Design of offline transfer management software base on QR code

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Abstract. With the development of our army's informatization and actual combat, the transfer of ordnance has become more frequent, and higher requirements have been placed on the efficiency, accuracy and security of data recording during the transfer. At present, the data management of our military ordnance allocation still uses manual methods. This method has the disadvantages of inconvenient storage of transfer slips, handwriting errors, and information leakage during the flow. At the same time, staff query and statistical transfer data are inconvenient and inaccurate. This design research uses database technology to manage the transfer data to overcome the current shortcomings in the management of ordnance transfer data. The research uses QR code technology to realize the exchange of transfer data, and solves the problem of reading the transfer data and lowering the accuracy of entry. This system uses C# language for development and design in Visual Studio2015 software. The data is stored in the SQL server database. The QR code technology is used to develop and design a transfer management software based on two-dimensional bar code to exchange offline data. By operating the software, operators can realize the exchange of transfer data, query and statistics of historical transfer data, and at the same time can ensure efficiency, accuracy and security.

1. Introduction
After entering the new century, the level of science and technology has risen, and more high-level ordnance equipment has been used in the modern army. At the same time, the level of actual combat training of our army is gradually improving, which makes the allocation of various ordnance equipment of our army change. More often. This puts forward higher requirements on the accuracy, safety and efficiency of data records in the transfer process. However, the current record management of our military's ordnance allocation is manual operation, which runs counter to the PLA's informatization construction, and is also very different from the goal of building a first-class army [1].

There are huge shortcomings in the manual recording method. When data is recorded, the storage of the transfer order for recording the transfer data cannot be guaranteed and there are handwriting errors, and the transfer order has hidden dangers such as easy information leakage during the flow process. At the same time, paper storage is extremely inconvenient for staff to query historical allocation orders and statistics. And if information technology is applied to data management in the allocation process, let the system automatically record the allocation data and store the data in a safer back-end database, not only can effectively improve the accuracy and efficiency of the allocation process, but also summarize And data statistics will be processed more safely, quickly and accurately with the help of computers.

Since the previous ordnance allocation method cannot automatically enter and read the allocation data, the QR code technology can better enable the allocation data to be automatically entered and
read [2], and the QR code has Advantages such as confidentiality and so on. For the management of the allocation data, information technology is used: SQL server database is used as the data storage backend [3~6], which can ensure that there will be no errors in the allocation data, and it is safe and convenient to extract the allocation data. At the same time, the transfer order can be printed into the corresponding paper transfer order, and the QR code can be attached to the paper, so it can be reported to the relevant department for approval and file retention. Therefore, in view of the current shortcomings of ordnance allocation, making full use of the methods mentioned above and developing an ordnance allocation management system can effectively solve the above shortcomings and improve the level of informatization to a certain extent.

The purpose of this design research is to improve the data management in the process of military ordnance allocation. Relevant personnel use the transfer management software based on the two-dimensional bar code to exchange offline data to perform data operations. The automatically entered data will be automatically stored in the database, and unauthorized personnel cannot carry out work. Therefore, this software can provide a guarantee for improving the efficiency of military ordnance allocation, ensuring accuracy and safety.

2. Demand Analysis

The construction and geometrical dimensions of the composite slabs are shown in Fig.1. It is noted that the slab specimens consist of the thin-walled steel skeleton which also is formed with H-type main steel beams and steel channels, lightweight precast panels set upon the steel skeleton, shear keys connected to the main steel beams and post-pouring concrete layer.

Through the demand analysis of the transfer management system through the actual process of ordnance transfer, it is concluded that the system should have the following functions:

1. The transfer order management module of the ordering authority realizes the issuance of the transfer order of the ordering authority, the receipt of the issuing unit, the receipt of the receiving unit, data exchange, and the printing of the transfer order;
2. The transfer order management module of the issuing unit realizes the functions of accepting the ordering agency's transfer order, submitting the issuance receipt, receiving the receiving unit's receipt, data exchange, and printing the allocation order;
3. The transfer order management module of the receiving unit realizes the functions of accepting the transfer order of the issuing unit, submitting the receipt receipt, data exchange, and printing the transfer order;
4. The transfer order query function module realizes the query and statistics function of different classification items according to the optional material name, guide size, and transfer basis, and the query results can be printed into an excel report;
5. The data statistical analysis function module realizes the statistical analysis function of different classification items according to the optional year and month interval, issuing unit, receiving unit, etc., analyzes the situation of receiving and dispatching, the completion of allocation, etc., and can generate the results into excel. At the same time, various statistical charts can be generated[7];
6. System parameter management is used to manage user-related parameters during system operation, including user ID, password, authority; user database parameters, etc.
7. The transfer order is printed. The file is first generated as a PDF file and then printed out. The printed transfer receipt has a two-dimensional bar code attached to the upper right corner. The barcode format is QR Code. The two-dimensional code stores the transfer order data. The barcode content needs to define the corresponding data format and perform data encryption.
8. The generated transfer data must be encrypted before the QR code can be generated to ensure the security of the transferred data, otherwise it cannot be generated.
9. Data exchange adopts two forms, direct exchange through the network, or data exchange through QR code.
3. QR Code Technology

Two-dimensional code is an extremely widely used coding method in the society in recent years. Compared with traditional barcodes, it can store more information and can also represent more data types\[8\]. The functions are as follows:

1. Obtain information: such as materials, data, business cards;
2. Website jump: scan the QR code and jump to the corresponding website;
3. Mobile payment: After scanning the QR code, complete the payment behavior, such as Alipay payment code and collection code \[9~11\].

The general functions of the QR code are summarized into the above three points, and the rest are similar. This design mainly uses the first function mentioned above to obtain the data in the QR code.

The advantages are as follows:

1. The capacity of information is relatively large, the density of coding is relatively high, and the range is relatively wide;
2. The ability to correct errors is relatively strong;
3. Low printing requirements, can be read by ordinary printers and faxes;
4. The reliability of the decoding result is high;
5. The QR code can be encrypted (this design encrypts the storage content, not the QR code);
6. Low production cost;

Similarly, the two-dimensional code has major shortcomings: it is easy to be used by criminals, to spread Trojan horse viruses and illegal links.

The structure of the QR code is shown in Figure 1:

![Fig1 Basic structure of QR code](image)

Among them, the correction graphic indicates the specification determines the quantity and position; the format information indicates the determined error correction level; the version information indicates the determined version, with 4 modules on each side of the previous version; data and error correction code words indicate the stored QR code information and error correction Codeword. The principle of QR code generation is:

1. Determine the type, character, and error correction level.
2. Coding: Characterized into a bit stream, 8 bits are a code word, forming a code word sequence.

Take the data 12345678 as an example to analyze:

1. Group the data: 123 456 78
2. Convert each group to binary: 123 (0001111011), 456 (0111001000), 78 (1001110)
3. Convert it into a sequence: 0001111011 0111001000 1001110
4. The number of characters is converted to binary: 8 (0000001000)
5. After adding the mode indicator shown in Table 1, it is: 0001 000001000 0001111011 0111001000 1001110

| model | indicator |
|-------|-----------|
| ECI   | 0111      |
For Chinese and alphabets, only the mode and method of grouping are different, and the basic method is the same. Table 2 shows the storage capacity of different characters in the QR code.

| Character type       | QR code capacity (maximum) |
|----------------------|---------------------------|
| number               | 7089char                  |
| letter               | 4296char                  |
| Binary number        | 2953char                  |
| Chinese              | 984char                   |

3. Error correction coding: Determine the error correction code word and insert the data code word sequence to obtain a new sequence. The version error correction level is determined, and the number of codewords and error correction codewords of the QR code are determined.

4. Determine the information and its structure: the specification is determined, the sequence is divided into blocks, and the corresponding error correction codeword block must be structured into a sequence and added to the original codeword sequence.

5. Construct a two-dimensional code matrix: store each module in the matrix, and then put the complete sequence into the corresponding matrix.

![QR code encoding bitmap](image)

4. System Implementation
The development platform used in this design is Visual Studio, the database is SQL server, and the C# code is used for the allocation management software that exchanges offline data based on two-dimensional bar codes. The computer system is Win10 Enterprise Edition, and the operating environment of the system is Microsoft.NET Framework 4.5.2.

From the above analysis, we can see that the allocation management software based on two-dimensional barcode exchange offline data uses two-dimensional code technology and database technology to automatically enter and read the allocation data during the allocation process and ensure the security of the data during the allocation process. The two-dimensional code technology is mainly used to save the transfer data, so as to realize the automatic reading and input of the data, and improve the efficiency and accuracy of the transfer. Database technology realizes the storage, query, and
reading of allocated data. The hierarchical block diagram of this system is shown in Figure 4 (the DES encryption technology shown in the figure is the focus of later work):

![Fig3 Overall hierarchy diagram of management system](image)

**4.1. Design of QR Code Technology**

A major innovation of the transfer management software based on the two-dimensional bar code exchange offline data is the use of two-dimensional codes to realize the automatic identification and entry of the transfer data. The two-dimensional bar code records the encrypted transfer data. In this design, the QR code encoding uses Byte mode (character encoding), the correction level is L, and the version is mainly 10~14, which mainly depends on the string length of the QR code to be generated. When a unit receives the transfer order, it can not only use the data on the transfer order to re-check the record, but also scan the QR code with the scanner to automatically read the data, and then enter the same key as the encryption used to decrypt the two-dimensional. The data in the code realizes automatic identification and input of the transferred data [17].

**4.2. Design and realization of QR code module**

One of the core innovative development technologies of the transfer management software based on two-dimensional bar code exchange offline data is the use of two-dimensional code technology to automatically read and enter the transfer data, eliminating some errors that may be caused by manual operation, and improving the transfer process speed.

In each QR code operation interface, there is a textbox control to store the data to be generated, and a textbox control to store the pixels that generate the QR code. Three ComboBox controls are used to select the QR code. Encoding type, revision level and encoding version. The specific interface is shown in Figure 5:

![Fig4 QR code interface diagram](image)

1) Generate QR code
In this design, when the transfer data is confirmed to be filled in, the transfer data will be automatically input into the textbox control, and each data will be separated by a comma ",". Then encrypt the text in the textbox control.

![Create a QR code map](image)

Fig5 Create a QR code map

When generating a two-dimensional code, there are five elements indispensable, namely data information, coding type, correction level, version information and pixels. In this design, the generated QR code is an encrypted character, and this design uses Numeric code. The revision level is selected as L, the version is selected as 10~14, and the selection is based on the size of the data information. After selecting, make sure to generate a QR code. If there are too many data information, a dialog box will pop up to prompt you to select a higher version. Follow the prompts to select the version. As shown in Figure 6.

After the QR code is successfully generated, the QR code can be saved locally, and the QR code is automatically attached to the upper right corner of the transfer order. At this time, printing the transfer order can print the transfer order with the QR code as shown in Figure 7. Show:

![QR code attachment diagram](image)

Fig6 QR code attachment diagram

(2)read QR code

After the transfer unit of the next layer receives the transfer receipt from the transfer unit of the upper layer, the transfer data can be obtained by scanning the QR code on the transfer sheet with the QR code scanner. When scanning a QR code picture, follow the scanning rules of the QR code scanner, and the mouse cursor needs to be placed in the text box, as shown in Figure 8:

![QR code scan map](image)

Fig7 QR code scan map
After the scanner scans the data, the information stored in the QR code is automatically filled into the text box, and the operator decrypts to obtain the allocation data. When the QR code is generated, the transfer data uses the English half-width "," to distinguish each transfer data, so when reading the QR code, the system automatically distinguishes each transfer data with each English half-width ",", and separately automatically fill each data into the corresponding transfer data text box.

5. Conclusion
The article first analyzes the current status of our military ordnance deployment, and draws the urgency of designing a computer system-based deployment management software. Secondly, according to the actual situation of the army and the requirements of our army for informatization construction, the demand analysis of the ordnance allocation management was carried out, and the work management process of each module of the allocation system and the specific functions of the system were analyzed. Then the overall framework and database design of this system. Secondly, detailed interface design and software coding of the system form a transfer management software. Finally, we test the software according to our functional design, and draw a conclusion that the system meets the design requirements.

1) This system studies the use of two-dimensional code technology to realize the automatic exchange of allocated data to reduce the workload of the staff and avoid data recording errors caused by human errors.
2) This system researches and utilizes database technology to realize the addition, checking and correction of allocated data, which effectively overcomes the shortcomings of data storage and the inconvenience of inquiry brought by traditional allocation methods.
3) Designed an allocation management software based on two-dimensional barcode exchange offline data. By using the software, the operator can quickly and easily exchange the allocation data, and avoid the occurrence of errors. At the same time, it is convenient to query the historical allocation data and statistical allocation status and generate statistical reports on the software.

Generally speaking, this system has good working ability and strong maintainability, is more convenient to use, can meet the needs of most people, and is a better working tool for ordnance management personnel[19].

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