the database in the software's connection options. After the connection is successful, the upper computer interface can display the tool information in the database, and follow the operation to complete the maintenance tool. Warehousing, warehousing and information query work.

The aircraft maintenance tool management system uses a QR code as the information carrier. Unlike barcodes that can only store a small amount of information, the QR code has the advantages of uniqueness, safety, small size, low cost, high fault tolerance, and mature technology[5]. On the one hand, the main function of the image processing subsystem is to identify the collected QR code image and read the information in the QR code. On the other hand, the system can also customize the QR code. After inputting the tool name or number on the host computer, it can generate the exclusive QR code for each maintenance tool.

The information of the tool can be obtained by identifying the QR code. The QR code recognition is read through the Zxing. Barcode Reader assembly. Image recognition technology uses Google's Zxing graphics library. The identification of a QR code requires a specific matrix sequence to convert the symbology information into digital information content. The two-digit code recognition process is divided into three parts: image acquisition, image processing, and QR code recognition.

3.4. Database subsystem

The database subsystem is a part of the upper computer and is developed and established based on the SQL server software. The software can use the database as a virtual warehouse for storing tool information such as the name, factory number, quantity, and current status of the tool.

First, complete the call of maintenance tool related information by querying the data. Secondly, different query statements can be used to simulate the query operations of aircraft

maintenance managers on actual problems. At the same time, you can write the relevant code and save it, call it when needed, or modify the code according to actual problems. Through the view function of the database, the operability and visibility of the database can be improved. Finally, the combination of database and Visual Studio makes the operation more convenient and can better meet the actual needs of maintenance personnel.

4. Result verification and analysis

According to the design of each subsystem, a complete aircraft maintenance tool management system is established to verify the reliability and accuracy of the system. The results of the validation are as follows.

If the tool name is correct, query according to "tool name", enter the required tool in the left box, for example, "micrometer "03, click query to get tool related information, and the prompt information is "tool" The name is valid".

If the tool name is entered incorrectly or the tool is not in the database, for example, enter "multimeter" in the query box, and there is no content after clicking the query, and the prompt message is "The name does not exist". At this time, you can query by number, and the query method is the same as the query by tool name.

5. Conclusion

According to the management requirements of aircraft maintenance tools, this paper designs a set of aircraft maintenance tools management system. Under the premise of realizing the basic functions, the system uses QR code scanning technology to reduce system costs as much as possible, and provides more small airlines with new design ideas for aircraft maintenance tool management systems. At the same time, through the selection and optimization of image recognition technology, the accuracy of image recognition is improved, so that the system has a higher recognition success rate and has certain engineering practical significance.

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