



Application of RFID Technology in Libraries and Role of Librarian

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Abstract:

Library consist intellectual capital it might be scholarly journals, books, reports, theses etc. For security purpose, the goal of the security system should be to provide a safe and secure facility for library employees, library resources and equipment and library patrons. At the same time due to application of security system, that promise to increase efficiency, productivity and enhance user satisfaction. Considering the importance of library security, the present paper concentrates on application of RFID technology in libraries, its components, benefits and role of librarian are described.

Keywords: RFID, Library Security, Radio waves, Security System, Tag

1. Introduction

RFID (Radio Frequency Identification) allows an item, for example a library book, to be tracked and communicated with by radio waves. This technology is similar in concept to a cellphone. RFID is a broad term for technologies that use radio waves to automatically identify people or objects. There are several methods of identification, but the most common is to store a serial number that identifies a person or object, and perhaps other information, on a microchip that is attached to an antenna (the chip and the antenna together are called an RFID transponder or an RFID tag). The antenna enables the chip to transmit the identification information to a reader. 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

RFID is one of the most technologies being adopted by both industry and academic world. Modern academic library is a place where millions of books advanced; periodicals, CDs, DVDs and other electronic reading materials are contained. It is a challenge to manage for librarians, managing such type of huge collection.

RFID technology is in use since the 1970s. RFID tags can be active, semi-passive and passive. It is a small device that can store information. Passive tags don't have internal batteries. RFID reader is a device that can receive and transmit a radio signal. It is built to encode data stored in the tag's microprocessor. Because of the higher cost, active and semi-passive RFID tags are used for valuable asset tracking. The passive RFID tags are used in RFID library management systems.

RFID For Libraries – RFID can be used library circulation operations and theft detection systems. 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 materials handling (Boss 2004). This technology helps librarians reduce valuable staff time spent scanning barcodes while charging and discharging items. RFID is a combination of radio -frequency-based technology and microchip technology. The information contained on microchips in the tags affixed to library materials is read using radio frequency technology, regardless of item orientation or alignment (i.e., the technology does not require line-of-sight or a fixed plane to read tags as do traditional theft detection systems).

2. RFID LIBRARY MANAGEMENT SYSTEM

Using RFID in libraries saves library staff's time by automatizing their tasks. An establishment that uses RFID library management saves a book reader, precious time that he would have been spent, waiting for his turn in a queue for borrowing or returning a book. Taking care of books and making them available to the book readers are important tasks. Most of the library staff's time is spent in recording information of incoming and outgoing books.

Borrowing and returning of books can be fully automatized with the help of self check-in/out systems. This system involves installation of special software. A person using this system to borrow books, is presented with options on a computer screen. The person has to identify himself with a code, which is preferably a personal identification number, or any form of unique identity code. Books selected by the person are identified by the system's built-in RFID reader. And, the surveillance bit in the book's tag is deactivated by the system. When a book is returned, the check-in/out system activates the surveillance bit.

Fig. No 1: RFID Library Management System



Application in RFID Library Management System

1. Book Drops: The Book Drops can be located anywhere, within or outside the library. Possible remote locations outside the library include MRT/train stations, shopping centers, schools, etc. This offers unprecedented flexibility and convenience of returning library items at anytime of the day, even when the library is closed.

2. RFID Transponder or Tagging: It is the most important link in any RFID system. It has the ability to store information relating to the specific item to which they are attached, rewrite again without any requirement for contact or line of sight. Data within a tag may provide identification for an item, proof of ownership, original storage location, loan status and history.

RFID tags have been specifically designed to be affixed into library media, including books, CDs, DVDs and tapes.

3. Counter Station is a staff assisted station on services such as loan, return, tagging, sorting and etc. It is loaded with arming/disarming module, tagging module and sorting module. Arming/Disarming module allows EAS (Electronic Article Surveillance) bit inside the tag of the library material to be set/reset so as to trigger/not trigger the alarm of the EAS gate.

4. The Patron self check-out station: It is basically a computer with a touch screen and a built-in RFID reader, plus special software for personal identification, book and other media handling and circulation. After identifying the patron with a library ID card, a barcode card, or his personal ID number (PIN), the patron is asked to choose the next action (check-out of one or several books). After choosing check-out, the patron puts the book(s) in front of the screen on the RFID reader and the display will show the book title and its ID number (other optional information can be shown if desired) which have been checked out.

5. Shelf Management: This solution makes locating and identifying items on the shelves an easy task for librarians. It comprises basically of a portable scanner and a base station.

The solution is designed to cover three main requirements:

- Search for individual books requested
- Inventory check of the whole library stock
- Search for books which are miss-helved

6. Anti-theft Detection: RFID EAS Gates is the anti-theft part of the Library RFID Management System using the same RFID tags embedded in the library items. Each lane is able to track items of about 1 meter and would trigger the alarm system when an un-borrowed item passed through them. The alarm will sound and lights on the gate will flash as patron passes through with the un-borrowed library material

3. Components of an RFID system

Tag-

The heart of the system is the RFID tag, which can be fixed inside a book's back cover or directly onto CDs and videos. This tag is equipped with a programmable chip and an antenna. Each paper-thin tag contains an engraved antenna and a microchip with a capacity of at least 64 bits. There are three types of tags: "read only", "WORM," and "read/write" (Boss 2003). "Tags are "read only" if the identification is encoded at the time of manufacture and not rewritable. "WORM" (Write-Once-Read-Many) tags are programmed by the using organization, but without the ability to rewrite them later. "Read/write tags," which are chosen by most libraries, can have information changed or added. In libraries that use RFID, it is common to have part of the read/write tag secured against rewriting, e.g., the identification number of the item.

Reader-

RFID readers or receivers are composed of a radio frequency module, a control unit and an antenna to interrogate electronic tags via radio frequency (RF) communication (Sarma et al. 2002). The reader powers an antenna to generate an RF field. When a tag passes through the field, the information stored on the chip in the tag is interpreted by the reader and sent to the server, which, in turn, communicates with the integrated library system when the RFID system is interfaced with it (Boss 2004).

RFID exit gate sensors (readers) at exits are basically two types. One type reads the information on the tag(s) going by and communicates that information to a server. The server, after checking the circulation database, turns on an alarm if the material is not properly checked out. Another type relies on a "theft" byte in the tag that is turned on or off to show that the item has been charged or not, making it unnecessary to communicate with the circulation database.

Readers in RFID library are used in the following ways (Boss 2003):

- Conversion station: where library data is written to the tag
- Staff workstation at circulation: used to charge and discharge library materials
- Self check-out station: used to check out library materials without staff assistance

- Self check-in station: used to check in library materials without staff assistance
- Exit sensors: to verify that all material leaving the library has been checked out
- Book-drop reader: used to automatically discharge library materials and reactivate security
- Sorter and conveyor: automated system for returning material to proper area of library
- Hand-held reader: used for inventorying and verifying that material is shelved correctly.

Antenna-

The antenna produces radio signals to activate the tag and read and write data to it. Antennas are the channels between the tag and the reader, which controls the system's data acquisitions and communication. The electromagnetic field produced by an antenna can be constantly present when multiple tags are expected continually. Antennas can be built into a doorframe to receive tag data from person's things passing through the door.

Server-

The server is the heart of some comprehensive RFID systems. It is the communications gateway among the various components (Boss, 2004). It receives the information from one or more of the readers and exchanges information with the circulation database. Its software includes the SIP/SIP2 (Session Initiation Protocol), APIs (Applications Programming Interface) NCIP (National Circulation Interchange Protocol) or SLNP necessary to interface it with the integrated library software but no library vendor has yet fully implemented NCIP approved by NISO (Koppel, 2004). The server typically includes a transaction database so that reports can be produced.

Optional Components

Optional RFID system includes the following three components (Bibliotheca 2003):

1. RFID Label Printer
2. Handheld Reader
3. External Book Return
4. RFID label Printer

An RFID printer is used to print the labels with an individual barcode, library logo, etc. When the print is applied, it simultaneously programs the data in to the chip. After this process, the RFID label is taken from the printer and applied to the book.

Advantages of RFID in Libraries:

The use of RFID reduces the amount of time required to perform Circulation operations. The most significant time saving with bootable to the fact that information can be read from RFID tags much faster than form barcodes and that served items in the stack can be read at the same time.

- Self charging discharging
- Reliability
- Streamlined Inventory Management
- Longitivity of Tag life
- Faster Circulation
- Reduction in workplace injuries
- Automated materials handling
- Easy stock verification

- Theft reduction
- High level of security
- Mis-shelve easy identification
- External Book Return
- Improved tracking of high value items
- Reduce Shrinkage errors
- Technology standards to drive down cost
- Reduce materials cost and handling

Disadvantages of RFID in Libraries:

- High Cost
- Frequency Block
- Chances of removal of exposed tags exit gate sensor problems
- User Privacy concern
- Reader collision
- Tag collision
- Interoperability

Role of Librarian

RFID technology introduces an ethical dilemma for librarians. The technology allows for greatly improved services for patrons especially in the area of self check out, it allows for more efficient use of professional staff, and may reduce repetitive stress injuries for library workers. And yet, the technology introduces the threat of hot listing and tracking library patrons. Librarians have taken extra steps to ensure that law such as the USA PATRIOT act can not be used by government entities to invade the privacy of their patrons, and yet many of those same libraries are placing traceable chips on their patron's books. Libraries have traditionally acted to protect and defend the privacy of their patrons and yet some are implementing a technology before proper safeguards have been developed. Library use of RFID technology serves to legitimize the technology in the eyes of the community. Therefore, it is incumbent on the library community to ensure that the technology is developed in concert with established privacy principles and that any library use of RFID follows best practices guidelines consistent with library values

4. Conclusion

RFID technology is not only emerging but also more effective, convenient and cost efficient technology in library security. This technology has slowly begun to replace the traditional bar-code on library items. The RFID tag can contain identifying information such as a book's title or material type, without having to be pointed to a separate. The information is read by an RFID reader, which replaces the standard barcode reader commonly found at a library's circulation desk. The RFID tag found on library materials. It may replace or be added to the barcode, offering a different means of inventory management by the staff and self service by the borrowed. It can also act as a security device, taking the place of the traditional electromagnetic security strip. And not only the books, but also the membership cards could be fitted with an RFID tag. The cost of the technology is main constraint.

References

1. Ayre, Lori Bowen, The Galecia Group (August 2004) Position paper: RFID and libraries. Retrieved from www.galecia.com/weblog/mt/archives/cat_rfidandwireless.php

2. Berkeley Public Library (n.d.) Berkeley Public Library: Best Practices for RFID technology. Retrieved from berkeleypubliclibrary.org/BESTPRAC.pdf.
3. BIBLIOTHECA RFID Library Systems AG (2003) RFID Technology Overview. Retrieved from www.bibliotheca-rfid.com
4. Boss. R. W. (2003). RFID technology for libraries [Monograph]. *Library Technology Reports*. November-December 2003.
5. Boss. R. W. PLA Tech Notes (May 14, 2004) RFID Technology for libraries. Retrieved from www.ala.org/ala/pla/plapubs/technotes/rfidtechnology.htm
6. FAQ RFID Journal (Online Version 2004) Retrieved from www.rfidjournal.com/article/articleview/207
7. Koppel, T. (March 2004). Standards in Libraries: What's Ahead: a guide for Library Professional about the Library Standards of Today and the Future. The Library Corporation. Retrieved from <http://www.tlcdelivers.com/tlc/pdf/standardswp.pdf>.
8. Molnar, D., Wagner, D. A. (June 2004). Privacy and security in library RFID: Issues, practices and architectures. Retrieved from www.cs.berkeley.edu/~dmolnar/library.
9. Sarma, E. S. Weis, S. A., Engels, D.W. (November 2002). White paper: RFID systems, security & privacy implications. Cambridge, MA : Massachusetts Institute of Technology, AUTO-ID Center.
10. Syed, S., 2005 Use of RFID Technology in libraries : a new approach to circulation, tracking, inventorying and security of library materials. *Library Philosophy and Practice*. 8(1), 15-21.