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Research on the Storage Process Management System Based on RFID

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Abstract

With the continuous development and complexity of the global supply chain, warehouse automation and intelligent technology have become the key means to improve the efficiency and accuracy. The application of radio frequency identification (RFID) in storage process management is discussed, Use RFID technology to manage the storage process, pretreatment the goods, and improve the overall logistics speed. At the same time, the visualization technology is used to monitor the status of the goods, The full state of cargo preprocessing to the end of the task is visible.

Keywords

RFID, Warehouse management, Cargo pretreatment.

1. Introduction

Under the increasingly fierce competition in market economy, it is crucial for enterprises to increase efficiency by improving production efficiency and reducing operating costs. Modern warehouse management is widely used in zero logistics, manufacturing and other fields, with a complete warehouse management process, improve the efficiency of warehouse management, reduce the cost has become the goal of modern enterprises.

Modern storage goods have many types and large quantities, and the modern warehouse updates the real-time status of storage materials is slow, which makes the warehouse management more difficult. It is more difficult to manually count all kinds of materials, which is easy to cause a series of problems such as delayed material registration statistics and high error rate of material inventory, which further increases the difficulty of storage management. In order to further improve the efficiency of warehouse management, grasp the status of inventory materials in real time, realize intelligent, scientific and automatic inventory management, and improve the management efficiency, it is planned to adopt advanced RFID[1] technology to realize the whole process management of warehouse goods.

2. Process Management and Design of Warehousing Goods

2.1. Goods pretreatment design based on visualization technology

2.1.1. Visual storage design

Compared with the traditional warehouse management system, the three-dimensional warehouse [2] built based on visualization technology is a warehouse process management system based on the real warehouse reservoir data and integrated with the management system. see Figure 1.

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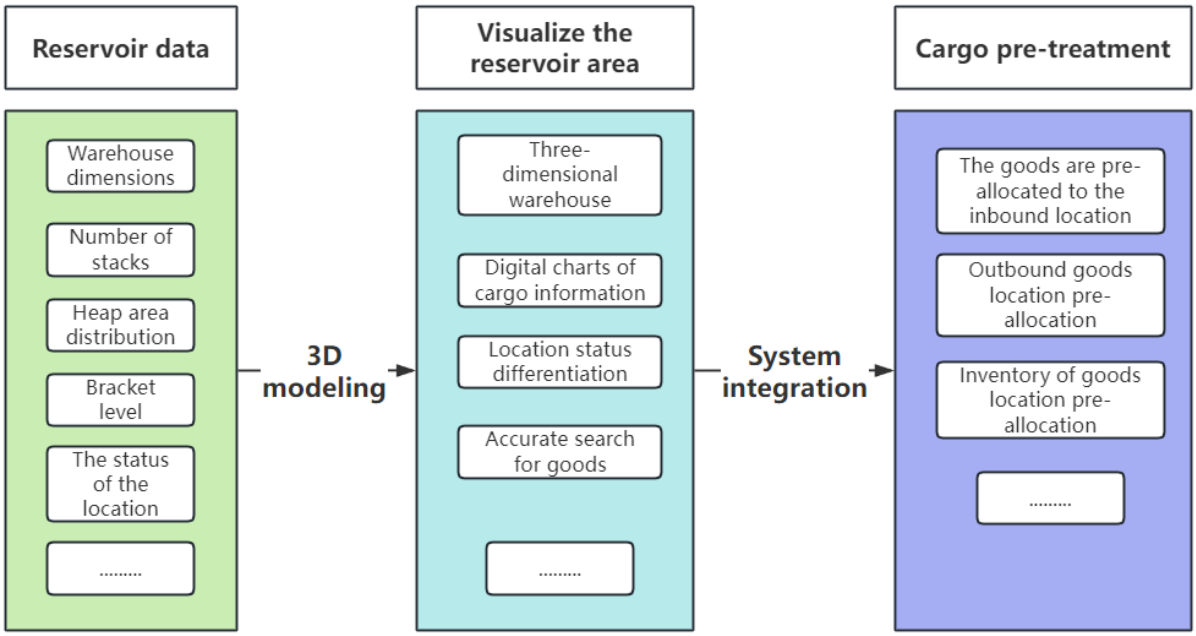

Figure 1. Storage design drawing

2.1.2. Visualize the preprocessing process of the cargo

Visualization displays the warehouse storage status through three-dimensional model and two-dimensional view, which is divided into empty storage, real storage, storage, and storage. The user selects the exit and warehousing task list, and the visual warehouse displays the location and status of its goods in the reservoir area by using the highlighted color.

In the outbound and warehousing operations, the goods experience two preprocessing states of distribution and assignment. When the user selects a plan, the user can highlight the assigned or assigned goods through the reservoir area; When users browse the entire visual reservoir area, the warehouse location status is distinguished by color.

The monitoring of goods and storage status through visualization technology can provide clear data support for the decision of outbound and storage plan.

2.2. Process management design for the RFID-based technology

Using RFID technology to manage the whole process of goods, in the face of upstream and downstream logistics needs, goods can be handled in advance, including pre-distribution of goods storage space, pre-distribution of storage space, pre-writing and printing of goods RFID labels; At the same time, in the process of warehousing operation, the warehousing management system needs to collect goods information comparison, storage information confirmation, the completion of warehousing and other information. From the beginning of the demand plan to the completion of the plan, the detailed management process of the tray unit based on RFID is required.

2.2.1. Goods code management

The goods code is set according to the type of materials, input into the database during the data construction of the warehouse system, and the goods code can also be added, modified and deleted in the system goods code management. In the preallocation stage of warehousing and warehousing, according to the task requirements and the actual type of goods, select the corresponding goods code and create the entry and exit plan. During the execution of the warehousing plan, the goods code is identified by the handheld RFID reader[3], and the goods are compared and checked.

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2.2.2. Warehouse warehousing process management

Before the goods arrive at the warehouse, create the storage plan according to the storage requirements, and assign the corresponding storage position, carrying vehicle and handheld RFID reader.

The goods are in the pre-storage state in the system. After the goods arrive at the warehouse, print the goods code according to the type of goods, and bind with the cargo bracket; The handheld RFID reader downloads the storage plan, and then the pre-allocated carrier vehicle enters the cargo carrier bracket; find the corresponding storage space and scan the code for storage.

After the warehousing, the handheld RFID reader will upload the warehousing data to update the status of the goods and complete the warehousing.

2.2.3. Warehouse outbound process management

Before leaving the warehouse, the delivery plan is created according to the storage demand, and the corresponding goods and the storage position are allocated according to the inventory, and the corresponding carrier vehicle and handheld RFID reader are redistributed. The goods are in the pre-storage state in the system.

The handheld RFID reader downloads the storage plan, and then the pre-allocated carrier vehicle enters the reservoir area, finds the corresponding storage position and scans the code out.

After the delivery of the goods, the handheld RFID reader will upload the library data, update the status of the goods, and complete the delivery.

2.2.4. Warehouse inventory process management

Inventory can be divided into various ways of inventory, including the overall point of storage goods, inventory of goods in designated storage areas, inventory of a certain type of goods, etc. The system generates the inventory schedule according to the inventory mode.

The inventory plan is downloaded from the handheld RFID reader. The operator uses the handheld RFID reader to scan and identify the goods and check the inventory schedule, record the inventory loss and profit, and finally generate the inventory result.

After the inventory, the inventory result shall be uploaded and the operator shall correct according to the inventory result.

3. Design of the Storage Process Management System

3.1. system architecture

Warehousing process management system is WMS system [4] as a blueprint, in the adaptation of the original management process, on the basis of building new warehouse management information system platform, coordinate the operation of each link, ensure timely and accurate in and out of the warehouse and real-time transparent inventory control operations, rational allocation of warehouse resources, optimize the warehouse layout and improve the level of warehouse operations. The overall architecture of warehousing process management consists of display layer, application layer, platform layer, network layer and perception layer. architecture diagram see Figure 2.

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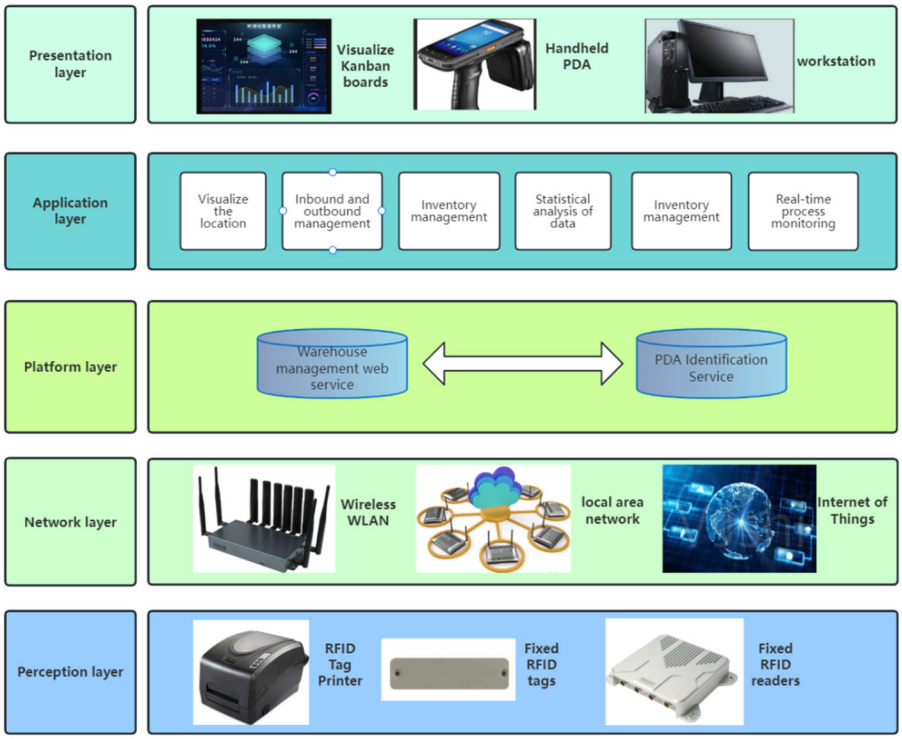

Figure 2. Architecture diagram

3.2. system function

The storage process management system is operated by the Web and PDA.

The Web side is to collect data statistics of the whole storage process and monitor the whole process of goods status.

The Web side has the following functions:

1) Storage position management: add, delete, change and check of warehouse shelves and storage positions;

2) Goods code management: according to the type of goods, set the goods code in advance for printing RFID label; or add new code for unlisted goods.

3) Warehousing management: create or receive warehousing plan, view the details of warehousing plan, pre-allocation of goods warehousing location (manual allocation and automatic allocation), delegate handheld PDA and transport vehicles to perform warehousing tasks, and receive the PDA end scanning warehousing results.

4) Outbound management: create or receive the outbound plan, check the details of the outbound plan, automatically allocate or manually allocate the outbound goods, assign the handheld PDA and transport vehicles to perform the outbound tasks, and receive the PDA end to scan the outbound results.

5) Inventory management: create or receive inventory plan, view inventory plan details, and inventory result statistics.

6) Inventory management: view inventory information, including inventory detail list and 3 D visualization of reservoir area; count the information in the form of drawings.

7) Transport vehicle management: check the operation status of transport vehicles, add and delete transport vehicles.

8) Labels and document printing: print the RFID label containing the goods information, and print the form of inventory and inventory plan.

9) Data import and export: import and export of inventory plan.

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PDA terminal [5] is mainly used for warehousing loading and unloading area, heap information checking, inventory information collection and task receiving. Data interaction with the RFID tag of the cargo during field operations, and synchronization with the Web side through wireless and wired networks. Its functions are as follows:

1) Warehouse information check: check the cargo information in the loading and unloading area and check the cargo in the storage space.

2) Storage information check: the goods reach the storage information and the storage information when the goods are out of the warehouse.

3) Inventory information collection: record the inventory results, including normal, inventory loss and inventory profit.

4) Task receiving: receive the tasks assigned by the Web side and execute the job process according to the task.

Specific functional module of the system see Figure 3.

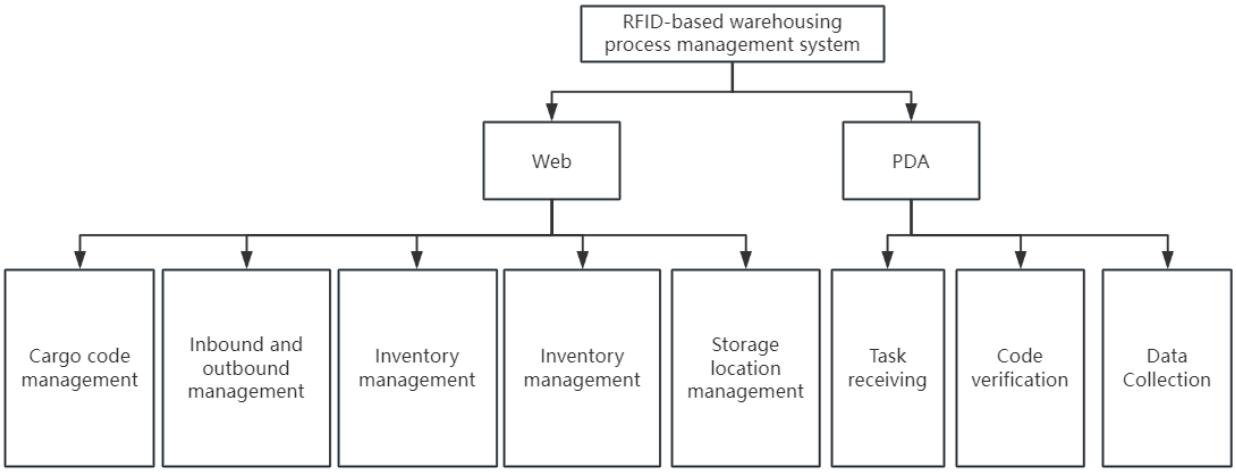

Figure 3: Function module diagram

3.3. system implementation

3.3.1. Web

The following introduces several humanized functions of the system to show the practicability of the system.

1) Interface design: the home page is mainly chart warehouse information and 3 D warehouse display. The navigation bar is equipped with material code management, warehousing management, outbound management and inventory management.

2) Goods warehousing: The storage of goods from the creation of the warehousing plan, the allocation of goods stacks, and the delegation of tasks to display different states in the interface table field, so that users can monitor the goods at a certain stage in the warehousing process. The corresponding 3D warehouse storage space prompts different colors according to the status of the goods, including vacancies, assigned to be appointed, delegated and goods stored in place.

3) Goods outbound: The goods outbound from the creation of the outbound plan, the distribution of cargo stacking areas, and then to the delegated tasks to display different states in the interface table field, so that users can monitor the goods at a certain stage in the outbound process. The corresponding 3D warehouse[6] storage space prompts in different colors according to the status of the goods, including vacancies, assigned to be appointed, assigned to be shipped, and goods out of storage.

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4) Goods inventory: During the cargo inventory, the system will display the goods for the operator in the interface list according to the goods in the storage space, and then the system will send the goods documents to the PDA terminal, which gives the operator more choices, and does not need to check the storage space without goods. Finally, the system updates the storage status of the visual interface according to the inventory results of receiving PDA terminal, and operators can click different storage positions to view the inventory results.

3.3.2. PDA

PDA is mainly in the warehouse storage area, where the operator scans the RFID on the tray to obtain the cargo information and the RFID on the storage site to obtain the storage information. During warehousing, warehousing and inventory operations, PDA will compare the two information according to the plan documents received from the Web end, make corresponding prompts for the operation, and update the data to the Web end after confirmation.

For different business scenarios, PDA can be used to achieve accurate identification of individual RFID tags, and data can be read through external materials. PDA field operation diagram see Figure 4.

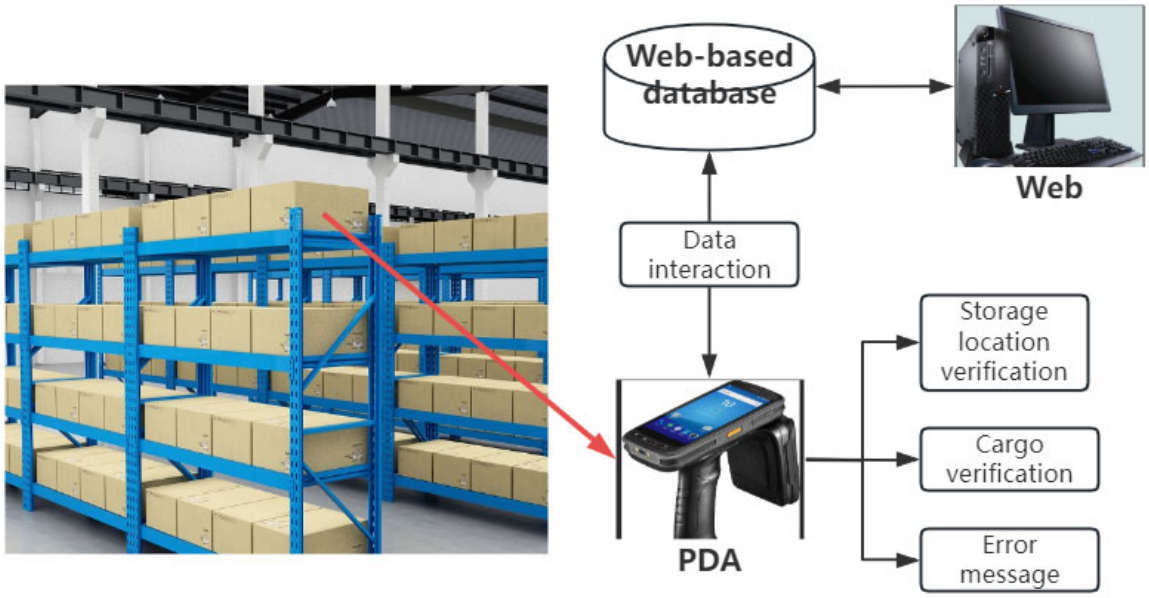

Figure 4. PDA field operation diagram

The advantages of PDA are mainly manifested in the following two aspects:

1) RFID electronic tags have uniqueness and penetration. In the stereo library, PDA can scan the labels from a long distance, and at the same time, obtain the required labels in many tags, without the need to move the goods to scan one by one, simplify the operation and improve the efficiency.

2) The pre-processing and pre-allocation of warehousing, warehousing and inventory plan are all completed on the Web end. PDA does not need complicated processing of the scanned information, but only needs simple comparison. Finally, the data is uploaded to the Web end, which reduces the complexity of manipulation and improves the accuracy of data.

4. Conclusion

The application of RFID technology in intelligent warehouse management system has important practical significance, which can not only improve the accuracy of storage information, but also realize the automation of warehouse management. This paper introduces

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the related technology of the storage process management system based on RFID technology, and then introduces the specific implementation of RFID technology and visualization technology in the process management. Focusing on the detailed design of goods exit, warehousing process management, inventory process management and goods code, finally gives the system architecture and introduces the system functions and implementation. It realizes real-time demand of storage operation process, real-time visualization of resources and real-time controllable activities.

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