Logistics Management System of Internet of Things Based on RFID Electronic Label

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Abstract: Radio Frequency Identification (RFID), as a new automatic non-contact identification technology, has developed rapidly at home and abroad in recent years. In recent years, the application of RFID in the logistics management of the Internet of Things has become more and more widespread. Therefore, based on the RFID tag, this paper studies the logistics management system of the Internet of Things. This paper focuses on the application of RFID technology in the Internet of Things, and finally discusses the cost and standardization problems of the application of RFID technology in the Internet of Things. The study found that at present, the traditional logistics warehousing management has not adapted to the requirements of information construction. With the emergence, development, maturity and wide application of RFID technology, the efficient, intelligent and fast logistics management system has been a development trend. Through this research, people can have a more comprehensive and in-depth understanding of the advantages and applications of RFID technology, so that it can be better developed.

1. Introduction

"Internet of Things" is based on the Internet, extending the user (person) to any item, realizing communication between people and things, things and things at any time, anywhere, bringing people and things, things and things closer. The distance between [1]. Traditional logistics uses barcode management, which plays an important role in logistics management. However, with the popularity of the Internet in the world, the automation of enterprise production management logistics management is getting higher and higher [2]. Radio frequency identification is a communication technology that uses radio signals to identify specific targets and read and write related data without the need to identify mechanical or optical contact between the system and a particular target [3]. In the logistics industry, RFID can maximize the efficiency of data acquisition and freight transportation, and effectively reduce errors caused by human factors [4]. And RFID is the link between them, and it is also one of the key technologies of the Internet of Things. Because of the high cost of this technology, it has been used in the military field since the war, and seldom in the civil field [5]. This technology is a non-contact information transmission technology using radio frequency signal through spatial coupling, and through the information transmitted to achieve the purpose of identification [6]. The characteristics of RFID radio electronic tags can just replace the traditional barcode technology. RFID tags will be a more powerful intelligent application mode for enterprise production management and logistics management in the future.

The application of bar code in commodity packaging and logistics management has been developing for more than twenty years. Its technology is very mature and its application is ubiquitous. The traditional commodity packaging and logistics management based on barcode has made great contributions to human beings [7]. However, with the development of enterprises, the demand for automated logistics management is increasing. The traditional logistics management based on bar code has been difficult to meet the needs of modern enterprise logistics management [8]. Real-time accurate positioning and tracking can accurately locate the exact location of product storage, and greatly improve the efficiency of logistics, warehousing, warehousing, inspection, inventory, replenishment and so on. The current cost of RFID tags and readers tends to be higher, so this also limits the application range of RFID products to a certain extent, and the division of RFID bands varies from country to country [9]. It can work in a variety of harsh environments, can

identify high-speed moving objects, can identify multiple electronic tags at the same time, and is quick and convenient to operate [10]. With the development of electronic technology and chip technology in the future, RFID technology is the first to be used in civilian fields such as road tolls. As an automatic identification and data acquisition technology, it has rapidly entered the fields of manufacturing, transportation, logistics, security, military and other fields and has been widely used. And the application industry continues to expand, develop and improve, and is becoming an independent field of interdisciplinary.

2. Brief Introduction to RFID Technology

2.1. Basic theory of RFID

RFID is a simple wireless system. By means of the identification device, by means of the interaction between the identification device and the device on the identified object, it is possible to automatically read the data information identifying the object and then transfer the data information to the background computer to perform the corresponding processing. According to the power supply mode, electronic tags can be classified into passive, active and semi-active. This is actually a kind of wireless electromagnetic wave propagation, which can be applied to electromagnetic fields at various frequencies, and has the advantages of small volume, fast reaction speed, and many applicable occasions. Due to the better encapsulation of RFID tags, the environment that can be used can be relatively harsh, and can be non-contact when acquiring data, so its application range is more and more extensive. Logistics warehousing management based on RFID is usually realized by combining software system with hardware equipment. It can recognize a specific target by radio serial number, and read and write the data contained in the target tag. Generally speaking, passive tags are the main development direction to replace bar code tags. Active tags have the advantage of long-distance recognition. It is mainly applied to the identification of large high-speed moving objects, such as vehicle tracking and recognition, such as animal or human identity tracking and recognition.

In recent years, the research on logistics management of Internet of Things based on RFID technology is increasing, which shows that this kind of research is being paid attention by scholars. Figure 1 shows the increasing and decreasing trend of related research in recent years.
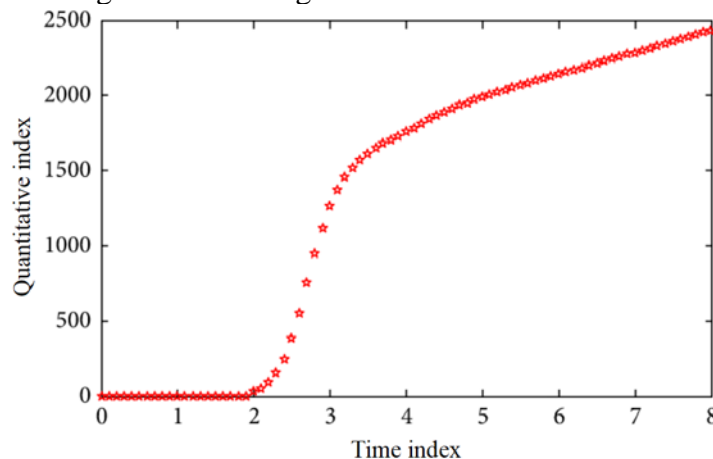

Fig.1. Research trends in recent years

2.2. The structure and principle of RFID

Also known as a reader, the device used to read (or write) label information. The range of transceiving and receiving distance of the reader is large, ranging from several centimeters to tens of meters according to the different output power and frequency of use. However, the number of enterprises that implement RFID technology in logistics industry in China is still small. The energy of the passive tag comes from the electromagnetic wave emitted by the reader. After coupling, the rectifier supplies power for DC. At the same time, the processing of information relies on the

assistance of memory and paper, which belongs to a relatively primary management mode. The electronic tag is attached to the object to be identified and saves the electronic data with the object to be identified. The electronic data in the electronic tag is read by the reader to achieve the purpose of automatically recognizing the object. The reader is divided into a handheld reader and a stationary reader, usually connected to a computer. The reader transmits an RF signal through the antenna, and the electronic tag enters the RF signal magnetic field to generate an induced current, thereby obtaining the electric energy that is working in the integrated circuit of the electronic tag. In the 1960s, electronic anti-theft products based on radio frequency technology began to appear, and gradually moved from the laboratory to commercial applications. The original electronic tag had only one bit of capacity, and later developed into a device that integrates small-scale storage. Compared with Western companies, due to the inferior position of technology and management, most industries in China have excessive competition, and prices have become the main means of market competition.

3. Practical Application of RFID Technology in Logistics Operations

3.1. Logistics operation process

The handheld system and the logistics management client system jointly complete the information management of the logistics operation process, jointly realize the original data collection, electronic label initialization, complete several inspections during the transportation process, and manage the logistics data. A radio frequency electromagnetic wave of sufficient power is transmitted through the antenna to excite and energize the electronic tag. Although RFID originated very early, it has not yet formed a global unified technical standard. China started late in the standard setting field. Because of the economic interests of various countries, it is believed that the standard dispute will continue for a certain period of time. The label content specifically contains the management information that the target object needs to complete during the completion of the management cycle. So the usual situation is "although ERP has been implemented, the situation has not been significantly improved, inventory is still high, order response speed is still very slow!" Passive tags are low-cost and have a long service life. They are smaller and lighter than active tags. The reading and writing distances of passive tags are closer. They are also called passive tags. It is characterized by small size, long life, low environmental requirements, and can meet the requirements of most occasions of the Internet of Things, but its reliability is poor. The transmitted signal is modulated, and then the modulated signal data is converted into electromagnetic wave and transmitted to the tag.

Through the analysis of the traditional warehousing logistics management, we summarize six main business modules: receiving, shelving, off-shelf, sorting, packaging and delivery. As shown in Table 1:

Table 1 Business function diagram

Function	Functional description
Harvest	When the materials enter the warehouse, the inbound order is automatically generated, and according to the reason and form of the goods in the warehouse, it is subdivided into different ways such as normal and return;
Upper/lower shelves	According to the specific reason for the change of the state of the goods, when the goods enter and leave the warehouse, more goods should be transported corresponding to the shelves, and the position of the shelves should be recorded. Convenient for inquiry;
Picking	According to the product, the consignee and other information to sort and package the goods.
Packing	Repackaged by product information, consignee letter package
Deliver goods	After all previous operations are completed, the goods are discharged from the warehouse for distribution.

3.2. Integrated information management platform

The radio frequency module in RFID is the foundation of the Internet of Things, and the application of RFID is the core of the Internet of Things. Inductive coupling is generally used in low-frequency RFID, while backscattering coupling is mostly used in high-frequency RFD. Based on these data, we can query the detailed data of various links, such as freight transportation, warehousing, and generate statistical data and various reports. Active tag itself has battery power supply. It has a long reading/writing distance and a large volume. Compared with passive tag, it is more expensive. It is also called active tag. The active tag is powered by a battery. Receive and demodulate radio frequency signals from electronic tags. According to the functional analysis of the RFID RF module, a simple RFID includes technologies related to RF circuits such as RF oscillators, frequency synthesizers, RF amplifiers, power controllers, RF antennas, and RF receivers. RFID technology can only be implemented in the entire supply chain to achieve transparency and sharing of supply chain information, in order to maximize the role of RFID, which is still difficult to achieve in the current situation. In addition, Spring has laid a good framework for J2EE scale applications, and can complete the functions of the previous complex EJB with intuitive and simple functional components. After the introduction of the system, it can help the workers to find problems in the logistics and warehousing process in a timely manner, shorten the cycle of solving problems, greatly reduce production costs, realize asset appreciation and improve competitiveness.

4. Conclusions

The remarkable feature of the RFID-based system is that it is easy and fast to operate, so it will be used by people, and RFID will be widely used in various industries. I also believe that RFID technology will definitely be further improved and innovated. In the near future, RFID will penetrate into people's lives and become more familiar and familiar. In system development, the accuracy of the system test results is largely affected and constrained by the equipment and test conditions, so there is no guarantee that the results are within expectations. Therefore, it can realize digital logistics and intelligent warehouse, which can track the whole process of goods, and can also network different warehouses in different places to perform warehousing statistics and transfer in real time. Realize the whole process information management from production, sales, transportation to warehousing. The renewal of RFID tag technology will have a far-reaching impact on commodity packaging and logistics management. We should grasp the huge business opportunities generated in this information age and stand in an invincible position in the commercial sea. Looking forward to the future, RFID will set off a new technological revolution in this century. Experts predict that the Internet of Things will be popularized on a large scale in the next 20 years, and people's lifestyle will be completely changed, and the comfort and happiness index of the masses will be further improved.

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