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APPLICATION OF RADIO FREQUENCY IDENTIFICATION TECHNOLOGY IN LIBRARIES

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Abstract:
Library is a storehouse of knowledge which collects, preserves and distributes information or reading materials such as books, periodicals, journals, reports, theses, CD, DVD, microfilm, microfiche, newspapers etc. to its users. Library staffs have to spend most of the valuable time in circulation and shelving of reading materials which is a cumbersome task for them. Besides, book stealing is a common occurrence in a library. So library security is a big challenge for the authority. Radio Frequency Identification (RFID) technology gives proper solutions to overcome these kinds of problems. This paper concentrates on application of RFID technology in libraries, its components, benefits and issues related to use of RFID in libraries and information centers.

Index Terms:
RFID, Radio Frequency Identification, Library Automation, RFID Components, Inventory Management, Library Management, Library Security, Tag, Theft detection.

Introduction:

In this age of ICT revolution, new technologies have always been providing the new features to libraries for improving efficiency of library operations. Among the various technologies, the RFID (Radio Frequency Identification) seems to be dominating in the Library and information industry. In fact, this is one of the significant technologies of the new millennium that had invaded the libraries. 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, inventory and materials handling. (Waddenkeri, 2006)

Radio frequency identification is a system that facilitates the tracking of objects, primarily for inventory tracking, via a three part technology comprised of a reader, a transceiver with decoder and a transponder. Radio Frequency Identification is a wireless communication technology that is used to uniquely identify tagged objects. (Anasane & Gorde, 2013)

RFID means Radio frequency 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.(Pandey, 2010)

Radio Frequency Identification (RFID) is the technology that is slated to replace barcodes in library applications. It is a form of identification that is contact-less and does not require line of sight. The technology, though new to libraries has been in use in other sectors for more than 20 years. The RFID tags are placed in books and generally covered with a property sticker. Antennas of different sizes, based on application, are used to read the tags and manage the various library functions. (Chachra, 2003)

Radio Frequency Identification technology is the latest technology to make strong security and automatic identification surveillance system in the libraries. RFID provides the easier and faster circulation work, security of material, shelf check out and stock verification than Barcode technology. (Somvir & Kaushik, 2011)

Literature Review:

Want (2006) stated that there are many types of RFID. But at the highest level, it can be divided into two classes: active and passive. Active tag requires a power source- either connected to a powered infrastructure or use energy stored in an integrated battery. Passive RFID is of interest because the tag doesn't require batteries or maintenance. The tags also have an indefinite operational life and are small enough to fit into a practical adhesive label.

Jechlitschek (2010) conducted a survey on Radio Frequency Identification (RFID) trends where he divided RFID tags in three types in relation to power or energy. 1. Passive, 2. Semi-passive, 3. Active. He also discussed on security, privacy, attack Ranges, location and tracking and social implications of RFID.

Parkash, Kundu & Kaur (2012) carried out a comprehensive work entitled "The RFID technology and its application: a review" wherethey showed current development and future scope of RFID technology.

Ishtiaq, Sajid & Wagan (2019) carried out an exclusive work entitled "RFID technology working it's applications and research challenges where they discussed about the working of RFID technology its components with real-life application belonging from the field of environment, water, etc. Research issues belonging from technological problems existing in RFID technology also highlighted by them.

Chetouane (2015) stated that RFID integration may often be synonym of costly investments, intensive experimentations, and real process reengineering. It is important, in his opinion, to develop virtual commissioning, testing, and simulation tools and techniques, due to the noticeable lack of such contributions.

Addepalli & Addepalli (2014) conducted a research on "Library Management System Using RFID Technology" where they showed that RFID in the library speeds up book borrowing, monitoring, books searching processes and thus frees staff to do more user-service tasks.

Objective of the study:

- To ascertain the performance of RFID Technology in library.
- To study ideas, techniques and components related to RFID system.
- To evaluate its privacy and security.
- To know the advantages of RFID system.
- To know the disadvantages of RFID system.

Components of RFID:

RFID Tag/ Transponder:

The RFID tag consists of small silicon chip that contains, a radio modulator, a radio receiver for sending a response back to the reader. It is thin and small in shape. RFID tag is a kind of tracking systems that uses barcodes for recognizing items. RFID tags use radio frequency technology. These radio waves send data from the tag to a reader which transmits the information to an RFID computer program. The RFID tag may also be known as RFID chip. The microchip on an RFID reader is written with whatever information the user wants.

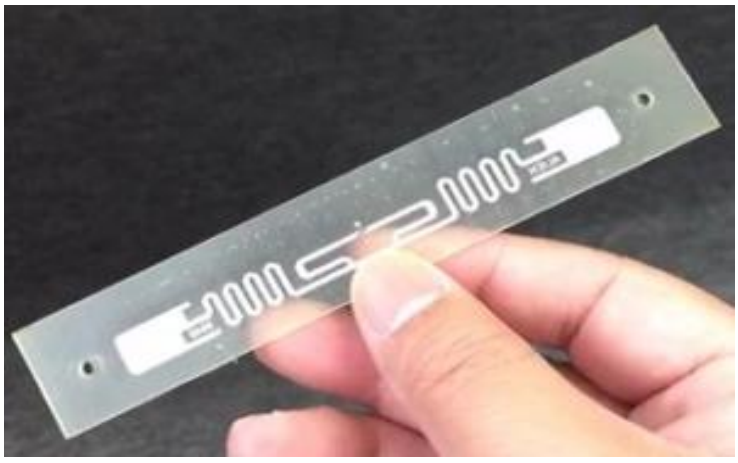

Fig-1: RFID Tag

RFID Antenna:

RFID antenna is made with a matching network and windings. It generates radio signals to actuate the tag and write and read data to it. RFID antenna is the way between the reader and the tag. That controls the system's data acquisitions and contact. The electromagnetic field which is created by an antenna may be always present when multiple tags are hoped regularly.

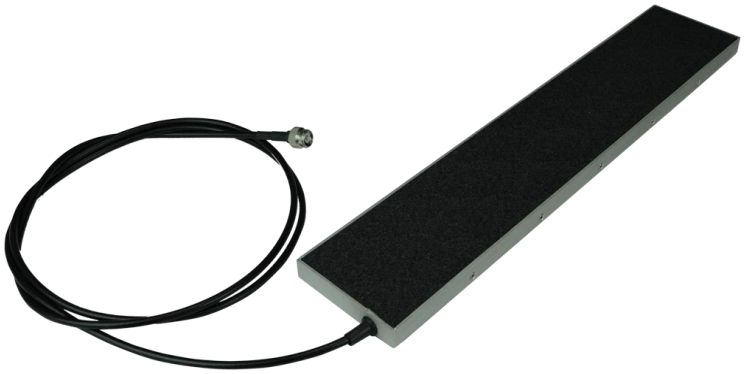

Fig-2: RFID Antenna

RFID Reader:

It is also known as scanner, wand or sensors. It is a combination of an antenna, a radio frequency module and a control unit to inquire electronic tags via radio frequency communication. It is available in various shapes and sizes.

Fig-3: RFID Reader

Server:

The server is a part and parcel of RFID systems. Without server, RFID implementation is impossible. It makes connections between the reader and the library automation system. It is the communications gateway among the various components. It receives the information from one or more of the readers and exchanges information with the circulation database.

Fig-4: Server

RFID Label Printer:

RFID Printer is a tool that simultaneously prints and enciphers information on RFID labels. It has the efficiency to print not only human readable information but also graphics and 1D and 2D barcodes as well. It also saves time by automating the manual process of encoding each tag.

Fig-5: RFID Label Printer

Inventory Wand /Handheld reader:
The portable handheld reader is mainly used for stocktaking, re-shelving and findings of library documents without touching them. It is easy to use. It reads RFID tags of library materials very quickly. It identifies items which are not checked in or out properly and instantly detect materials caused by an alarm.

Fig-6: Inventory Wand/ Handheld Reader

Application of RFID

RFID Tagging:
The RFID tag is the heart of the systems. It is paper flexible, thin and small in size which accommodates it to be placed inconspicuously on the inside cover of book in a library. It depots bibliographic information of reading materials with a unique ID number to recognize each item. Data within a tag may give identification for an item, main storage location, evidence of ownership, loan status and history.

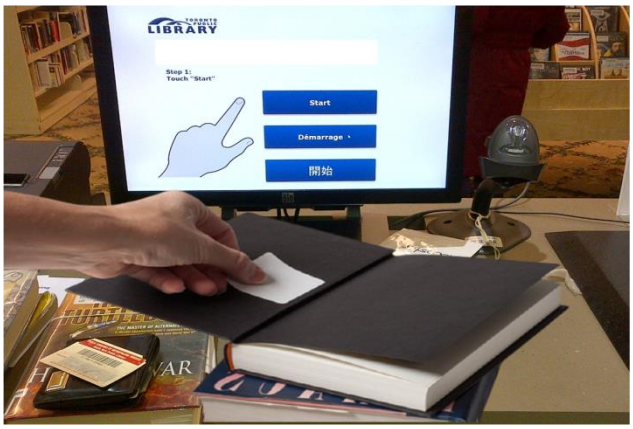

Fig-7: RFID Tag pasting inside book cover

Book Drops:
A Book Drop can be placed inside or outside the library. The library authority always thinks the user's convenience during placing the book drop. The user can easily return the book at anytime. A reader installed in a book drop permits reading of RFID tags as user drops of the materials. It automatically checks in the document, takes them off the user's library account and reactivates the security function.

Fig-8: Book Drop

Check in /out or Counter Station:

This is a desk or station where staff provides services such as loan, return, tagging etc to library users. In this station, library staffs and users directly give and take the reading materials of the library. It is loaded with arming/disarming module, tagging module and sorting module.

Fig-9: Check in /out station

Shelf Management:

By using a portable scanner and a base station, the library authority can Identify misplace of the book, inventory check of the library stock, search individual requested books .

Fig-10: Shelf Management

Self check-out station:

In this station, user itself can check-in or check-out without taking help of library personnel. Generally there is a computer, special software related with circulation functions, touch screen with RFID reader. The user who have valid library card can use the computer and can check out by using his Personal Identification Number -PIN.

Fig-11: Self out station

Anti-theft Detection:

RFID gate is used for security of library collection. RFID tags attached in the library items. Each lane is able to track items and would trigger the alarm system. When anyone takes books without issue and tries to go outside the library between these gates, it gives the alarm and sends the information to the local administrator through the server. It also acts as an antenna.

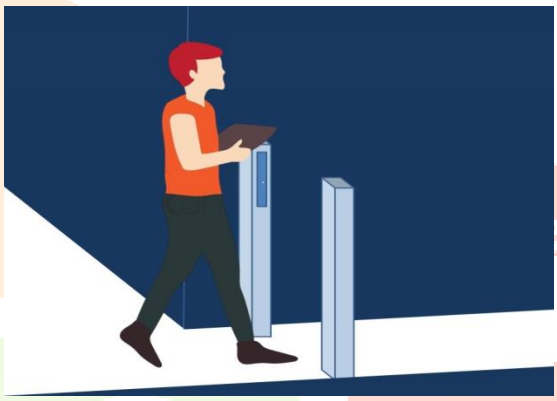

Fig-12: Anti Theft Detection

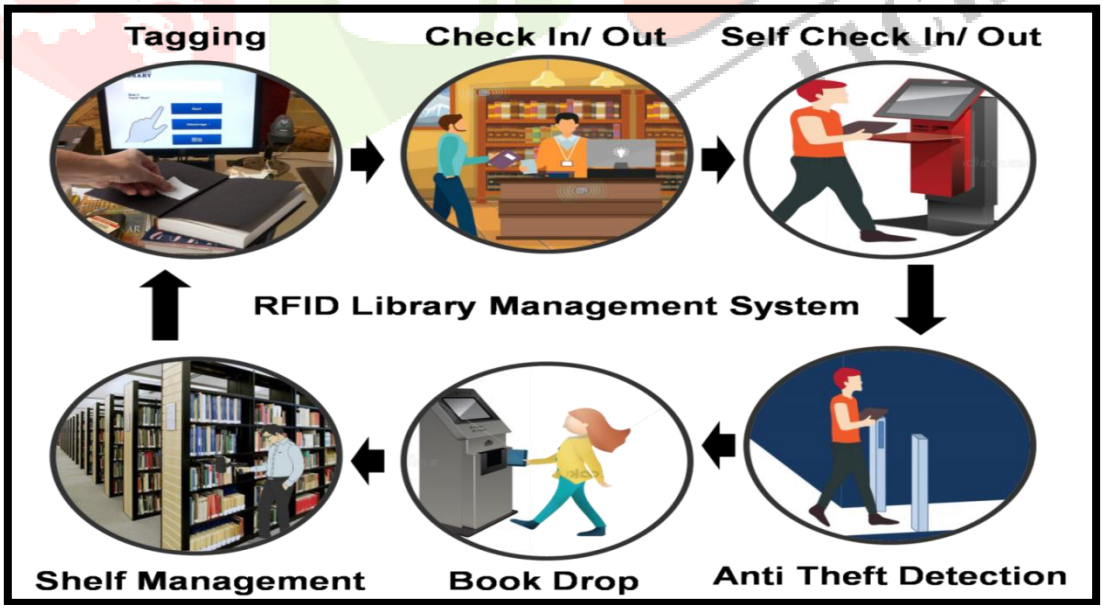

Fig-13: RFID Library Management System

Advantages of RFID:

- RFID improves library workflow.
- It provides stronger security, privacy and safety of the library.
- It reduces human errors from data collection.
- RFID saves the times of library staff and users.
- The rows in front of circulation counter can be avoided by using RFID Technology.
- It overcomes the problem of theft in the library.

- It is very effective for stock verification of library materials.
- RFID Assists to re-shelving of misplaced books.

Limitations of RFID:

- Implementing RFID in library is still too expensive.
- Many of the library RFID vendors don't supply standard RFID tags.
- The pasted RFID tags inside back cover of the book can be easily removed, which is a threat for the security gates.
- Uninterrupted power supply
- Tag collision
- RFID system alternatively reduces staff and patron interaction
- Privacy concerns related to item-level tagging is another significant barrier to use of RFID tags

Conclusion:

It is clear from the above discussion that an RFID system may be a wide scope technology for library. This technology is capable to change the work flow of a library. RFID in the library is not a intimidation if the best practices guidelinesare followed properly. The authority must provide training to library staff and library users about RFID technology. Otherwise, satisfaction and proper effectiveness of RFID technology may not be found.

References:

Waddenkeri, M. (2006). RFID Technology in library and information centers: relevance and prospects. 4th International Convention CALIBER-2006, Gulbarga, 2-4 February, 2006. Available at http://ir.inflibnet.ac.in:8080/ir/handle/1944/1114

Anasane, M.B. & Gorde, D.P. (2013). Applications of Radio Frequency Identification (RFID) Technology's In Libraries. International Journal of Computer Science and Applications Vol. 6, No.2, Apr 2013. Available at www.researchpublications.org

Pandey, P. (2010). Application of RFID Technology in Libraries and Role of Librarian. 12thMALIBNET Convention at Jaipur. Available atwww.researchgate.net/publication/269571818

Chachra, V. (2003). Experiences in implementing RFID solutions in a multi-vendor environment (VTLS Inc., Blacksburg, USA), IFLA Conference, Berlin, August, 2003. Available at http://archive.ifla.org/IV/ifla69/prog03.htm

Somvir & Kaushik, S.(2011). The New Emerging Technology in Libraries: RFID Technology. International Journal of Information Dissemination and Technology . April - June 2011. Vol. – 1. Issue - 2

Want, R. (2006). An Introduction to RFID Technology. Pervasive Computing and Communications. IEEE Press

Jechlitschek, C.(2010), A Survey Paper on Radio Frequency Identification (RFID) Trends. Available at www-docs/cse574-06/ftp/rfid/index.html

Parkash , D., Kundu, T. & Kaur, P. (2012). The RFID technology and its applications: a review. International Journal of Electronics, Communication & Instrumentation Engineering Research and Development (IJECIERD). Vol.2, Issue 3.

Ishtiaq, S., Sajid, A. & Wagan, R.A.(2019).RFID technology working it's applications and research challenges. Acta Informatica Malaysia (AIM)

Chetouane, F. (2015).An Overview on RFID Technology Instruction and Application. International Federation of Automatic Control Hosting by Elsevier.

Addepalli, S. L. & Addepalli , S.G. (2014). Library Management System Using RFID Technology International Journal of Computer Science and Information Technologies, Vol. 5 (6)

Pontius, N. (2020). What is RFID Tags? Learn How to RFID tags work, What they're used for, and some of the disadvantages of RFID technology. Available at https://www.camcode.com/asset-tags/what-are-rfid-tags/

Anasane, M.B. & Gorde, D. P. (2013). Applications of Radio Frequency Identification (RFID) Technology's In Libraries. International Journal Of Computer Science And Applications Vol. 6, No.2,

Singh, N.K. & Mahajan, P. (2014). Application of RFID technology in libraries. International Journal of Library and Information Studies. Vol.4 (2).

Alwadi, A., Kilby, J.& Gawanmeh, A. (2017).Tracking and automating a library system using radio frequency identification technology. International Journal of smart sensing and intelligent systems. Vol.10, No 02.

Shahid, S. M. (2005). Use of RFID Technology in Libraries: a New Approach to Circulation, Tracking, Inventorying, and Security of Library Materials. Library Philosophy and Practice Vol. 8, No. 1.

Chhetri, M. & Thakur, R.S.(2019). Implementation of RFID system in Libraries: A case study in UPES library. Library Philosophy and Practice (e-journal). 2344.