
USE OF RFID TECHNOLOGY IN LIBRARIES

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Abstract

RFID (Radio Frequency IDentification) is a wireless data collection technology that uses electronic tags for storing data. Like barcodes, they are used to identify items. Unlike barcodes, which must be brought close to the scanner for reading, RFID tags are read when they are within the proximity of a transmitted radio signal. RFID system can be used for faster charge, discharge, inventorying, security and tracking of library material. Present paper explains RFID technology and its working. It also elucidates in detail the need for RFID in library, its advantages and disadvantages. Various components required and their functioning in RFID system is discussed in this paper. Before implementing the system it is better to study the system and plan it out properly, hence, guidelines to use RFID in library are also highlighted. Step wise functioning of the complete system is cited in this paper. It also discusses about recent developments and vendors in India.

Keywords : RFID system, RFID technology, Library Security, Document Tracking.

1. Introduction

New technologies have always been of interest for libraries, to increase efficient and qualitative services. RFID (Radio Frequency Identification) was developed about 30 years ago. It was used for 'Radio Tracking' of wild and agricultural animals, and evolved later into a technology which is used in many industrial applications today [7]. In 2004, an amusement park in Denmark launched a child tracking system that uses RFID wrist bands. If children are lost, they can be found by the numerous RFID readers around the park. Even now in libraries RFID is used for theft detection, inventorying, documents handling, collection management and circulation operations for easier and faster charge and discharge. The RFID solution is an application of Automatic Identification and Data Capture (AIDC) technology. It resembles a traditional barcode system used in libraries. The main aim for today's libraries in adopting RFID is to improve library operations by increasing the efficiency of library transactions, reducing workplace injuries, and improving services for library users. Library manpower can be utilized to provide more value added services.

2. How does RFID Technology work ?

RFID is a technology that uses radio waves to automatically identify people 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). All of the tags used in RFID technology for libraries are "passive." The power to read the tags comes from the reader or exit sensor (reader), rather than from a battery within the tag. These tags are placed in books and generally covered with a proper sticker. The reader converts the radio waves reflected back from the RFID tag, into digital information that can then be passed on to computers to make use of it.

A passive RFID tag draws power from 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 and the reader converts the new waves into digital data. The RFID gates at the library exit(s) 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 gate sensors.

3. Need for RFID Technology in Libraries

1. Libraries implement RFID to improve user's services and to cope up with the rising cost of library material, cost of labour, etc.
2. To increase circulation staff productivity.
3. To reduce losses of library material like CDs, DVDs and books, etc.
4. To increase collection accuracy with accurate reshelving of materials.
5. Decrease document injuries caused at the time of charging, discharging and inventorying.
6. To provide more value added future service with same number of staff.

4. Components of RFID System

RFID system has some basic physical and other optional components requirement, which can be added in due course of time depending upon the functioning of the system, need of the other components and the available budget they can be incorporated.

1. RFID tags that are electronically programmed with unique information
2. Sensor Gate
3. Couplers or readers or sensors to query the tags
4. Antenna to enable the chip to transmit the identification information to a reader.
5. Server on which the software that interfaces with the integrated library software is loaded.
6. RFID Label Printer
7. Handheld Reader/Inventory Wand
8. Self Check Unit
9. External Book Return
10. Staff and Conversion Station.

Functioning of all these components are described below.

4.1 RFID Tags/Transponder

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 on a foil, the cover paper or plastic label and the silicon liner. Each paper-thin tag contains an engraved antenna and a microchip with a capacity of at least 64 bits. Reading of Tags distance depends on their frequency.

There are three types of tags: "read only", "WORM," and "read/write" [1]. "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, so that information can be changed or added. Some times the tags are powered by an internal battery and are "read/write" so that data can be rewritten or modified. Tags memory size varies according to requirements.

Tags have three memory components. 1. Item identification (barcode) number. 2. security bit that is turned off and on as items are checked out and checked in. 3. Variable memory that can be used for sorting. The tags that are presently used in libraries are 13.56MHz (Mega Hertz) tags with no embedded power source.

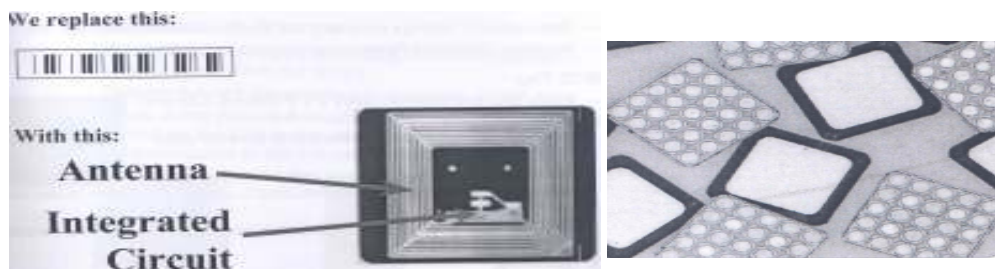


Fig. 1 - Tag

Passive RFID tag has no power source and no on tag transmitter built on to it, it gives range of less than 10meters. Passive tags are generally lowest in cost for use in library.[10]

Active RFID tag has both an on tag power source and an active transmitter. Active tags are connected to their own battery and they continuously emit radio signals. They can be read up to several kilometers away. They are larger and more expensive than passive tags. [10]

4.2 Sensor Gate

The sensor gate is designed for the detection and reading of information from RFID labels, which are carried through a door. The gate consists of two or three antennas which are parallel to each other.

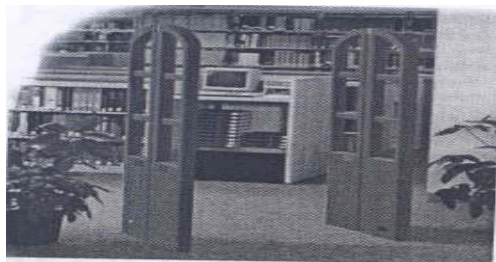


Fig.2 - Sensor Gate

4.3 Couplers/Readers

Couplers /Readers are the link between RFID tags and the server (PC). Couplers vary in size and shape from portable handheld terminals to fixed devices positioned at circulation desk or library entrance ways. RFID couplers are composed of a radio frequency module, a control unit and an antenna to interrogate

electronic tags via radio frequency (RF) communication. The couplers can send information in two directions; it can read information from a tag and send it to the server (read mode) or it can read information from the server and send it to an RFID tag (write mode). [15] The server, after checking the circulation database, turns on an alarm if the material is not properly checked out.

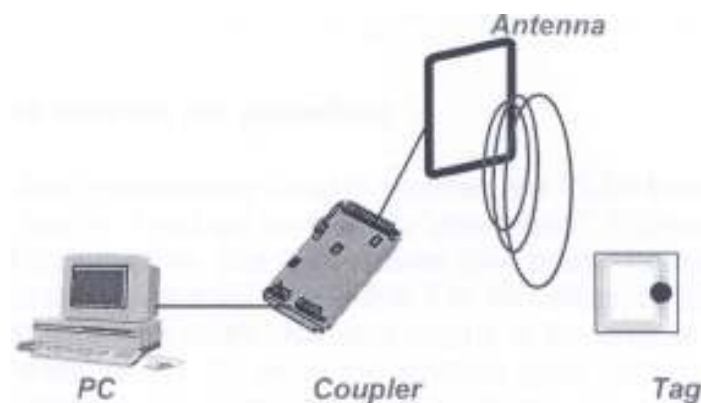


Fig. 3 - Coupler/Reader

4.4 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/coupler, 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 persons passing through the door.

4.5 Server

The server is link between the coupler/reader and the library automation system. It is the communications gateway among the various components working as the heart of the RFID system. 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 or Standard Interchange Protocol), APIs (Applications Programming Interface) NCIP (National Circulation Interchange Protocol) necessary to interface it with the integrated library software but no library vendor has yet fully implemented NCIP approved by NISO (National Information Standards Organization). [13], [14]

4.6 An RFID Label printer

It 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 document.