RFID Technology for Better Library Services

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Abstract

[This paper describes on RFID technology, i.e. what is RFID Technology, what are the objectives of this technology, its history, how does the system works, what are the basic requirements to implement this technology, current uses of this technology, what are the application areas in library functions and so on. This paper also describes on advantages and drawbacks of RFID System. Finally an effort also made to compare the two technologies- RFID and barcode in a very lucid language.]

1. Introduction

RFID, stands for Radio-Frequency Identification, is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders and presently used in various field like passports, transportation payments, product tracking, automotive, animal identification, inventory system, libraries, human implants, hospital and health-care and so on.

As we are facing the increasing demand of the users, it becomes inevitable to adopt modern technology for better and prompt library services. RFID is one among the modern technologies, has been started to use by many libraries to replace the barcode technology. RFID has so many advantages over the barcode technology.

2. Rfid

RFID is a generic term for technologies that use radio waves to automatically identify people or objects.[1] Actually, it is made by small electronic devices that consist of a small chip and an antenna. The chip and the antenna together are called an RFID tag or an RFID

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transponder. The antenna enables the chip to transmit the identification information to a reader. Then the reader converts the radio waves reflected back from the RFID tag into digital information that can then be passed on to computers that can make use of it.

3. Objectives

The main objectives of introducing RFID Technology in a library are as follows:

1. To eliminate the difficulties experienced in barcode technology.

2. To improve operational efficiency and reduce human error.

3. To save the time of the users by simplifying patron self check-out and check-in of document.

4. To establish high-speed inventory and identifying system.

5. To prevent theft of document.

4. History

RFID is a proven technology that's been around since at least the 1970s. Mario Cardullo's U.S. patent 3713148 in 1973 was the first true ancestor of modern RFID, a passive radio transponder with memory. But the first patent to be associated with the abbreviation RFID was granted to Charles Walton in 1983 (U.S. patent 4384288)[2]. And it was first proposed in the late 1990s as a technology that would enhance workflow in the library setting.

5. HOW DOES AN RFID SYSTEM WORK?

An RFID System consists of a tag made up of a microchip with an antenna, and an interrogator or reader with an antenna. The reader sends out electromagnetic waves. The tag antenna is tuned to receive these waves. A passive RFID tag draws power from the field created by the reader and uses it to power the microchip's circuits. The chip then modulates the waves that the tag sends back to the reader,

which converts the new waves into digital data.

6. Types of Rfid Tags

RFID tags are of three types viz. passive, active and semi-passive. Passive RFID tags have no internal power supply. It draws power from field created by the reader, whereas active RFID tags have their own internal power source, which is used to power the integrated circuits and broadcast the signal to the reader. On the other hand semi-passive tags have also their own power source but the battery only powers the microchip and does not broadcast a signal.

7. Scanning of Information From Rfid Tag

Like barcode technology, RFID does not require line of sight to read the information stored on RFID tag. RFID tags can be read as long as they are within range of a reader. It means that RFID reader has required just to pass away to the RFID tags to read the information. Hence it is a big advantage of RFID, over the barcode technology because barcodes is line-of-sight technology where scanner has to "see" the barcode to read information stored on the barcodes.

8. Basic Requirements toImplement the System

For implementation of the RFID System following equipments and parts are required

1. RFID Transponders or RFID Tags which may be passive, active or semi-passive depends upon the need and that has been programmed with information regarding the material on which it attached with.

2. RFID Reader or Scanner to read or scan information from the RFID tag attached with the objects. RFID scanner may be fixed within the scanning range or portable to carry them every where in the premises.

3. A Host Computer depending on the requirements and system.

4. Library Management Software to run the system.

5. User Database to keep details record of the users.

6. Documents Database to maintain the status, whether it is issued to patron or not, and past transaction history of the document.

7. Counter Station for circulation process.

8. Anti-theft Detection Gate with Closed Circuit Camera to prevent theft of the document by automatic alarming the bell and at the same time captured a photo of the patron by CC Camera.

9. Current Uses of Rfid Technology

9.1 Passports

Now RFID tags are being used in passports issued by many countries. Malaysia is the first country in the world, issued RFID passport in 1998 followed by United States in 2006. The chips embedded with the card will store the same information that is printed within the passport and will also include a digital picture of the owner.

9.2 Transportation Payments

Many countries like France, South Korea, Malaysia etc. have been introduced RFID technology for easy and faster transportation payment service.

9.3 Product Tracking

Now RFID technology is also used for product tracking in supply chain system which dramatically simplified this process.

9.4 Automotive

Microwave RFID tags are used in long range access control for vehicles. Since the 1990s RFID tags have also been used in car keys. Without the correct RFID, the car will not start. Now Ford, Honda, and several other manufacturers use RFID-equipped ignition keys as anti-theft measures.

9.5 Animal Identification

Implantable RFID tags or transponders can be used for animal identification.

9.6 Inventory System

Introduction of RFID technology had brought a dramatical change in inventory system. Major benefits of using RFID include the reduction of labour costs, the simplification of business processes and the reduction of inventory inaccuracies.

9.7 Other Uses

RFID also used in human implants, hospitals and healthcare to track patients and high-value

assets, as well as ensure patient safety. Schools and Universities are used this technology in monitoring system. Another use of RFID is in driving license that bears the license holders personal information and stores data regarding traffic violations, tickets issued, and outstanding penalties.
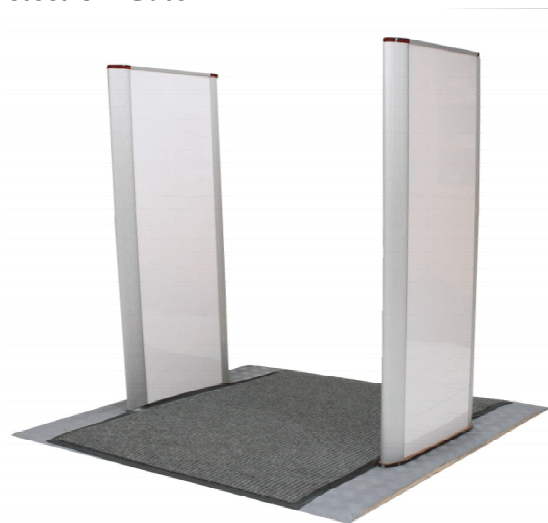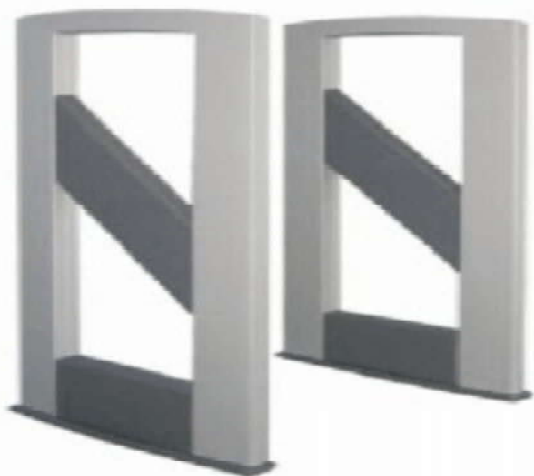
10. Rfid Technology for Libraries

RFID is the latest technology to be used in library theft detection system. Unlike EM (Electro-mechanical) and RF (Radio Frequency) Systems, which have been used in libraries for decades, RFID-based systems move beyond security to become tracking systems that combine security with more efficient tracking of materials throughout the library, including easier and faster charge and discharge, inventorying and material handling[3].

11. Application of Rfid Technology for Library Functions

RFID Technology may use for the following library functions known as four phases of library RFID Management System.

11.1 Library Security System Only

11.1.1 Phase Action

1. Using RFID tag replace EM Security strip

11.1.2 Phase Target

1. Radio Frequency Detection

2. Replace the EM Anti-theft system to avoid the high volume EM field harm human body and without false alarm.

11.1.3 Equipment & Parts Needed

Anti-theft Detection Gate - Detect the RFID tag on book and check EAS (Electronic Article Surveillance) Status, system alarm when the EAS status is on.

1. Security processing station - Turn on or off the EAS setting of the chip.

2. RFID tags

Anti-theft Detection Gate

11.2 Support Library Circulation

11.2.1 Phase Action

Using RFID tags replace the barcode in circulation process. Reading book's accession number from RFID is faster than from barcode to borrow and return the book.

11.2.2 Phase Target

1. No line of sight needed.

2. Allows to check-out and check-in several items simultaneously.

3. Performing both identification and anti-theft in one single operation.

11.2.3 Equipment & Parts Needed

1. Counter Station.

2. New integrated library system functions-read from RFID and set the EAS status.

11.3 Patron self check-in / check-out

11.3.1 Phase Action

Let patron do the check-out and check-in process of books.

11.3.2 Phase Target

1. Benefit to librarian

*   Speeds up book check-in / check-out

*   Frees staff to better service patrons.

*   Better space planning

2. Benefit to patrons

*   Easy to use: Books can be read in any orientation.

*   Reduces queuing time.

*   Provides patron privacy.

11.3.3 Equipments and Parts Needed

1. Self check station - Perform patron self check-out and check-in process and turn off or turn on the EAS status.

2. Book Drop - Indoor or outdoor after patron drop in the book into this station, book's id in checked and turned on the EAS simultaneously.

3. Remote Book Drop - Long distance away from library, Acquire better protection of the Book-drop.

4. Sorting station - Sorting the return books automotive or manual.

Patron Self Check out / in Station
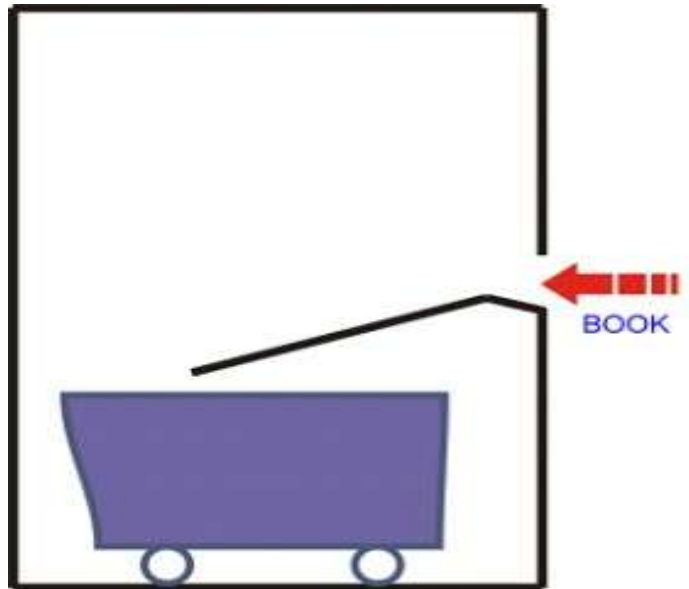
1.4 Smart and Quick Inventory

11.4.1 Phase Action

1. Search and Inventory by reading the RFID using portable reader and portable computer

11.4.2 Phase Target

1. Quick inventory

2. Look up the misplace material.

3. Search for certain material

11.4.3 Equipment & Parts Needed

1. Portable RFID reader

2. Portable Computer - Notebook PC or PDA

3. Inventory & Searching Software.

Portable RFID Reader

12. Advantages of Rfid Systems

Rapid charging and discharging process.

1. Simplified patron self-charging / discharging.

2. Highest degree of reliability.

3. High-speed inventorying is a unique advantage of RFID system.

4. Automated materials handling.

5. Long tag life is another advantage of RFID system.

6. To read or scan information from the tag there is no any requirement of contact or line of sight with the RFID scanner.

7. Ability of performing both identification and anti-theft in one single operation.

13. Drawbacks of Rfid

1. Lack of global standards.

2. RFID systems can be easily disrupted.

3. Reader collision occurs when the signals from two or more readers overlap.

4. RFID tag is unable to respond to simultaneous queries.

5. Tag collision also occurs when many RFID tags are present in small area.

6. Illicit tracking of RFID tags is possible by any person.

7. RFID tags are difficult to remove from the consumer products.

8. RFID tags can be read without our knowledge

9. Implementation of the system is costly.

14. Is Rfid Better than Using Barcodes?

RFID tags and barcodes both carry information about products. These two are different technologies and have different applications, which sometimes overlap. The major differences between the two are as follows:

*   Barcodes are line of sight technologies which require a direct line of sight to the printed barcode. On the other hand RFID readers do not require a direct line-of-sight to the RFID tag.

*   RFID tags can be read at much greater distances than barcode.

*   RFID readers can read RFID tags much faster than the barcode.

*   More longer tag life than the barcode.

*   RFID tags are typically more expensive than barcode, whereas barcodes are less expensive than the RFID tags.[4]

15. Conclusion

RFID is a very faster and speedy technology which has so many advantages over the barcode technology. The difficulties which are we experienced in barcode technology that can easily be overcome if we introduced this new technology in a library for better service. In the context of library, RFID is obviously better than the barcode technology. But to implement this technology in our country, the main hindrance is lack of funds, because RFID is relatively expensive technology.

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