

ROLE OF LIBRARIAN IN APPLICATION OF RFID TECHNOLOGY IN LIBRARIES

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Abstract

RFID (Radio Frequency IDentification) is the latest technology to be used in library theft detection systems. 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 materials handling. 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 and distance from the item is not a critical factor except in the case of extra-wide exit gates. The corridors at the building exits can be as wide as four feet because the tags can be read at a distance of up to two feet by each of two parallel exit sensors. Considering the importance of library security, the paper concentrates on application of RFID technology in libraries, its components, benefits and role of librarian are described.

Keywords: RFID, Library Security, Security System, Tag, Theft detection.

Introduction

RFID means Radio frequency identification i.e. the technology that uses radio waves to automatically identify individual items. The objective of any RFID system is to carry data in suitable transponders, generally known as tags and to retrieve data, by machine readable means, at a suitable time and place and to satisfy particular application needs

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 library management, using RFID tags library, is easy and convenient. A RFID library management system consists of books, each attached with an RFID tag, RFID reader, computer network and software. Library staff handle lending, returning, sorting, tagging etc. of books, using RFID tags in this library system. A person can locate RFID library books marked with a RFID tags, using the RFID reader which identifies and locates the book. When the book is carried to the counter, the library staff can either activate or deactivate the electronic article surveillance bit in the book's tag. If a book is borrowed, then the surveillance bit is deactivated.

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.

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.
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.

Important points based on RFID Library Management System

1. RFID tags replace both the EM security strips and Barcode.
2. Simplify patron self check-out / check-in.
3. Ability to handle material without exception for video and audio tapes.
4. Radio Frequency anti-theft detection is innovative and safe.
5. High-speed inventory and identify items which are out of proper order.
6. Long-term development guarantee when using Open Standard.

5.0 COMPONENTS of an RFID System

RFID system has mainly four components:

1. RFID tags / transponder that are electronically programmed with unique information
2. Readers or Sensors to query the tags.
3. Antenna.
4. Server on which the software that interfaces with the integrated library software is loaded.
5. RFID Label Printer

6. Handheld Reader
7. Self Check Unit
8. External Book Return
9. Staff and Conversion Station

1. **Tags:** RFID tag is 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. These are three types of tags 'read only', 'WORM', and 'read/write'. 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 using RFID is common to have part of the read/write tag secured against rewriting e.g. the identification number of the item.

2. **Readers:** A receiver device called as reader detects the signal as soon it enters into its radio range and decodes the number for interpretation; Reader interrogates the tags and offers optimum reading performance enabling instant data capture when passed alongside the items in a continuance movement. The devices used within the building are usually called 'readers' while the ones used at building exits are usually called 'sensors'.
3. **Antenna:** An antenna is connected to the reader to help to process identification of the items and activate/deactivate the tag antitheft function simultaneously. Additional antenna can be added to increase the number of item processed in case of larger transactions.
4. **Server:** The server is the heart of some comprehensive RFID systems. It is the communication gateway among the various components. It receives the information from one or more of the readers and

exchange information with the circulation database. Its software include the SIP/SIP2 (session initiation protocol), APIs (Application Programming Interface) NCIP or SLNP necessary to interface it with the integrated library software

5. **RFID Label Printer:** Used to Print the labels
6. **Handheld reader:** It can be moved along the items on the shelves without touching them. It used in stock verification, used in search for book-misshelved, search for individual book on request.
7. **Shelf Check Unit:** Users identification is done with an RFID-ID card. Users can put item onto the reader surface in front of the self check unit to be registered under particular user's name. Multiple items can be checked out at the same time.
8. **External Book Return/book Drop Station:** Libraries can offer a distinct service, such as ability to return the books when library is closed. It is machine with a slot with a chip RFID Reader integrated into a wall. User identifies him or her then puts the Books into the Slot. Upon Completion of return, user gets a Receipt showing how many and which books are returned.
9. **Staff and Conversion Station:** Staff station consists of antenna, electronic Module and power supply. There are additional software windows Integrated into library management Systems.

6.0 Benefits of RFID use in Library

1. RFID improves library workflow by
2. reducing non-value added work processes
3. Improves staff productivity
4. Improves customer service
5. Assist inventory check with ease.
6. Easy book identification for shelving process
7. Assist traceability of book allocation
8. Enhance book return processes by full automation of check-in, EAS activation and system updates completed simultaneously

in the self-return chute

9. Allow better accuracy in book collection management, resulting in reduced book purchase
10. More than one item can be checked out or checked in at the same time.
11. Items can be placed on reader without careful placement that it is required for line of sight system (bar code scanner)
12. Faster inventory process.
13. Ability to locate specific items.

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.

1. Self charging discharging
2. Reliability
3. Streamlined Inventory Management
4. Longevity of Tag life
5. Faster Circulation
6. Reduction in workplace injuries
7. Automated materials handling
8. Easy stock verification
9. Theft reduction
10. High level of security
11. Mis-shelve easy identification
12. External Book Return
13. Improved tracking of high value items
14. Reduce Shrinkage errors
15. Technology standards to drive down cost
16. Reduce materials cost and handling
17. Automated issue/return
18. Automated sorting of books on return
19. Inventory visibility accuracy and efficiency
20. Improved Production planning
21. Ability to manage the expenses over a number of years.
22. RFID tags are very simple to install/inject inside the body of animals, thus helping to

- keep a track on them. This is useful in animal husbandry and on poultry farms.
23. RFID technology is better than bar codes as it cannot be easily replicated and therefore, it increases the security of the product.
 24. Barcode scanners have repeatedly failed in providing security to books and journals in libraries. But nowadays, RFID tags are placed inside the books and an alarm is installed at the exit doors.
 25. The RFID tags can store data up to 2 KB whereas, the bar code has the ability to read just 10-12 digits.

Disadvantages of RFID in Libraries:

1. High Cost
2. Frequency Block
3. Chances of removal of exposed tags exit gate sensor problems
4. User Privacy concern
5. Reader collision
6. Tag collision
7. 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.

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.

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RFID improves library work flow by. Role of Librarian RFID technology introduces an ethical dilemma for professionals. RFID tags are very simple to install/ inject inside the body of concerned, thus helping to keep a track on them. RFID technology is better than bar codes as it can not be easily replicated and therefore, It increases the security of the product bar code , Scanner have repeatedly failed in providing security of books and journals in libraries. But Now a days, RFID tags are placed inside the books and an alarm is installed at the exist doors. CONCLUSIONS RFID technology is not only emerging but also more effective convenient and cost efficient technology in library security. This technology has begun to replace the traditional bar code in library items. the first application of RFID technology fully deployed in a library environment in 1998. The use. of RFID by libraries since then has grown dramatically. Figure 2: Library RFID Management Systems

2.3 Advantages of RFID in Libraries.

Due to the low cost of the barcode technology, most of the libraries around the world are using it. for circulation management. Librarians are always known as early adopters of technology and they have started using RFID. to provide more effective and efficient circulation services as well as for security of library. collections. Although the use of RFID by libraries over the last few years has grown. dramatically, yet the major barriers of RFID technology adoption by more libraries is its cost. factor, non availability of standards and user privacy. Radio-Frequency Identification (RFID) technology can be defined as a wireless sensor technology which is based on the detection of the electromagnetic signal. RFID was first invented in 1948 and has subsequently undergone several developmental stages. In the 1950s, the explorations of RFID technology were confined to laboratory experiments while the development of theory and field trials with RFID took place in the 1960s. The next decade saw an explosion in the development and testing of RFID. Application of RFID Technology In Libraries Circulation. It is one of the important applications of RFID technology. The circulation in the library carried out with the help of RFID with smart card system helps the students to borrow and return books in an easy. Most librarians understand the limitations of RFID read ranges in libraries—the government is unlikely to track what people are reading if it has to get to within a foot of someone to scan a tag. They also understand that information on customers and the materials they have checked-out is stored in the library software systems, so the threat to privacy isn't about the misuse of RFID but the potential abuse of the Patriot Act to get access to those records. According Venture Development, a Natick, Mass.-based technology research company, the library RFID market will see a compound annual growth The use of RFID in libraries has grown rapidly since the late 1990s, and has become a fundamental element in the design of many new major libraries around the world — from Seattle in the USA to Shenzhen in China. In some of these large libraries — Shenzhen has a stock of 2 million items, Seattle has capacity for nearly 1.5 million — this has included not only self-service but also automated stock handling. It is also possible to argue that, to some extent, libraries' use of only a limited element of this technology's potential is no different from that of software generally. According to the widely quoted statistics researched by the Standish Group (Johnson, 2002), only 20% of the features in enterprise software are ever used, with 19% rarely used and 45% never used.