

RFID and Libraries

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Abstract

RFID or Radio Frequency Identification is a technology that is used for tracking and identifying objects or, in other words, inventory control. RFID has been widely used in passports, smartcards, home appliances, merchandise tags, animal's tags, automobiles, for monitoring heart patients and has even gone as far as in the operation of satellites and spacecraft. RFID technology has also entered the library space. This paper lays out the basics of RFID in terms of information and functions and how it has revolutionized the library space both in terms of management, circulation as also security of books and resources and has established a greater level of ease and efficiency at the end of both the library staff as well as the users.

Keywords: RFID, RFID in Library, Application of RFID, RFID Security, Drawbacks of RFID.

INTRODUCTION

Though RFID technology was first used in 2nd world war, from around 1980s it is being used in commercial activities. Now a days RFID technology is in great use in Industries' e.g. in tracking persons and objects, identifying goods in supply chain, high value tools and other assets. In recent past, libraries too have started using Radio waves for inventory management, circulation, stock taking and security of books and other materials. RFID technology does not require wires to work but uses Radio waves as a medium for communication. By identifying Radio frequencies individual items can automatically be detected.

What is RFID?

RFID is an acronym for Radio Frequency Identification. It is a technology that enables objects to be wirelessly identified by using radio waves. This technology and its usage is similar to that of bar codes, RFID being a few notches more advanced than the bar-code technology [1]. This is so because RFID operates within a diametrical range and is not restricted by the compulsion of items being in the line-of-sight of a reader. Despite being more advanced, however, RFID is yet to replace barcodes as the choice of technology in institutions owing to its high cost and also the need to identify each item individually.

RFID has entered the realm of libraries and has been beneficial in libraries as it has a huge potential to increase efficiency in all library operations by saving time, reducing errors in data entry and also by reducing dependency on the staff so they may perform other more valuable functions. It is used for book identification, for self checkout, for sorting, conveying of library books and may even be used for theft detection among many other things.

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RFID System Components

RFID guarantees 100 per cent efficiency and accuracy with a simple system which consists of a reader, an antenna, tags, cables, the software and other auxiliary items such as antenna mounting brackets, RFID printers, GPIO adapters, and portals [2].

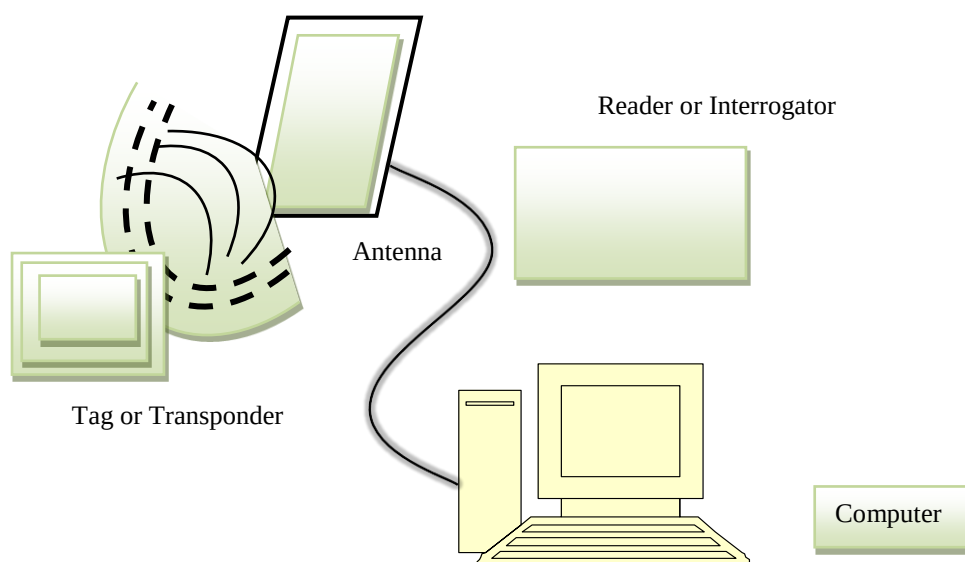


Figure 1. Basic components of a typical RFID system.

According to the components of a RFID system in Figure 1, An RFID tag is made of integrated circuits which contain an antenna. Digital data is stored in an RFID tag which then transmits this data through the antenna to an RFID receiver. “Frequency ranges vary from low frequencies of 125 to 134 kHz and 140 to 148.5 kHz and high frequencies of 850 to 950 MHz and 2.4 to 2.5 GHz. Wavelengths in the 2.4 GHz range are limited because they can be absorbed by water.” The RFID reader can be considered to be the actual brain of the system as it is programmed to suit user requirements. “Readers can be programmed to only read certain RFID tags, read tags at certain time, read tags once in inventory mode, or read tags over and over to gauge specific information”. Coaxial cables are used to connect the reader and the antenna and they may vary in lengths, insulation rating and connectors depending upon the entire setup. While these are the core hardware requirements for an RFID setup auxiliary addendums like portals, antenna mounting brackets, RFID printers, GPIO adapters may be added to make the system more smooth and efficient. In a library RFID setup is called a workstation and many books may be issues and returned here at one time by the user themselves.

RFID Tags

RFID Tags are one of the most central components of the system as they store all relevant information regarding the object to which they are tagged. The communication between RFID tags and the RFID reader is based on electromagnetic waves which operate between 125 kHz and 960 MHz while tags are small and thin in appearance, they are made up of an antenna to communicate and a microchip which stores information with a capacity of 64 bits at least.

Active RFID Tag

433 MHz or 915 MHz-Active RFID tags come with a battery which enables them to be read at a much higher range which can go as far as several hundred meters. While their range is greater, active tags are also bigger and bulkier [3]. Drawbacks of Active RFID tags also include an increased cost as well a limited battery life of only 3-5 years. While Active tags may not be best suited for use in libraries, they prove efficient in construction yards applications, “for manufacturing, such as tracking components on an assembly line, or for logistics where the tag may be reused or any system that requires real-time location”.

Passive RFID Tag

Passive RFID Tags are different from Active tags in that they do not operate on a battery or any other power source. While this significantly reduces the range of the tags. Low frequency-125-134 kHz is used in animal tracking and other such applications which require a small read range. The read

range for low frequency is 10 cm. High frequency-13.56 MHz-is most suitable for use in smart posters and transit ticketing systems which require a read range from 1cm to 1m.

RFID Applications

The different kinds of RFID Tags in use give an indication of the different uses RFID technology can be put to. While libraries are our primary concern, the potential of RFID has also been tapped by various other applications such as in passports, smartcards, home appliances, merchandise tags, animal tags, automobiles, for monitoring heart patients and has even gone as far as in the operations for satellites and spacecraft. With its unique ability to track and identify individual items RFID technology becomes invaluable and is in great demand. Along with the ability to imprint any information onto tags such as company names, product information or instructions RFID tags also ensure maximum security as tag data is encrypted and may further be locked for more security. RFID tags have the ability to store more data than other types of tags or labels and are also more durable against impact and environmental factors.

Along with these general benefits, RFID technology is especially suited to libraries.

RFID Applications in Libraries

RFID technology provides the “fastest, easiest and the most efficient way to track, locate & manage library Materials”. As a result of using RFID in library working and management, libraries as an institution have improved both in terms of their functioning as well as in terms of the overall customer experience [4]. By enabling, the quick and efficient creation as well as tracking of inventories, stock taking, automated material handling, circulation and collection management, RFID aids in reducing staff time needed for material handling [5]. For users, RFID introduces greater ease by enabling 24*7 services for return of books as well as automatic check-in and check-out. In other words a self-service-self-issue-self-return environment is established which helps both the user and the library staff as less time is needed to carry out circulation operations. The library system also becomes more efficient as each book has a unique ID which prevents counterfeiting and library inventories can be tracked in minutes instead of hours as multiple books can be read simultaneously.

RFID Drawbacks

In the face of innumerable benefits RFID technology does have drawbacks although only few and far between [6]. Installation incurs a high cost but once installed RFID has minimal maintenance costs and therefore becomes cost efficient. One may also experience minor glitches in the form of removal of exposed tags, exit gate sensor problems, reader collision and tags collision etc. [7].

RFID has witnessed surging success and popularity in libraries all over the world and even in India [8]. Jayakar Library, university of Pune, Maharashtra, Dhanvantri Library, Jammu University, Jammu and Kashmir and Indian Institute of Technology, Chennai are some out of the many libraries in India that have successfully converted their institution into an RFID zone [9].

CONCLUSION

In a world which is becoming increasingly technologically advanced it is imperative that obsolete methods be discarded to allow new and more efficient systems to step in. RFID is one such groundbreaking technology which has revolutionized the functioning of libraries [10]. From the basic function within libraries which is of management and circulation of books to also setting up higher security standards RFID has paved the way for upping the ante for libraries all over the globe.

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