"SMART LIBRARY MANAGEMENT SYSTEM USING RFID TECHNOLOGY"

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ABSTRACT: Radio Frequency Identification (RFID) means a system that transfers the information wirelessly, using radio frequency waves. It is automatic identification technology. This paper is about RFID based Smart Library Management System (SLMS) that allows fast transaction flow and will make easy to handle the activities like issue and return of books from the library without much manual intervention. This system is based on RFID readers and passive RFID tags that are able to store the information electronically which can be read by the RFID readers.

This system will make users to issue and return of books via RFID tags very easy and also calculate the corresponding fine associated with the period of time the absence of the book from the library.

Keywords: *RFID Readers; RFID Tags; Methodology; Anti-theft.*

1. 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 the 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.

1.1 RFID Technology in Libraries

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.

2. COMPONENTS

The RFID based Smart Library Management System consists of following components

A. RFID Tags
B. RFID Reader
C. Microcontroller
D. Database Software

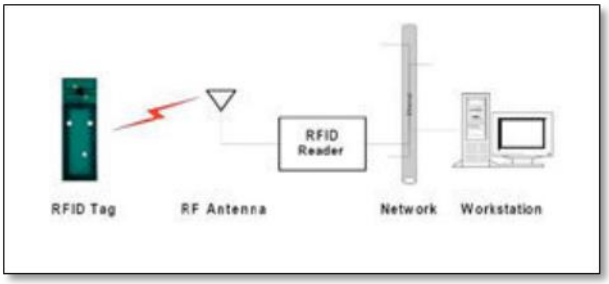


Figure 2.1 RFID Components

A. RFID Tags: Tags are thin labels which can be fixed inside a back cover of the book. RFID tags are made up of carbonic structure which contains a magnetic strip or coil layer inside the tag which helps in sensing the tags. In the figure shown, the tag contains a unique serial number like

"0600394791 000345" which is used for the authentication of the user.

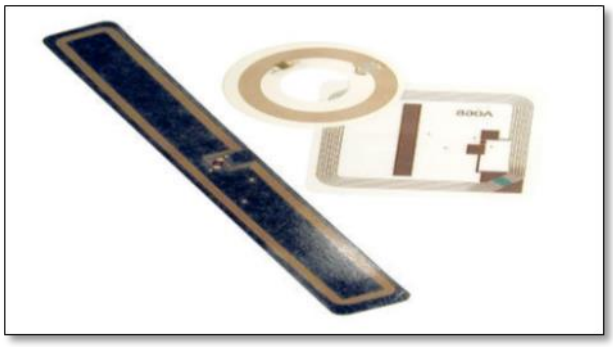


Figure 2.2 RFID Tags

When we bring the tag in front of the reader of the reader, the reader antenna senses the tag and checks the unique serial number of the tag. If the tag is registered in the database then the reader authenticates the tag otherwise the reader shows an error and gives the message that the tag is not registered or the tag is not authenticated.

Figure 2.3 RFID Tags Construction

B. RFID Readers: RFID readers are used to interrogate data stored in tags. It contains a radio frequency module, a control unit and an antenna to communicate with electronic tags via radio signals. The antenna inside the reader generates electromagnetic field. When a tag passes through the field, the information stored on the tag is interpreted by the reader and sent to the database server, which in turn stores or retrieves information about the book's issue or return.

Figure 2.4 RFID Reader

Different types of readers are available in market depending on their range and suitable applications.

- Low frequency readers-125Khz
- High frequency readers-13.56Mhz
- Ultra High frequency readers-800-900Mhz

C. MICROCONTROLLER:

In this project, we are going to design a system by which user can use the library smartly. Major components in our system are as microcontroller, Database, RFID readers & RFID tags. Microcontroller has the inbuilt USART support and we will use it to obtain serial communication for transmitting and receiving the data between RFID readers, Microcontroller & the Database stored in PC. Also to achieve anti-theft we will interface a Buzzer and one more RFID reader to the Microcontroller.

D. DATABASE:

A **database** is an organized collection of data. It is the collection of schemas, tables, queries, reports, views, and other objects. The data are organized to model aspects of reality in a way that supports processes requiring information

Figure 2.5 Database management

3. METHODOLOGY

The working of SLMS is divided into a total of five modules that are described as follows

A. Module 1

The Initial Setup

Whenever a book is acquired by the library, an RFID tags are placed into the books with the relevant information like, call number, author name, and book number, etc. The detailed information regarding the book is also stored in the computer database. The computer database also stores all information for individual users (users) of the library. Each user is supplied with registered RFID cards. These cards carry identification data and details like: address, roll number, and telephone no. etc. for each user.

B. Module 2

The Login Process

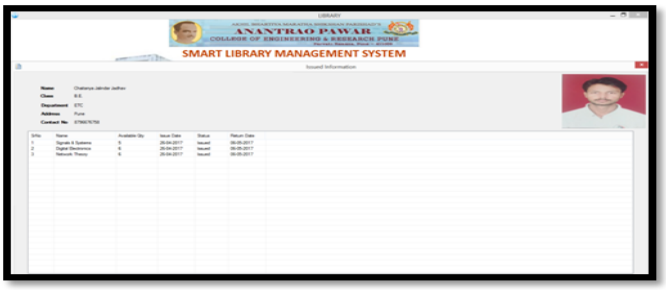
There is an administrator with special privileges who has a unique master password controlling the GUI of the RFID SLMS system. As soon as he powers on the system, the first screen displays the LOGIN dialogue box. First he will need to scan his ID card in front of the RFID reader and then entering the corresponding password to enable the system for further usage.

4. Figure 3.1 Login process

C. Module 3

The Issue Process

When a user needs to get a book issued, he can get it done without any manual intervention. He simply needs to scan his RFID card in front of the RFID reader and it automatically opens his/her login account page. Then again he needs to scan the selected books to be issued, one by one in front of the RFID reader. The computer records all these data against his name. Finally a message is displayed informing the user that the ISSUE process has been successful. The user takes the books for a specified time period from the library after which he has to return the books to the library.

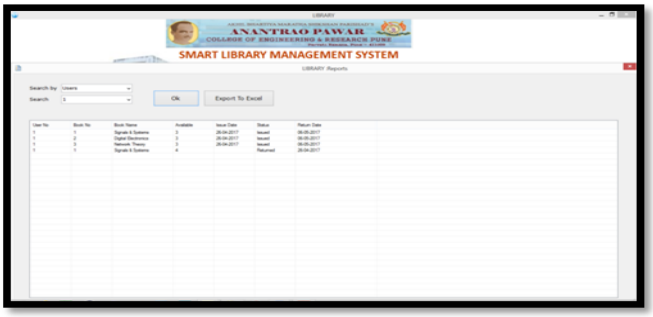


5. Figure 3.2 Issue of Books

D. Module 4

The Return Process

When a user wants to return books, he simply places the books again in front of the RFID connected with the controller and the books are automatically adjusted for return against the user's name.



6. Figure 3.3 Return of Books

4. CONCLUSION

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.

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