

Application of Internet of Things Technology in Intelligent Warehouse Management

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Abstract: With the sustained advance and expand of science and technology, the internet is gradually entering people's daily life. The IOT based on the internet has been widely used in various fields of society, among which the intelligent storage system for logistics management has played an important role. The Internet of Things technology, as an important driving force in the information age, connects things through sensors, RFID tags, QR codes, GPS and other devices to achieve real-time information collection and exchange, greatly improving the intelligence level of warehouse management. In the field of warehousing, IoT technology not only optimizes inventory control, but also strengthens cargo tracking and asset management capabilities. This paper briefly introduces the key technology of the utilization of IOT technology in warehouse management, and analyzes and discusses the utilization of IOT technology in each module of warehouse management system in detail. Through this paper, it can offer practical support for the combined growth of China's warehouse management system and IOT technology.

1. Introduction

With the vigorous growth of e-commerce, warehouse intelligent management has become a hot spot. The traditional warehouse management mode of manual recording, supervision and tracking cannot meet the current development needs. With the increasing demand of the market, the limited and unitary management mode cannot adapt to the intelligent management of the warehouse. Moreover, there are many kinds of materials under warehouse management, and the frequency of warehousing is increased [1]. Many enterprises began to comply with the development trend of the times and use the construction mode of warehouse management system to maintain the continuation and development of electronic bookkeeping. The way of relying on the name to identify the managed items cannot achieve fine management, the accuracy is low, and there are a large number of supplementary records after the event, and the records are lack of real-time. Bar code gun management will be restricted, resulting in insufficient supervision. Using Internet of things technology in intelligent warehouse can use strict and scientific methods to strengthen warehouse management, prevent safety accidents and ensure people's life safety [2]. In view of this, how to ensure the accuracy of data input in all links of warehouse management and how to use Internet of

things technology for intelligent warehouse management have become the main contents that people need to explore at present. As an important part of logistics, warehouse intelligent management plays a great role in the cost and efficiency of logistics. The birth of Internet of things technology and its application in intelligent warehouse management system have contributed to another round of change in warehouse management.

2. Key Technologies in Internet of Internet of Things

2.1. Perception Technology

Perception technology can also be called information collection technology. Perception technology is the basic guarantee of the IOT. From the current development of Internet of things technology, it is not difficult to see that if perception technology wants to really play its role and value, it needs to use sensor equipment, electronic label equipment and so on. Sensing technology uses RFID reader to collect information through two-dimensional code scanning [3].

2.2. Data Fusion Technology

There are many sensor network nodes in the Internet of things. It is not advisable to radiate the data information of independent nodes to aggregation nodes during the actual information perception [4]. Because this method will produce a lot of useless information, which will occupy energy resources and communication broadband. The application of data fusion technology is mainly to process all kinds of data information to meet the needs of users.

3. Utilization of IOT in Intelligent Warehouse Management System

The intelligent warehouse management system module mainly includes five functional modules: purchase module, storage module, inventory module, replenishment module and distribution module. These modules provide complete information services throughout the whole life cycle of raw materials based on the circulation and information communication of raw materials, combined with information integration technology, RFID and other technologies, and also constitute an information sharing and exchange platform, At the same time, it can also connect with intelligent park, supply chain system and physical system [5]. The classification and function of each module is shown in Table 1 as follow.

Table 1: Module and Function of Intelligent Warehouse Management System

Module Types of Intelligent Warehouse Management System	Function of Each Module
Purchase Module	Configure RFID tags on goods to realize the information input of goods
Storage Module	Input the goods information into the information system center and update the inventory information
Inventory Module	Integrate and analyze the inventory information of various goods
Replenishment Module	Analyze and judge whether the goods need to be replenished, and replenish the goods in time
Distribution Module	Realize the real-time logistics tracking of goods, and improve the accuracy and efficiency of logistics information transmission

3.1. Purchase Module

Before delivery, the supplier needs to configure the RFID tags on the goods one by one. When the goods are transported to the storage center, the RFID tags can be read out one by one through the reader. The label mainly records the name, characteristics, delivery order number, order details, delivery place and receiving place of the goods. Previously, the order management system has entered these information into the information system. Therefore, after receiving the goods, you only need to proofread them with the order information read out by RFID [6]. If the information is completed correctly, the comparison and acceptance of the goods will be completed. For the goods just warehoused, it is necessary to determine the storage location of the goods according to the warehousing principle in the information system of the unloading platform and the reserves of this kind of goods, and finally write the location where the goods are ready to be stored in the storage center into the RFID tag through the reader.

3.2. Storage Module

The storage module is mainly used to update the cargo information in the information system in real time. When the goods are put into storage, the staff first needs to use the handheld read-write terminal to read out the location of the goods in the storage center from the RFID tag of the goods. When the goods of this kind are put into the fixed storage location, the reader near the location is used to transfer the information on the RFID to the information system, so as to continuously update the storage location, storage quantity and other information of the goods in the information system.

3.3. Inventory Module

The intelligent storage inventory module is fully automatic and completed in real time. It will complete the inventory of goods in real time while the storage module works. The inventory module mainly relies on RFID reader to transfer the basic information of goods to the information system center, and then the system center will centrally integrate the collected data and sort out the accurate information of this kind of goods [7]. The intelligent warehouse management personnel can realize the fastest supply speed according to the data sorted out by the information system center. Compared with the traditional manual warehouse management, the inventory module can not only quickly sort out the goods information and improve the work efficiency, but also reduce the storage cost to a great extent. Function module of intelligent warehouse management system of IOT is shown in figure 1.

3.4. Replenishment Module

The replenishment module determines whether replenishment is required for this kind of goods by comparing the actual inventory of goods with the demand stock. The actual inventory of goods can be obtained in real time through the inventory module, and the required inventory of goods is calculated through the goods control strategy and the customer order entered into the information system. The replenishment module compares and analyzes the above two groups of data to accurately judge whether this kind of goods need replenishment. If it is found that the demand stock of such goods is far greater than the actual stock, it is necessary to replenish such goods in time. If the demand stock of such goods is far less than the actual stock, it is not necessary to replenish such goods in the future [8]. At the same time, it is also necessary to deliver goods in time to clean up the inventory.

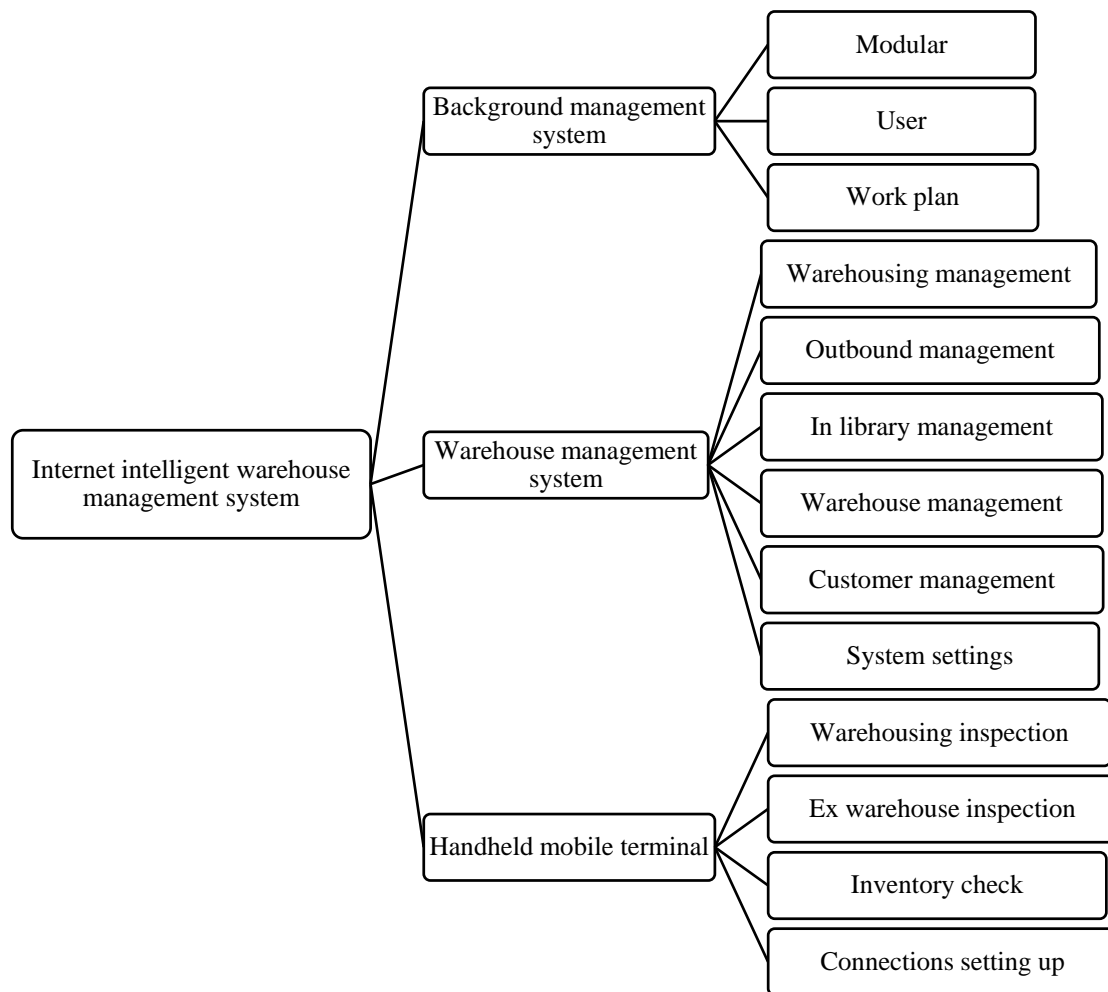


Figure 1: Function module of intelligent warehouse management system of IOT

3.5. Distribution Module

Distribution module is the core part of intelligent warehouse management model design. In the traditional logistics operation, the sorting and distribution of goods account for about 60% of the labor force in the whole logistics operation, and it is easy to make mistakes. Therefore, the research and development of intelligent warehousing and distribution module can greatly reduce the labor cost in logistics operation. The distribution module first prints out the picking list of the goods required by the customer through the information system center, and then the sorting personnel enter the warehouse to pick the goods, and use the RFID reader to write the order information and customer information into the RFID tag of the goods. When leaving the warehouse, the RFID reader at the door of the warehouse is used to read out the data of the goods, and then transmit the data to the information system center for proofreading with the original order, so as to realize the correct shipment quickly and efficiently [9,10]. At the same time, the automatic sorter can also realize the correct classification of goods according to the RFID tag of goods, transmit it to the accurate location, greatly improve the accuracy and efficiency of logistics information transmission, and realize the real-time logistics tracking of goods according to the information system. In addition, relevant managers can effectively manage the goods inventory through the goods in and out information and goods order information in the information system center, and can also use operation decisions to shorten the goods logistics transfer cycle and greatly reduce the operation

cost of the distribution center.

3.6. Security Management

In the process of practice, from the perspective of warehouse intelligent management, security is a very important thing. By using Internet of Things technologies such as infrared sensors, real-time monitoring of temperature, humidity and other contents can be carried out to enhance the security of the warehouse. In this way, even in case of fire, the Internet of Things technology can also be used to precisely locate it. Not only that, it can also analyze the distribution of nearby fire-fighting work and water sources in combination with the site conditions, and can also analyze the number of people needing rescue according to the information collection, and formulate scientific solutions according to the actual needs to reduce casualties and maximize economic losses. For example, the intelligent fireworks warehouse management system of the Internet of Things technology and the Internet of Things institutional system can realize the perception of the perception layer, network layer and application layer, and realize the information interaction between objects, objects and people, and people and people. The key technologies in the Internet of Things include sensor technology, network communication technology and cloud computing technology, which can dynamically manage all kinds of goods in real time and scale up construction. The design of the intelligent fireworks warehouse management system is based on the sensor system, monitoring system and event processing system, implemented by ZigBee technology, and the C++builder software has been effectively developed. The system hardware design sensor temperature measurement accuracy is ± 0.5 °C, and the flame alarm adopts R2868 sensor, which can maintain the accuracy of flame induction. ZigBee node and network topology are quite different from general warehouses. According to the characteristics of intelligent fireworks warehouse, tree network topology can be established. Once an emergency occurs, the system control temperature and humidity controller and fire extinguishing controller will be triggered and call will be implemented. If the disaster is serious, it will also send information to the fire brigade, convey the most accurate information and location to the fire center, so that it can arrive at the scene at the first time, stop the loss, effectively control the temperature, humidity and fire, and bring new development opportunities for the management of fireworks warehouse. Fireworks warehouse management needs high security. Once problems occur, it will bring great losses. Timely finding problems can ensure security.

4. Application Prospect of IOT Technology in Intelligent Warehouse Management System

With the further development of science and technology, the technology of Internet of Things has also made rapid development and progress in the intelligent management of warehouses. It can be seen from the public's perspective that intelligent and automated management has a good development prospect at present. However, there are still some limitations in some details. At this time, relevant personnel are required to adhere to the scientific concept of development, maintain the continuous upgrading of technology, reduce limitations, and lay a good foundation for future development. First of all, automatic account generation is a new development direction in the current state. Based on the Internet of Things technology, it can automatically generate accounts, read electronic information, and reduce the error rate. If there is a problem, the previous item will also be wrong. At this time, it is necessary to comply with the development of the times, further upgrade RFID technology, maintain the reliability of information, improve the strength of identification, and maintain the scientific development trend. Secondly, automatically generate the warehousing scheme. This way is to use the Internet of Things technology to accurately locate the warehouse items. Not only the efficiency of outbound, but also the efficiency of inventory

management needs to be improved. At present, we see that most of them are based on a single function. If we want to carry out macro regulation, it is a more difficult problem. In the process of future exploration, relevant personnel will be required to automatically find the most appropriate location based on the size, weight and size of the stored goods. It not only improves the degree of intelligence, but also optimizes the space of the warehouse. In the design of RFID key technologies of the system, in general, the RFID sensing area part/logic processing module part, RFID tag writing module part, network camera management module part, etc. are required to be jointly formed. In the operation of a large enterprise, these warehouse management technologies can also be introduced into the warehouse to solve the problem of imprecision of the enterprise's goods warehouse and the problem of goods being taken privately. In the linkage control, we can increase the security of warehouse management, and increase the objectivity and security of management. Under the new concept, it will once again promote the further development of intelligent warehouse management. Not only does society need innovation, but intelligent warehouse management also needs to keep innovation and keep pace with the times. Only in this way can we use innovation to serve the public, use innovative means to better manage warehouses, and maintain the sustainable development of various industries. The Internet of Things technology can also increase its application value in other fields, extend towards diversified development directions, and maintain scientific development momentum.

5. Summary

To sum up, with the sustained application and expand of internet technology and automation technology in China, the intelligent warehouse management model based on internet of things technology needs to be successively improved and optimized to successively elevate the logistics efficiency and benefit of enterprises. The reasonable application of internet of things technology in logistics warehouse management can not only enable enterprises to systematically and efficiently manage the logistics process, but also effectively solve the problems brought by traditional technology, realize the intelligent, automatic and controllable management of the whole process of goods, reduce the use of funds, and improve the overall resource utilization efficiency of logistics, so as to promote the steady development of logistics warehouse management.

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