

RFID Enabled Book Tracking System

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Abstract-Radio Frequency Identification (RFID) Systems is used in libraries for book identification, for self checkout, for anti-theft control. These applications can lead to significant savings in labour costs, enhance customer service, lower book theft and provide a constant update of collections of books. It also increases the speed and efficiency of book borrowing, returning and monitoring, and thus frees staff from doing manual work so that they could be used to enhance user-services task. The efficiency of this system is depending upon the information to be written in tag. To obtain best performance, RFID readers and RFID tags must be of good quality. Tags or transponders, the vital components of RFID, are the electronic chips consisting of an integrated circuit and antenna coil that communicate with a reader by means of a radio frequency signal. Since RFID does not require 'line-of-sight' between the transponder and the reader, it surmounts the limitations of other automatic identification devices, such as bar coding. Smart labels/tags are designed for lasting to lifetime of the item they identify and also perform the EAS (Electronic Article Surveillance) function to detect the thefts.

INTRODUCTION

In everyday life, we are using Library. In libraries, working is still done manually. Books issue, reissue, return all this activities are done by librarian and it also increases the labor cost. So instead of doing this manually we are creating the system named as Smart Library Management System. In this system we are going to design a system in which user can get all information about name of the books he/she had issued. They will also get to know return date of the book. If user is not registered then there is option for new registration (sign up). The tag is attached to each book in the library. These tags have the unique code and because of this uniqueness in code we are using it for different items. For this smart library management system we used RFID instead of Barcode due to more advantages over barcode.

A library is a growing system. The problems associated with the maintenance and securities are used to identify, track, sort or detect library collections at the circulation desk and in the daily maintenance. This system consists of smart RFID labels, hardware and software, provides libraries with more effective way of managing their data while providing greater service. The technology works through thin smart labels, which placed on the inside cover of each book in a library's collection. Manual interactions are not needed for RFID-tag reading. Utmost care is taken to provide following features to the Library using RFID technology to minimize the manual intervention and to minimize the manual errors and to provide fast issuing, reissuing and searching of books.

Radio-Frequency Identification (RFID) devices have importance in our daily life and they will become appearing in the near future. There is a tremendous growth in the industry to use RFID technology in the recent years. Research and development in this field has made this technology to be used in supply chain management, attendance management, library management, automated toll collection etc. RFID is an electronic technology whereby digital data encoded in an RFID tag is retrieved utilizing a reader. In contrast to bar code technology, RFID systems do not require line-of-sight access to the tag in order to retrieve the tag's data. Passive RFID is sure to replace bar codes in library applications. The bar-code system used in libraries is very time consuming and labor intensive.

One step is to decide on which kind of RFID reader and tag is used for library automation. The importance of reader is what kind of tag it reads, its operating frequency, capability of near reading, writing inside the tag , connection type with computer The reader has two main functions: the first is to transmit a carrier signal, and the second is to receive a response from any tags in proximity of the reader. A tag needs to receive the carrier signal, modify it in some way corresponding to the data on the

card, and retransmit the modified response back to the reader. Further, tags which are located in book are binding with the specific Id. In modern passive RFID devices; the tag consists of a small integrated circuit and an antenna.

The benefit of passive RFID is that it requires no internal power source; the circuit on the tag is actually powered by the carrier signal. Thus, the carrier signal transmitted from the reader must be considerably large so that the response can be read even from the card. In practical applications of using RFID technology, a tag is attached to an object used to identify the target, when the target object pass through the area that the reader can read, the tag and the reader builds up the radio signal connections, the tag sends its information to the reader, such as unique code and other data stored on, the reader receives those information and decodes them, and then sends to a host computer so as to complete the whole information processing.

LITERATURE REVIEW

RFID is an innovative automated system for automatic identification, sorting, arranging and tracking of different materials. Currently RFID applications range from book tracking and stock management to theft detection and automatic book sorting in libraries. Radio frequency identification (RFID) technology is a dynamic link between people, objects and processes and in the near future it plays a prime role in data collection, identification as well as analysis necessary for specific library operations. An automated library with the support of RFID technology would be a “self service station” that demands least intervention by the library personnel. Efforts are being made to introduce self-service “check-in” and “checkout” that avoid long delay in the delivery of library material and also for achieving better efficiency in operations RFID is an innovative automated system for automatic identification, sorting, arranging and tracking of different materials. Currently RFID applications range from book tracking and stock management to theft detection and automatic book sorting in libraries. Radio frequency identification (RFID) technology is a dynamic link between people, objects and processes and in the near future it plays a prime role in data collection, identification as well as analysis necessary for specific library operations. An automated library with the support of RFID technology would be a “self service station” that demands least intervention by the library personnel. Efforts are being made to introduce self-service “check-

in” and “checkout” that avoid long delay in the delivery of library material and also for achieving better efficiency in operations A library is a structured collection of information sources [3] that are made accessible to the people. Library usually holds the information physically or in a digitized format. In the previous period, the access of library frequently used in the library room as the technology developed the access mode changed to computer system. Library is a fast-growing organism, however; the olden methods to maintain library systems are not dynamic and effective. The application of the modern system has become indispensable for prompt to retrieval and dissemination of information and improved service for the users.

LMS is an application that portrays a library system that can be generally small or medium in size. It is used and controlled by the library staff categorically to manage the library using computerized system [4] where librarians can record numerous transactions like the issue of books, the return of books, the adding of new eBooks, the adding of new members, etc. Books and user preservation modules are also involved in this system that would help to keep track of the users and a detailed description of the books that the library contains. Computerized system will help to avoid loss of books or members record; however, missing records mostly happens when a non-computerized system is used. This system is open access for all users however to some extent system maintenance and to generate different kinds of reports like lists of users registered, addition of eBooks and users return reports are only applicable to the admin. All these sections can help the librarian to manage [5] the library with more suitable and in a more effective way as compared to the manual library systems. This system is established and designed to support librarians to record all book transaction, to avoid and eradicate the problem of book loss and files in the library.

Those papers [6], [7] describes the advantage of using proper management in the information system and the sustainability of library systems. They mentioned that fast rising in different types of data creates difficulties to get accurate information. However, our system focuses on building more valuable information for the ACCE library users and the admin of the system have full control to manage the updated data. Library provides information and services that are essential to the learning and development of one’s knowledge skills. Although we have a collaborative idea with their papers in maintaining,

the long ran of the library system and information facilities.

This paper view management is explained by [8] “the art of performing things through people.” A manager is noticed as a person who accomplishes the organization's goals by inspiring others to perform well. Moreover, there is a subjective question about whether management [9] is an art or a science; however, it can be said without a doubt that modern management in the environment of technology is becoming more of a science than an art. Moreover, we describe management for Management Information Systems (MIS) as the procedure for planning, organizing, staffing, coordinating, and controlling the efforts of the members of the organization to accomplish the commonly identified aims of the organization.

As Asmait Futsumbrhan explained that, a library is a place where a collection of books and other informational materials are made accessible to people for reading, study, or reference in their daily life activity. The library collections have almost contained a diversity of materials making it much easier for everyone who has an interest in reading and finding new things regarding their interests. Contemporary libraries preserve collections that contain printed materials such as manuscripts, books, newspapers, magazines, maps, and photographs. However, we found her explanation limited to the usage of the library. We are converting all the paperwork activities to a computer system and although adding a new eBook system, so the users can get access inside the library room and outside in digital format.

The focal task of a library is to collect, organize, preserve, and provide knowledge and information. In rewarding this mission, libraries preserve valued records of a culture that can convey over the following generations. Libraries are a crucial link in the communication among the past, present, and future generations. Whether the cultural record is limited in books or other Media, libraries must certify the record is preserved and made available for future use. Libraries provide for the users to get access to the information that is essential for work and learning. People in many professions use library materials to assist themselves in their daily work time. Although they use to gain information about their interest or to gain recreational materials such as films and novels. Scholars use library to supplement and boost their classroom proficiencies, to learn abilities in discovering sources of information, and to improve reading habits. One of the most valued activities of the library is to [10] provide

information and services that are essential to the learning and development of one’s knowledge.

METHODS

In order to overcome the Difficulties faced by a librarian, we need to Propose on a system which contains RFID Tags and Readers. Tags place on both library individual books and Student ID cards. Student database is already in the Database. Once the student Scan the ID means his complete details about the student is shown. Simultaneously if he scans the tag of the book, that particular book is allotted to the respective person database. The whole system becomes autonomous by having security to prevent the user from entering without scanning their RFID tag which already in databases. So that work of the librarian gets reduced.

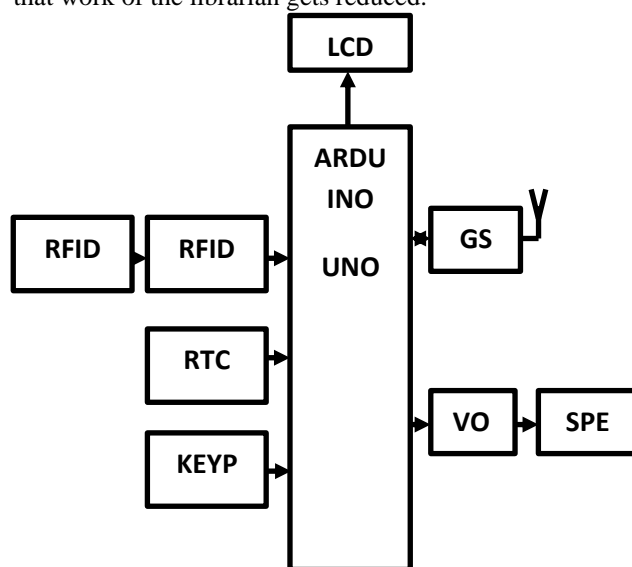


Fig 1: PROPOSED BLOCK DIAGRAM

Each book would be uniquely identified via the RFID tags attached to it and communication would be done wirelessly. An RFID sensor would be placed near the library desk wherein one should only place the book near the sensor and it would get reissued/issued/returned depending on the actions required. Moreover information regarding the asset i.e. book can be gained by both the authority and students remotely instead of the traditional way of manually searching the book. This would save a lot of time and enable efficient queue management. As actions on these tagged assets are being recorded, data can be usefully exploited as per librarian's need. Hence, it is tracking books within a limited transmission range.

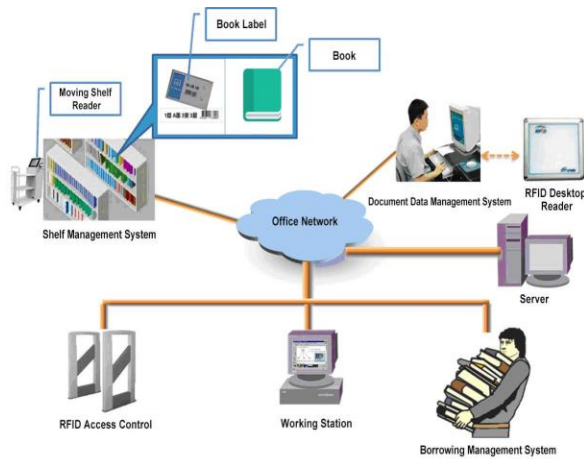


Fig 2: Block Diagram

RFID READER: It communicates with the tags through an RF channel to obtain identifying information. Depending on the type of tag, this communication may be a simple ping or maybe a more complex multi-round protocol. In environments with many tags, a reader may have to perform an anti-collision protocol to ensure that communication conflicts don't occur. Anti-collision protocols permit readers to rapidly communicate with many tags in serial order.

RFID TAGS: These are the tags that have a magnetic coil within them and are used to generate radiofrequency waves. They are passive in nature i.e. they can be read up to a small distance of 10-15 cm, so the system is static. A passive tag is an RFID tag that does not contain a battery; the power is supplied by the reader. When radio waves from the reader are encountered by a passive RFID tag, the coiled antenna within the tag forms a magnetic field. The tag draws power from it, energizing the circuits in the tag. The tag then sends the information encoded in the tag's memory. The tag is typically much less expensive to manufacture. All tags have unique identification number (15 characters long) which is quite useful and these tags can be re-used. One set of library tags are attached within the Library cards of the books and details of books can be accessed and actions like Issue/Re-Issue can be done in the library interface after the tags are scanned.

RESULT ANALYSIS

RFID is an abbreviation of Radio Frequency Identification that is a combination of radio-frequency and microchip. It facilitates to wireless identification of people, books or assets by radio waves. RFID technology has existed from a long time. In (Stockman, 1948)

discussed the basic theory for reflected power communication and implementation of RFID in published paper entitled "Communication by means of reflected power". (Vernon, 1952) published paper entitled "Application of the microwave homodyne" and (Harris, 1960) paper entitled "Radio transmission systems with modulatable passive responder", respectively. After that, the development of RFID continued. It has emerged rapidly as a key element to use as a security and access control system in library. "The information contained on microchips in the tags affixed to library materials is read using radio frequency technology regardless of item orientation or alignment (i.e., the technology does not require line-of-sight or a fixed plane to read tags as do traditional theft detection systems) and distance from the item is not a critical factor except in the case of extra-wide exit gates. The corridors at the building 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 sensors" (Boss, 2003). In this paper, awareness of RFID has been proposed.

Tagging: Tag 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. The role of the librarian is to classify the books into groups and paste the RFID tags on them. These paper-like tags helps in tracking the books within the range of the reader.

Check in/out service: The counter station is a staff assisted station on services such as loan, return, tagging, sorting and etc. The patron approaches the counter to borrow or return the book. First the patron is supposed to identify themselves using the tags provided to them. The staff at the counter then uses a reader to read the tags to make an entry in the central database. In case of book return, the staff collects the book and reads the tag. If the book is returned beyond the due date, fine is collected from the patron.

Self check in/out service: The system basically consists of a computer interfaced with a 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 RFID card- containing the patron details and their ID, the patron is asked to choose

the next action (check-out or check in of one or more books). After choosing check-out, the patron puts the book(s) in front of the RFID reader and the display will show the book title, author name and its ID number (other optional information can be shown if desired) which have been checked out. It displays the date before which the book is to be returned. Whereas in check in, the patron shows the book(s) in front of the RFID reader and the same will be displayed as in check out. Besides, if there are delays in the return of book(s), the fine amount will be displayed.

Shelf Management: Shelf management includes locating and identifying items on the shelves as an easy task for librarians. It comprises basically of a scanner and a base station. The system is designed to cover three main requirements: Search for individual books requested, Inventory check of the whole library stock, Search for books which are miss-helved.

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CONCLUSION

RFID in the library speeds up book borrowing, monitoring, books searching processes and thus frees staff to do more user-service tasks. To yield best performance, RFID readers and RFID tags to be used must be of good quality. The efficient utilization of the technology also depends upon the information to be written in tag. These applications can lead to significant savings in labor costs, enhance customer service, lower book theft and provide a constant record update of new collections of books. Though the system is more expensive than the barcode systems, security is ensured and is more efficient. RFID technology is also applicable in various fields like: Asset tracking, people tracking, healthcare, animal tracking, document tracking, object tracking in stores, building access control, airline baggage tracking and toll collection at toll booths.

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