Research on University Wisdom Library Based on RFID Technology

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ABSTRACT

With the development of information technology, libraries urgently need a fast and convenient service mode. The application of RFID technology in Library and its standardization is one of the effective ways to optimize the library management service mode. Therefore, RFID technology in the library application and standardization is studied. First, the traditional library management model and modern library management model are compared. Then, the workflow of RFID technology in library management is introduced. The application goal of RFID library management intelligent system is discussed. Finally, the problems of using this technology are analyzed, and the corresponding solutions are put forward according to the existing problems.

KEYWORDS

RFID technology, colleges and universities, smart library, statistical analysis

INTRODUCTION

RFID technology, also known as radio frequency identification technology, has experienced a long time from its production to its application. At present, it is widely used in the field of logistics, manufacturing, transportation and other fields [1]. It shows great advantages in the application of the library. At the same time, there are many disadvantages inevitably. Radio frequency identification technology is to automatically identify the target object and obtain the corresponding data through the radio frequency signal. The whole process does not need manual intervention, and it is a non-contact automatic identification technology [2]. Radio frequency identification (RFID) technology has been recognized as one of the ten important technologies in the world in twenty-first Century. Through radio frequency signal, radio frequency identification technology obtains and identifies the target object related data. As the most important perception technology of the Internet of things perception layer, and combined with Internet and communication technology, RFID realizes tracking, positioning and information sharing in the world. After the application of RHD in Library and other information services, it can greatly improve the efficiency of management and operation, reduce costs, and become an important intelligent infrastructure [3]. Therefore, RFID technology is also considered as the cornerstone of building intelligent library services.
It has attracted more and more attention, and the development is very rapid [4]. The large-scale application of RFID technology in library is a systematic project. It cannot be expected to be done overnight. We should make clear the long-term nature and complexity of its technical applications.

THE COMPARATIVE ADVANTAGES OF TRADITIONAL AND MODERN LIBRARY MANAGEMENT MODES

Traditional library management mode

The traditional library management system mostly adopts the technology of combining security magnetic stripe and bar code. In the process of management, the safety magnetic stripe ensures the safety of the books, and the bar code is used as the identification book [5]. This combination has initially completed the functions of library management, but there are still many problems. The traditional library management mode is as shown in Figure 1.

Modern library management mode

The goal of modern library is the humanized open self-service, convenient, efficient and simple management mode. The reform of automation technology brings new image to Library's service management. The application of computer, network technology and RFID technology has solved a lot of repetitive work to a great extent, which makes the management of books more intelligent [6]. The modern library management mode is as shown in Figure 2.

![Figure 1. The traditional library management mode.](image1.jpg)

![Figure 2. The modern library management mode.](image2.jpg)
INTRODUCTION OF RFID TECHNOLOGY

Radio frequency identification technology can really realize automatic management. Therefore, it is widely used. The most basic RFID system consists of electronic tags, readers, antennas and middleware. The configuration of the RFID system is shown in Figure 3.

Electronic tag: Electronic tags are also known as data carriers, transponders or radio frequency tags, which are made up of built-in antennas and total chips. Usually, it attaches to objects. The chip can store the relevant information of the identified items in the form of electronic data. Electronic tags exchange data between an electromagnetic field and a reader. According to the power supply, it can be divided into active tags and passive tags. According to the role of distance, it can be divided into close-coupled labels, near-coupling labels, coupling labels and distant labels. According to read and write, it can be divided into read-only labels and read-write labels. According to the working frequency, it can be divided into low frequency label, high frequency label, ultrahigh frequency (UHF) and microwave label. In general, electronic tags have some characteristics. It can store information and be read out or written [7]. After programming, it cannot modify persistent data. The service life is fixed, and the maintenance is not required within a specified period.

Reader: Because tags are non-contact, tags and systems need a bridge. Reader is responsible for reading and writing label information equipment, with display and read and write data functions. At the same time, it has the function of data processing. Through the union with other systems, the electronic tag is operated. According to satellite, readers can be divided into fixed readers, OEM readers, portable readers, industrial readers and special structure readers [8]. According to the system frequency, it can be divided into low-frequency reading and writing, high-frequency readers and ultra-high frequency readers.

Antenna: The antenna provides space for radio frequency signal transmission between the tag and the reader. It provides transmit and receive services for transmitting data. It cannot only convert the received electromagnetic wave into a current signal, but also convert the current signal into an electromagnetic wave. It cannot only be built into
the reader, but also can be connected to the reader's antenna interface with a coaxial
cable. The antenna has a variety of forms and structures, including loop antenna, Yagi
antenna, helical antenna, planar antenna, dipole antenna and double-doublet antenna.

Middleware: Middleware is the core of RFID application system, which is used to
connect applications and RFID devices. Middleware can connect RFID devices with
different platforms, and provide convenient and suitable data exchange interface for
them.

The working principle of RFID is shown in Figure 4.

APPLICATION OF RFID TECHNOLOGY IN LIBRARY

RFID self-borrowing and returning books system

In the application of RFID in library, the basic function is mainly reflected in several
links such as borrowing and shelving of books. The communication process of self-
borrowing and returning is shown in Figure 5.

At present, the frequency of RFID applied in libraries can be divided into two types:
high frequency (HF) and ultra-high frequency (UHF). The selection of RFID frequency
is one of the important contents of RFID system application. There is no uniform
standard in domestic library industry. ISO/IEC 15693 technical specification defines
high frequency tag, and the maximum induction identification distance is 1m. The read
distance of UHF can reach 10m, and the sensing distance can be adjusted and controlled.
Ultra-high frequency is powerful in book checking, searching, picking out and
removing shelves. However, it is easy to locate the book on the shelf or the adjacent
shelf to the bookshelf when the book shelves are positioned. When borrowing and
returning, it is easy to identify other books around the machine because of the far
distance of induction identification. False alarms are generated during access control.

Figure 4. The working principle of RFID.

Figure 5. The communication process of self-borrowing and returning.
In the self-service library, the number of books returned is limited. In practical applications, the number of books effectively identified is 10~20. At the same time, the distance between tags is close and easy to interfere with each other, which affects the recognition effect of RFID reader. The ultra-high frequency tags have relatively strong ability of induction identification. It can identify more books than high frequency tags. At present, the RFID system cannot directly communicate with the existing library business management system to exchange data. It must communicate with the library business management system through middleware. The middleware is called ACS (Automated Circulation System) in the RFID system. ACS software is indispensable in the RFID project. Generally, it is developed by library business system software vendors based on SIP2 Interchange Protocol Version 2 (Standard), which is provided for library.

In order to ensure the normal operation of the library business system and maintain the relative independence of the ACS software and library business management system, ACS software needs to be installed on the independent server. At the same time, it is necessary to ensure the smooth flow of ACS server and library business management system network.

**Intelligent preservation system of books**

The life span of paper documents is limited. In the process of continuous circulation, books will inevitably be damaged. Even if the book has been kept in the museum, it will inevitably be more or less damaged. Therefore, the preservation of books has always been a common problem bothering library staff. A variety of factors need to be taken into account for the preservation of books. The temperature, humidity, microorganism, light and gas in the library are the key factors for the long-term preservation of paper books. At present, the long-term preservation of books in the library is mainly to prevent light, harmful gases and harmful microorganisms, to ensure that the temperature and humidity in the museum is constant. The paper is mainly fibrous tissue, which is greatly affected. The condition of temperature and humidity will change harmful gases, microbes and light. It causes a chemical reaction in the fiber, which breaks the paper and reduces the life of the paper. Especially the influence of temperature, humidity and light is very important to the life of books.

RFID technology has a wireless sensor tag, which can sensitive to the temperature, humidity and light changes in the library, so as to timely feedback to the staff indoor situation. The staff controls the indoor conditions. According to the established indicators, RFID intelligent management system independently regulates the indoor temperature, humidity and illumination. This system is the intelligent preservation system of books. The intelligent storage system consists of hardware, software and wireless networks. The hardware devices are: wireless sensor, electronic tag (temperature, humidity, light and other sensors), electronic tag reader, electronic label receiver, computer and so on. Software system is a kind of intelligent management system with Internet of things as its core technology. The working principle of the smart save system is shown in Figure 6.
CONCLUSION

The successful application of RFID technology in library has brought great changes to library construction and reader service. It provides an important technical foundation for the construction of Intelligent Library in twenty-first Century. At present, there are still a few problems in the application of this technology. However, with the continuous development of RFID technology, the level of hardware manufacturing, middleware technology, library system integration and other technologies have become increasingly mature. RFID technology and library business systems are deeply integrated, which will speed up the library's third-generation automated management building.

REFERENCES


Figure 6. The working principle of the smart save system.