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# LibRFID: Automation Software for Library Management System Using RFID Technology

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**ABSTRACT:** Radio Frequency Identification (RFID) is a one of the Auto Identification and Data capture technology which helps to automate library management system and also it helps to identify the books from being taken out by the user of library from the library premises without issuing the books authentically from the circulation counter. The identification is done with help of radio frequency waves which are emitted by the rfid tags which are pasted in the books. The rfid software which is developed would allow for the fast library book circulating and also provide immediate traceability and security for the books which are there in the library. The aim of this paper is to implementing efficient library management system software with the rfid technologies to provide security to books in the library as well as to provide fast service by the library staff to the library users

**KEYWORDS:** Authentication, RFID- Radio Frequency Identification RFID Reader, RFID Tag, Security, USB-Universal Serial Bus, PICC- Integrated Circuit Card, PCD- Proximity Coupling Device, COM Port- Communication port

### I. INTRODUCTION

Identification of persons or things is always important in places like Airports, railway stations, shopping malls, industries, education sectors like libraries etc. Identification can be made automatic using Auto-identification. There are various methods for auto-identification; some of them are bar-code systems, optical character recognition, biometrics, smart cards and RFIDs [1]. RFID based systems are going to revolutionize the entire auto identification system due to its fast processing speed. In this paper we are going to develop library automation system using this revolutionary rfid technology[2], which will track the books, whether they are issued or they are in library, so that library user will get the instant information and also to the library staff to maintain and manage the books library easily . RFID can be used library circulation operations and theft detection systems. RFID-based systems are tracking systems that combine security with more efficient tracking of materials throughout the library, including easier and faster circulation of books, inventorying, and books handling.

### II. GETTING INTO RFID

RFID stands for Radio-Frequency Identification. It is the acronym stands for small electronic devices that consist of a small chip and an antenna. The chip typically is capable of carrying data around 2,000 byte or less. RFID is not a single technology it is a combination of radio-frequency-based technology and microchip technology. The unique identification contained on microchip tags are already fed into the server which is present in the library and the tags attached to library materials and those tags emits radio frequency waves which is read using radio frequency reader, regardless of item orientation or alignment[7] i.e. the technology does not require line-of-sight or a fixed plane to read tags as do traditional theft detection system and compared with the information of microchip which is stored in the server. The RFID tags provide a unique identification for the each book.

### III. COMPONENTS OF RFID

In RFID technology we use lot of components but following are the major components we use it for implementations.

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### a. RFID Tag

RFID tag is contactless card, referred to as a Proximity Integrated Circuit Card (PICC) [5]. Tags may either be actively or passively powered. Active tags contain an on-board power source, such as a battery, while passive tags must be inductively powered via an RF signal from the reader.

The distance a reader may interrogate tags from is limited by the tag's power. Consequently, active tags may be read from a greater distance than passive tags. Active tags may also record sensor readings or perform calculations in the absence of a reader. Passive tags can only operate in the presence of a reader and are inactive otherwise [6]. An active tag's memory size varies according to application requirements and some systems operate with up to 1MB of memory. Passive RFID tags operate without a separate external power source and obtain operating power generated from the reader. Tags contain microchips that store the unique identification (ID) of each object. The ID is a serial number stored in the RFID memory. The chip is made up of integrated circuit and embedded in a silicon chip. RFID memory chip can be permanent or changeable depending on the read/write characteristics. RFID tags can be different sizes and shapes depending on the application and the environment at which it will be used

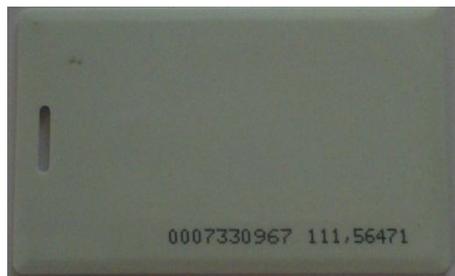


Figure 1. A RFID Tag with Tag ID as 007330967

### b. RFID Reader

RFID reader, also referred as Proximity Coupling Device (PCD) [5], reads tag's data through the RFID antennas at a certain frequency. Basically the reader is an electronic apparatus which produce and accept a radio signals. The antennas contains an attached reader, the reader translates the tag's radio signals through antenna [3], depending on the tag's capacity. The readers consist of a build-in anti-collision schemes and a single reader can operate on multiple frequencies. As a result, these readers are expected to collect data from tag. For this purpose readers can be connected using RS-232, RS-485 and USB cable as a wired option and connect to the computer system.

In LibRFID project developed our own module using RFID EM-18 Module with USB cable as a wired option to send the data to our Software when we swipe the RFID IDs and RFID Tags. Following is the Diagram of final developed RFID reader

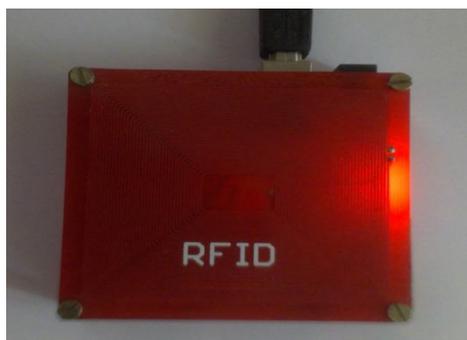


Figure 2. A RFID Reader with USB Cable



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## IV. HOW TO USE RFID IN LIBRARY WORKS?

A library is a center of Knowledge which has collection of information, sources, resources, books, and services in a single place. Apart from book libraries are now also becoming repositories and access points for maps, prints, or other documents on various storage media such as microfilm or microfiche, audio tapes, CDs, LPs, cassettes, videotapes, and DVDs. According Library Science 5<sup>th</sup> Law **The library is the growing organism**, the resources of the library will increased from one year to another year. So all the Libraries materials are arranged in a specified order according to a library classification system, so that items may be located quickly and collections may be browsed efficiently.

The following are the tasks to be performed in the library.

- Circulation: handling user accounts and issuing/returning and shelving of materials.
- Collection, development, order materials, maintain materials' budgets.
- Technical Services work behind the scenes cataloguing and processing new materials and de accessioning weeded materials.
- Basic tasks in library management include the planning of acquisitions of materials, arranging the acquired materials according to the library classification, preservation of materials the de accessioning of materials, patron borrowing of materials, and developing and administering library computer systems. Among these, the proposed system will automate the following tasks using RFID technology,
  - Searching a particular book to check its presence in the library
  - Locating the physical location of the book
  - Accounting/Stock verification of the materials

The RFID technology facilitates the fast issuing, reissuing and returning of books with the help of RFID enabled tags and rfid readers. It directly provides the book information and library member information to the library management system and does not need the manual typing. It also provides monitoring and searching system. The monitoring module will continuously monitor the movement of books across the gates, so that the books taken out without prior issuing will be traced out easily and will alarm the librarians. The searching module provides the fast searching of books using RFID reader [4] and finds the physical location of the books in the library.

## V. IMPLEMENTATION OF RFID IN LIBRFID

In LibRFID software we are maintaining the separate database for issuing or returning reissuing the books etc. Also to identify the authorized student, staff using their RFID IDs and to check the status of the each and every book whether it is issued or not using the LibRFID software. Each student or staff has issued RFID IDs and each has got unique id number and in the Library software for that id is stored with the student or staff detail. Whenever student or staff needs any book from the Library to be issued, he or she needs to swipe his RFID card in front of the RFID Card Reader placed in the Library after that he have to swipe the book in front of RFID reader. Once the rfid readers read the tag value it checks whether the student or staff got membership or not, and the details of the book by communicating with RFID Card Reader and database of the LibRFID software. If student or staff has the membership and books detail is found in the data base then the book has been issued in the particular student or staff name. If any user of the library will not follow the above procedure and try to go out of the library the rfid gate reader reads the tag in the book and it send the tag to the server which is connected to the gate and search for authentic issue of that book if the book is not authentically issued then the software buzz the buzzer loudly to indicate the book has been taken out without issued authentically so the security person or library person can stop that user from taking that book out of library premises. The LibRFID Software is implemented using .NET platform using VB.NET as a front end and Microsoft SQLServer 2008 Express as back end to maintain the database.

## VI. RESULTS AND DISCUSSION

In the LibRFID first is needed to attach the reader to system and have to connect it via COM ports. COM port number of the particular rfid has been searched first then has to choose that port number in the LibRFID software to configure the port to the rfid. After configuring successfully we can use the RFID reader to read the rfid IDs and rfid tags. After Successful reading the tags the tags values are used to track the resources in the library with the database and also for issuing the books, returning the books or to reissue the books we use the same ID. If anyone tries to take the library

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resource out of the library without issuing it from the counter the buzzer in the LibRFID will be buzzed to indicate book has been stolen. Some of the Screen shots of the applications are as follows

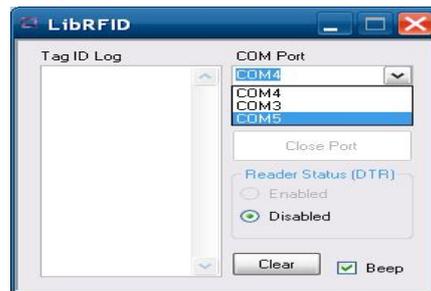


Figure 3. Connecting RFID reader module with LibRFID System With help of COM Ports

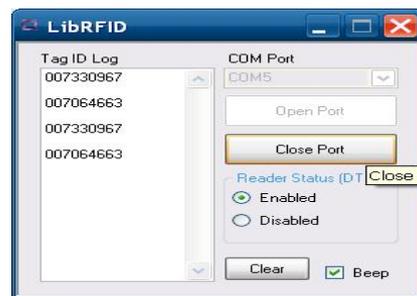


Figure 4. Reading the RFID Tags After Connecting RFID reader module with LibRFID System With help of COM Ports

## VII. CONCLUSION

According to the Library Science 4<sup>th</sup> Law **Save the time of the reader** -the time of the user should be saved when he or she is searching some resource in library. The LibRFID in the library speeds up book borrowing, monitoring, books searching processes and thus frees the library staff to do more user-service tasks and helps the library user to get their desired books easily. Thus LibRFID is able to fulfill this law by speeding library process and providing extra service to the library user thus the time of the users is saved lot since library staff provided a right way to find the book instead of searching it here and there in the library building. The RFID system may be a system that helps to implement both the security and materials tracking needs of a library. The significant advantage of LibRFID systems is the non-contact, non-line-of-sight nature of the technology.

Further improvement can be done by using a method in which the tag encrypts its ID and then sends to the reader, which will eliminate the capturing of the tag IDs and hence cloning the tags. Right Now the LibRFID will work for low frequency range tags we can extend our implementation for the higher frequency ranges by implementing a reader which can read the high frequency ranges.

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