RFID Technology-based the Railway Package Management Platform Design

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Abstract. Modern logistics management system brings a significant convenience to commercial activities and our life. Whereas low efficiency and frequent mistakes exert negative influence on the development of logistics industry. The problems exist in the process of logistics management that includes collection, sorting, storing and tracking. RFID technology is of great importance to intelligent logistics management system. This will have a good prospects in railway package management. On the basis of the RFID technology and the proposed problems, a well-performed Railway Package Information Management Platform is proposed. This platform can provide fast, high efficient, intelligent, safe and stable solutions. The Platform consists of five systems, which are handhold terminal system, sorting system, warehouse management system, tracking system and Railway Package information management system respectively. Implementation on the platform shows that it not only reduces package transportation cycle, but it also improves the stability and safety for the logistics management system. Multiple verification demonstrates that the proposed platform has a very good practicality.

Introduction

Logistics management is an important part of the industry chain[1]. With the development of modern technology, logistics technology, to some extent, improve the efficiency of logistics management, but still unable to meet the growing demand of logistics, from the original manual operations to present automation technology, bar code technology, image recognition technology combined. To further improve efficiency, RFID technology is introduced. RFID is non-contact automatic identification technology, electronic tag can identify automatically and obtain relevant datas[2], It has the characteristics of high speed of reading and writing, long distance, at the same time, identifying multi-tag. Electronic tag may be stored encrypted railway package information, It is not easy to influence by extrusion, collision, wet environment, and it is reusable. Based on the above advantages, recently, it becomes a hot spot of the field of logistics to build a logistics information management system based on RFID technology. Some domestic and foreign scholars have conducted relevant researches and applications. Zhang Feng et, proposed aviation logistics solutions on sorting, positioning of baggages based on RFID and Internet technology, which have improved the efficiency and security of the airport baggage sorting[3]. In the nineties of the last century, RFID technology-based automatic train identification system has increased the train dispatching efficiency, but less applications and researches on the railway package information management. In this paper, we talk about the use of the advantages of RFID technology with reference to the existing logistics management technology on the low-the railway package information management efficiency, poor
real-time, long transport cycle, as well as paper tag easily damaged, vulnerable to pollution and other shortcomings, combined with the actual demand, for RFID the application of technology in the Railway Package information management system to make the design of the total program [4].

**System Architecture**

To reduce the cost of the transformation of the system, based on the existing "Railway Package Management Information System", we can come out electronic tag information collection, smart sorting railway package tracking, intelligent storage functions. RFID technology-based the railway package information management system architecture (Fig. 1) include: the electronic tag railway package, handheld devices[5], warehouse management subsystem, sorting subsystem railway package tracking subsystem and the railway package information management subsystem. Functions as follows:

![System Architecture Diagram](image)

**Fig. 1 The system architecture of RFID technology-based the Railway Package management**

The electronic tag railway increased: For railway package information tag, stickers electronic tag can enter electronic information and print text messages simultaneously. It is easy for baggage clerk to check railway package information.

Handheld device: RFID module embeds into handheld devices, and provides a graphical user interface, which makes handheld devices can read the effective area electronic tag quickly. The device is used for warehouse keepers to check luggage information, which can reduce the chance of error effectively.

Storage management subsystem: It includes hardware part and the client part. The RFID reader installed in the warehouse doors real-time monitors the in and out of luggage situation. The warehouse management clients work out the loading schedule according to the train information railway.

Sorting subsystems: It is used for baggage and parcel sorting to storage areas. The current manual sorting labor has high intensity. Barcode technology sorting system requires completed, no dirt tag. The sorting subsystem of the program can sort automatically according to the tag trips information using the PLC processor controlled stepper motor. The characteristics of the sorting subsystem is the large angle of the electronic tag identified, the low requirements of belt angle placed on the conveyor, which can improve the work efficiency of the sorting system.

Railway package tracking subsystems: It is used for remote tracking railway package information. Railway package tracking subsystem uses existing automatic train identification system to track luggage cart, to facilitate the preparation of the loading plan single. RFID reader installed in the door, and real-time monitoring of the loading and unloading of the luggage cart railway package, which can reduce handling railway package error rate, and improve security.
Package management subsystem: It is PC software part of the system for luggage parcels, package information management, electronic tag information written, the sorting monitoring, warehouse management and other sectors. The trip package information management subsystem to connect with the server, share resources and reduce duplication of information entry. And the working area is covered with the WiFi network, which convey datas between system and handheld devices to improve the mobility of handheld devices.

Handheld Devices Hardware Design

Handheld devices requires the function of railway package management, electronic tag information collection and wireless transmission, are convenient for handheld operation, good network functions, system stability performance. After comprehensive consideration, handheld microprocessor uses the ARM company's S3C2440 chip, the major peripheral modules and functions (Fig. 2):

![Fig. 2 Handheld device hardware structure](image)

LCD modules, touch screen module: Intelligent operator interface functions, SDRAM, FLASH module: the memory for the system running, Power management module: Stable power supply for the module, USB interface: It is used to mount the USB device, UART interface: It is used to control RFID reader, WiFi module: It connected to a wireless network, Buzzer, alarm, reading and writing success prompts, RFID modules: it selects AS3992 chip, whose operating frequency is 840MHz-960MHz, MCU module: it selects the C8051F340 chip, handheld devices with RS232 serial commands to control the reader.

Railway package information management subsystem

The trip package information management subsystem is the PC software of the system, the use of the C++ Builder program design software is designed to achieve the entry and management features of electronic tag. The back-end database is built with Microsoft SQL server 2000 software.

The overall interface is designed in accordance with the block diagram (Fig. 3) of the hierarchy. Open the program, the login form is displayed firstly, the operator must input the correct user name and password to ensure the security of the system. Into the system the system's main menu is displayed(Fig. 4), including the votes of products made, integrated query, revenue management, on day shift statistics, system maintenance, sorting and monitoring, warehouse management and exit function menus. The product manufacturing ticket includes baggage and parcel tickets. The item of bills queries is included in the drop-down menu items. Revenue management consists of the handover certificate, prepared handover certificate queries and the handover certificate printing. Daily shift statistics include bills finishing reports. System maintenance includes garage dictionary maintenance items. Sorting monitor is the PC software of sorting subsystem, and warehouse management is the PC software of warehouse management subsystems.
Fig. 3 Block diagram of the overall interface

Fig. 4 Management of the main menu

Products made ticket items electronic tag information into the function is achieved by calling the API function. Firstly it issues to a tag finding request to find tag by calling the request function int rf_request (int icdev, unsigned char _Mode, unsigned int * TagType), which the icdev is on behalf of the communications equipment identifier, the _Mode on behalf of seeking tag mode, * TagType on behalf of the tag type tag. When requests is sent successfully, the function returns a value of 0. Next, the anti-collision mechanism is started by invoking the anti-collision function int rf_anticoll (int icdev, unsigned char _Bcnt, unsigned long * _Snr). When it invokes successfully, the return value is 0. Encryption function is invoked(rf_load_key_hex), and finally read and write functions is invoked (rf_read rf_write). Validation is completed to determine whether the tag is legal: if it is not a legitimate tag, then tag will be found; if it is a legitimate tag, data in the tag will be continued to read and write, and do information processing and data transmission.

Conclusion

The entry, sorting, storage, and transfer of informations are discussed and designed. The design routines run stable, safe and reliable to achieve the desired effect. With the creative integration of RFID technology with the existing railway package management mode and ATIS, barcode technology, the railway package management efficiency is expected to improve.

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References


