Design of Automated Warehouse Management System

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Abstract. Aiming at the low degree of automation in production enterprises, real-time tracking and automatic access to warehouses are realized by developing warehouse management software. The paper first analyzes the system requirements, and then gives the overall design plan, through C#, MySQL and TCP. IP communication protocol, compiled a set of warehouse management system software. The actual application shows that the automation level and management efficiency of production enterprises are improved.

1 Introduction

In recent years, the strategic plan of industry 4.0 has promoted the entire industrial production system to a new level. As the core component of industry 4.0,intelligent logistics is an important link linking customer, supply chain and manufacturing industry[1]. Warehousing is the top priority in logistics. Warehousing management balances all aspects of logistics operation imbalance, which integrates the whole process of logistics operation. It is the design goal of the warehouse management system (WMS) to find the best solution to solve all kinds of contradictions in the warehouse under certain hard conditions[2].

WMS supports the execution of warehousing and distribution through different functional modules and adapts to changing business strategies, e-commerce, customer needs, modern equipment, order size and structure environment, and improves operational efficiency and resource utilization to reduce logistics costs and enhance management capabilities[3].

2 System requirement analysis

We all know the fact that the existing automation level of the client company is not high and the real-time communication is not possible, so the system design must do the following points to meet the needs of users: Good interface design, according to menu prompts to facilitate the completion of various operations, that is, to achieve the "fool" operation, to ensure that there is no computer application base personnel can also be used correctly. Protecting database has high security and setting software access. Record data as simple and convenient as possible. Establish dynamic database according to material classification to realize the dynamic requirement of all kinds of materials in, out and out storage data. All behaviors are for the sake of providing different users with multi-angle and multi-directional inquiry procedures for material receiving, sending and storing. According to management requirements, all kinds of material statistics reports can be generated automatically at any time.

3 System Design Plan

3.1 C/S structure and B/S structure

Client/Server (C/S) architecture software is divided into two layers: client and server, which are structured as shown in the figure 1. The client has the ability of data processing and storage. By reasonably distributing the calculation and data of the application software between the client and the server, the network traffic and the server computation can be effectively reduced. The architecture can make full use of the advantages of both ends of the hardware environment, assign tasks to the client and server to achieve reasonable, reducing system overhead.

Browser/Server(B/S) architecture software is divided into three layers: browser, Web server and dataserver. The core part of the structure is the Web server. It is responsible for receiving remote HTTP query requests, then according to the conditions of the query to the database server to obtain relevant data, and then translate the results into HTML and various page description languages, sent back to the browser making the query request.Similarly, browsers apply to Web servers for requests to change, delete, and add a data record description language.

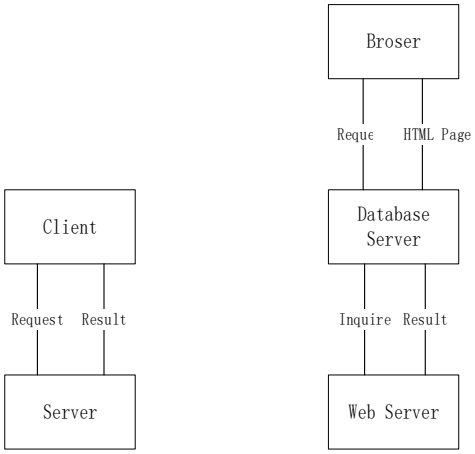

Figure 1. C/S structure and B/S structure.

C/S is generally built on the LAN, facing small-scale user groups, more attention to information security and privilege control. Comprehensive consideration, WMS adopts C/S network architecture.

3.2 WMS overall architecture

WMS is not an independent system. On the basis of its own multi-tier architecture, it designs a unified specification OPC (Object Linking and Embeding (OLE) for Process Control) interface that can be extended according to various standards with other logistics software such as ERP to realize the collection of logistics equipment from different manufacturers on WMS platform.

WMS is divided into 10 modules, the main modules are system management module, data management module, warehouse management module, communication module.

The system management module is mainly responsible for determining the permissions of operators and routine maintenance and upgrading.

The data management module is mainly responsible for data backup and data security, and can communicate with the database in real time.

The warehouse management module mainly has five functions: manual storage-in, manual storage-out, automatic storage, automatic storage, table class to view the status of the warehouse, to realize the warehouse allocation of products and warehouse status monitoring.

Communication module mainly has four functions of connecting WCS, AGV, PLC and palletizer, realizing real-time communication with each communication module.

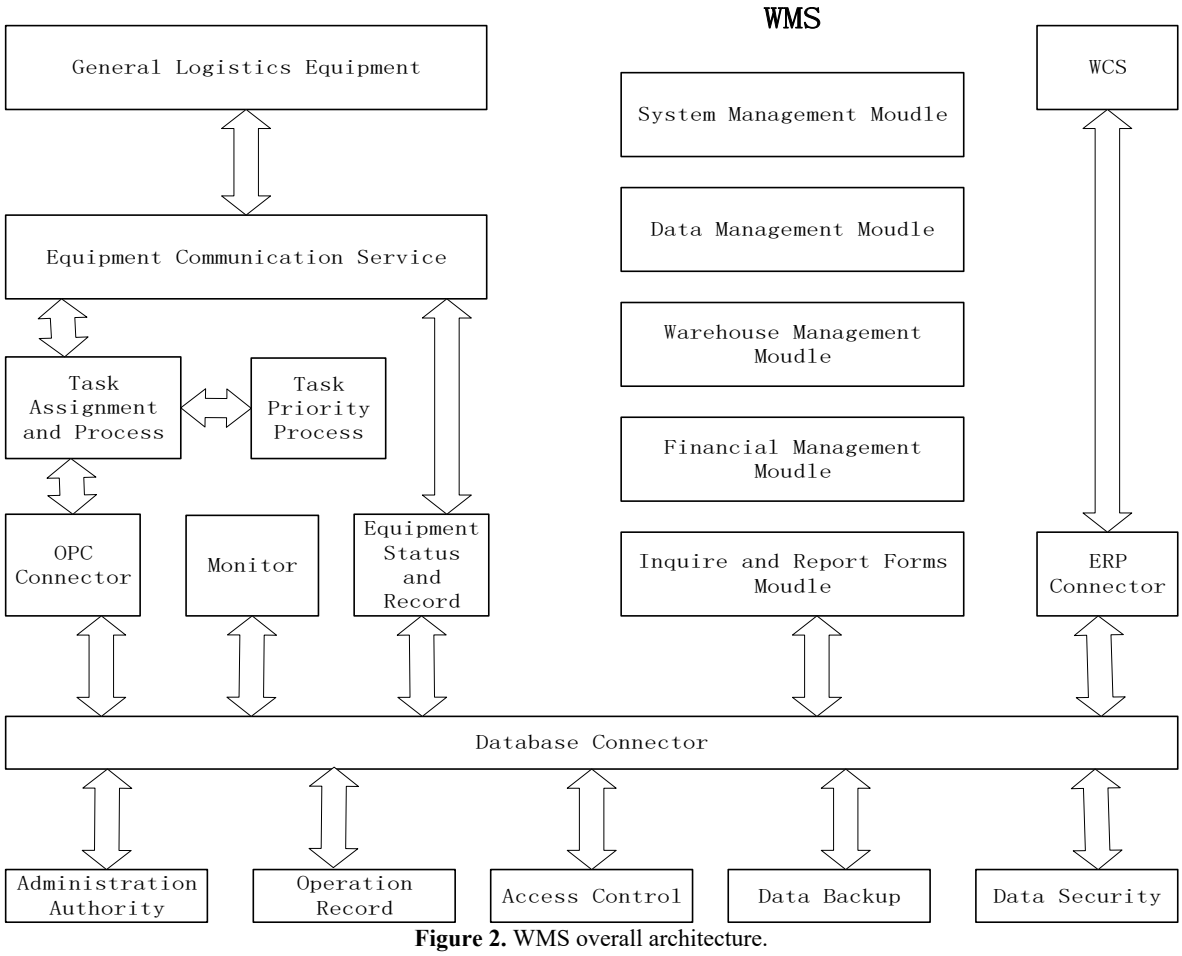

Figure 2. WMS overall architecture.

4 Database design and main function demonstration

From 2.1.1's discussion, we can see that WMS adopts C/S architecture and adopts large database system SQL Server2013. In the Server 2013 database environment to establish a database and tables, the main data tables are: warehouse entry list, warehouse instruction table, goods

in and out of warehouse information table, inventory inventory table, receipt form, delivery list, invoice form, etc, which are shown in the figure 3.

Combined with the first section system requirement analysis and second system architecture, a set of WMS system suitable for production is developed.Some main interfaces included login screen,manual entry screen,auto go-out screen, task status screen and allocation information screen are shown in the following figures.

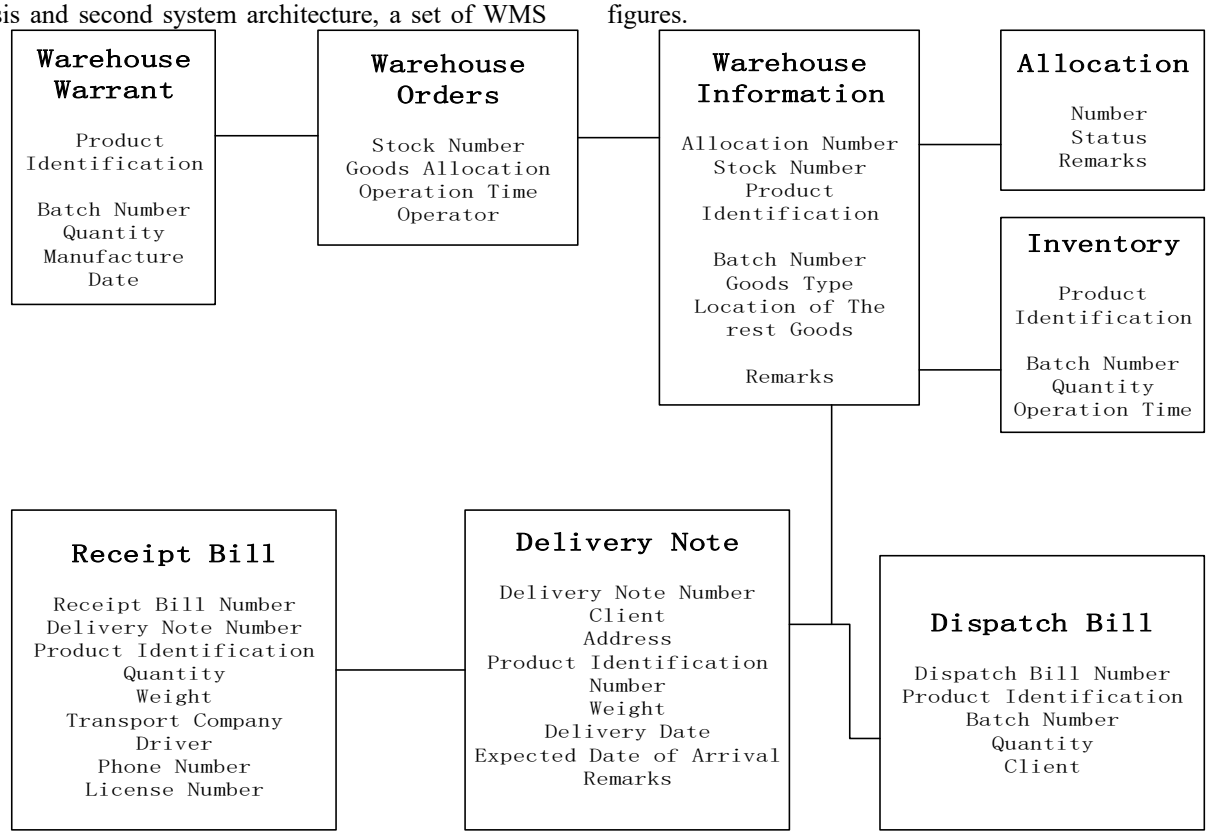

Figure 3. WMS data model.

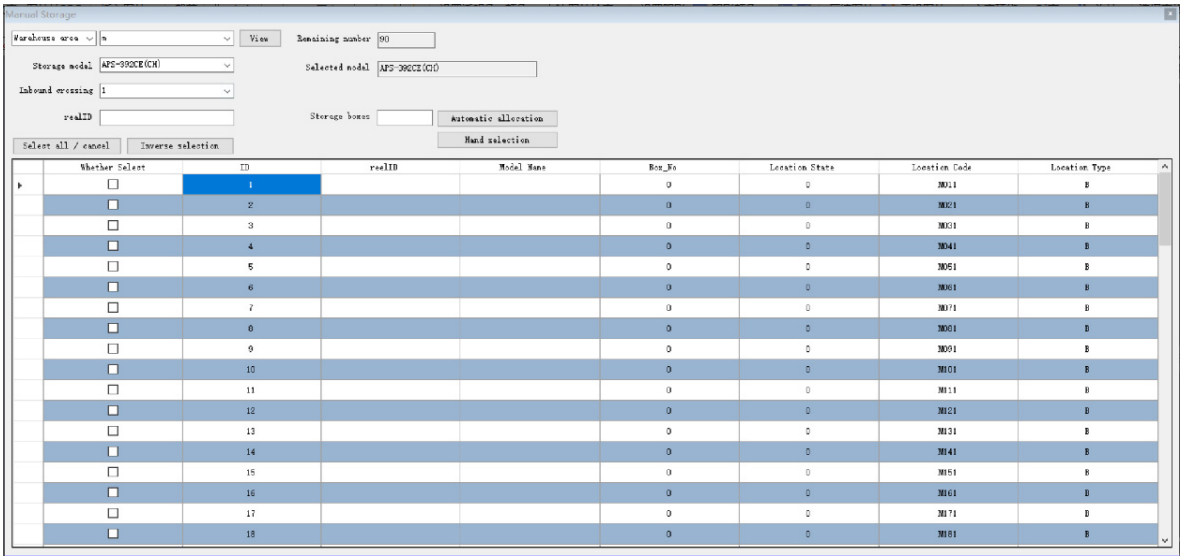

Figure 4. Manual entry screen.

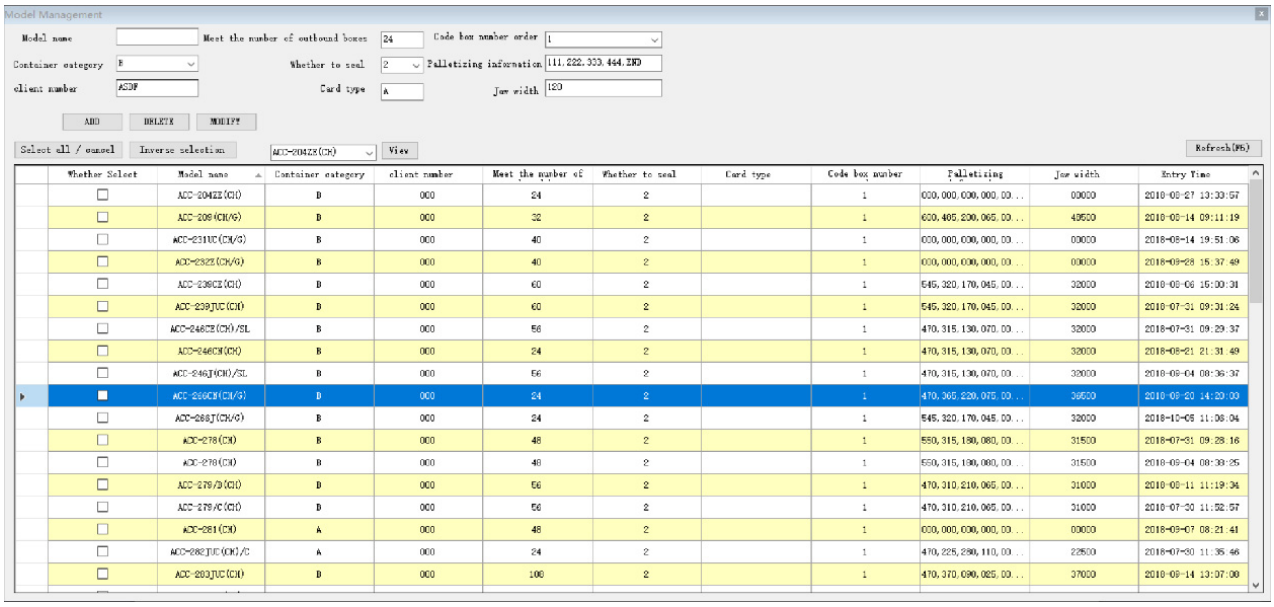

Figure 5. Automotive work screen.

5 Conclusions

The development and development of this WMS management system can realize the real-time tracking of products and automatic access to and from warehouses by cooperating with WCS, ERP and general logistics equipment, greatly speeding up the automation process of enterprises and improving the competitiveness of enterprises. The system still has room for improvement in real-time communication. When further optimizing this function, it can be more flexible when handling the warehousing operation, that is, flexible operation.

References

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