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# Library Book Detection System

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**ABSTRACT:** A college library book detection system is a project that manages and stores, books information electronically according to the need of the student. The system helps both students and library manager to keep a constant track of all the books available in the library. It allows both the admin and the student to search for the desired book. It becomes necessary for colleges to keep a continuous check on the books issued and returned. This task, if carried out manually will be tedious and includes chances of mistakes. These errors are avoided by allowing the system to keep track of information such as issue date, last date to return the book, and thus there is no need to keep manual track of this information, thereby avoiding chances of mistakes. Thus, this system reduces manual work to a great extent, allowing a smooth flow of library activities by removing the chances of errors in the details. The deadline of the book to be returned is also intimated to the user through a message from the detection system. The major problem faced by the users in university libraries and big libraries is the identification of the books in certain racks where they are placed. To overcome this difficulty, here introducing a new system in which the door of the rack will be opened only after verifying the RFID tag on the book.

**KEYWORDS:** Library management system; Rack identification; RFID reader; RFID tag

## I. INTRODUCTION

A college library book detection system is a project that manages and stores, books information electronically according to the need of the student. The system helps both students and library manager to keep a constant track of all the books available in the library. It allows both the admin and the student to search for the desired book. It becomes necessary for colleges to keep a continuous check on the books issued and returned and even calculate fine. This task, if carried out manually will be tedious and includes chances of mistakes. These errors are avoided by allowing the system to keep track of information such as issue date, last date to return the book, and even fine information, and thus there is no need to keep manual track of this information which thereby avoids the chances of mistakes. Thus, this system reduces manual work to a great extent allows smooth flow of library activities by removing the chances of errors in the details. Aim is an alert message will be sent to the user's email id or phone number to inform about the details of the due. Details of newly arrived E-books/magazines can be found out by selecting the month. A major concern of librarians is that the books may be misplaced at different locations. Here in this project, when a book is returned to the library, the shelf corresponding to it will be opened. By using a motor, the door of the rack can be moved for taking the appropriate book.

## II. RELATED WORK

The major problem faced by the users in the university libraries and big libraries is the identification of the books in certain racks where they are placed. To overcome this difficulty library management with identification of the specific racks is implemented. The deadline of the book to be returned is also intimated to the user through an intimation message from the management system through the GSM module.

As a new identification technology, RFID has extensive application prospects in the field of the library was mentions by Cheng Feng et al.(2010). As the RFID in the library lending and management advantages, in recent years, the library at home and abroad began to be widely used. Automatic identification technology with the traditional comparison, RFID has advantages just as scanning, non-contact reading, and writing, long service life, high information content, etc. This paper analyzed the advantages of RFID technology and studied the application of RFID technology in libraries.

Design plan of university library management system based on RFID and elaborates the overall structure design of

the system including the system hardware and software environment mentions by Jin Feng et al.(2017). The paper introduces the function and the use of each module in the system which emphatically studies the label conversion subsystem and self-help borrowing book subsystem. Through the design of the system, the RFID brings automation and intelligence to the library management. The system is based on RFID and depends on RFID middleware as the media to achieve the organic combination of the advanced RFID and library management and offers very effective technical means to the library management. The innovation of this paper is the use case diagram to explain the overall function of the system and its sub-functions and realize the intelligent management from the book-entry to the circulation of books.

Counting and organization of books in libraries is a routine and time-consuming task. The task gets more complicated by misplaced books in shelves mentions by Ali Bugra et al.(2018). To solve these problems, they proposed an automated visual call number (book-id) detection and counting system in this paper. The method employs a Haar feature-based classifier from OpenCV library and cloud-based OCR system to decode characters from images. To develop and test the method, they had acquired and organized a dataset of 1000 book call numbers. The proposed method has been tested on 20 bookshelves images that contain 233 call numbers, which resulted in a true detection rate of 96% and a false detection rate of 1.75 per image. For the OCR step, the number of false recognized characters per call number was 0.76.

### III. METHODOLOGY

The user will have to choose the book he wants and go to the check out station where he should show his identity card and the RFID reader will read the book identification code automatically. An RFID system consists of a reader. Then RFID tag fetch into the reader

RFID tags are passed in front of a reading station, a radio field charges the chip and lets it transmit its data. Thus, the information contained in the microchips, inside the tags, affixed to the library materials is “captured” and retrieved using radio frequency technology regardless of its location.

#### A. Block Diagram

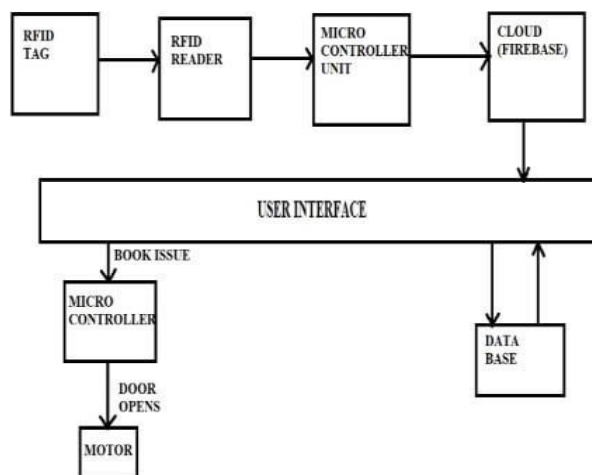


Fig. 1 Block Diagram

#### B. Database

A database is an organized collection of data, generally stored and accessed electronically from a computer system. Where databases are more complex they are often developed using formal design and modeling techniques. The database management system (DBMS) is the software that interacts with end-users, applications, and the database itself to capture and analyze the data.

#### C. NetBeans

NetBeans is an integrated development environment (IDE) for Java. NetBeans allows applications to be developed



from a set of modular software components called modules. NetBeans runs on Windows, macOS, Linux, and Solaris. In addition to Java development, it has extensions for other languages like PHP, C, C++, HTML5, and JavaScript. Applications based on NetBeans, including the NetBeans IDE, can be extended by third-party developers. NetBeans IDE is an open-source integrated development environment. NetBeans IDE supports the development of all Java application types (Java SE (including JavaFX), Java ME, web, EJB, and mobile applications) out of the box. Among other features are an Ant-based project system, Maven support, refactoring, version control (supporting CVS, Subversion, Git, Mercurial, and Clearcase). All the functions of the IDE are provided by modules. Each module provides a well-defined function, such as support for the Java language, editing, or support for the CVS versioning system, and SVN. NetBeans contains all the modules needed for Java development in a single download, allowing the user to start working immediately. Modules also allow NetBeans to be extended. New features, such as support for other programming languages, can be added by installing additional modules. For instance, Sun Studio, Sun Java Studio Enterprise, and Sun Java Studio Creator from Sun Microsystems are all based on the NetBeans IDE. The NetBeans Platform is a framework for simplifying the development of Swing desktop applications. The NetBeans IDE bundle for Java SE contains what is needed to start developing NetBeans plugins and NetBeans Platform based applications; no additional SDK is required. Applications can install modules dynamically. Any application can include the Update Center module to allow users of the application to download digitally signed upgrades and new features directly into the running application. Reinstalling an upgrade or a new release does not force users to download the entire application again.

#### D. MySQL

MySQL is an open-source relational database management system (RDBMS). Its name is a combination of “My”, the name of co-founder Michael Widenius’s daughter, and “SQL”, the abbreviation for Structured Query Language. MySQL is free and open-source software under the terms of the GNU General Public License and is also available under a variety of proprietary licenses. MySQL was owned and sponsored by the Swedish company MySQL AB, which was bought by Sun Microsystems (now Oracle Corporation). In 2010, when Oracle acquired Sun, Widenius forked the open-source MySQL project to create MariaDB.

#### E. Firebase

Firebase is a mobile and web application development platform developed by Firebase, Inc. in 2011, then acquired by Google in 2014. As of March 2020, the Firebase platform has 19 products, which are used by more than 1.5 million apps. Firebase has launched Cloud Firestore, a real-time document database as the successor product to the original Firebase Real-time Database. Firebase Authentication is a service that can authenticate users using only client-side code. It supports social login providers Facebook, GitHub, Twitter, and Google as well as other service providers like Google Play Games, Apple, Yahoo, and Microsoft. Additionally, it includes a user management system whereby developers can enable user authentication with email and password login stored with Firebase. Firebase Storage provides secure file uploads and downloads for Firebase apps, regardless of network quality, to be used for storing images, audio, video, or other user-generated content. It is backed by Google Cloud Storage.

#### F. Arduino Uno

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced with various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution-Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware.

#### G. RFID

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. Passive tags collect energy from a nearby RFID reader’s interrogating radio waves.

##### RFID Tag:

RFID tags are a type of tracking system that uses smart barcodes to identify items. RFID is short for “radio frequency identification,” and as such, RFID tags utilize radio frequency technology. These radio waves transmit data from the tag to a reader, which then transmits the information to an RFID computer program. RFID tags are frequently used for merchandise, but they can also be used to track vehicles, pets, and even patients with Alzheimer’s disease. An RFID tag may also be called an RFID chip.



#### RFID Readers:

RFID readers are mounted on the entry and exit doors of the library. These readers can read up to 15 tags at a time even if a direct line of contact between the reader and the code is provided. They can read tags even if the books are carried in bags. RFID readers are used to interrogating 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 an 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. Different types of readers are available in the market depending on their range and suitable applications.

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

#### IV. SIMULATION RESULTS

This library book detection system can be used to maintain records of a user's details like registering books, updating information about books, etc. This system not only works from the admin side but also from the user side. In this system, admin can register user details and provide them with a login ID and password. They can also add books and view the due date. The user can search the book details such as book name, author name, etc.

A database has created to get the list of books arrived on each month using Netbeans. An alert message would be sent to the user's email id if the book is not returned on time. The due days are set to 15 days.

A sensor placed on the rack reads the RFID tag in the book. It was compared with the tags already stored in the controller, if it matches, the door of the shelf will be opened. If it doesn't match, a beep sound will be produced. If the book belongs to the same shelf, the Green LED will blink otherwise Red LED will blink.

#### V. CONCLUSION AND FUTURE WORK

RFID in the library speeds up book borrowing, monitoring, books searching processes, and thus frees staff to do more user-service tasks. To yield the 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 on the 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. Thus frees staff from doing manual work so that they could be used to enhance user- services tasks. The efficiency of this system is depending upon the information to be written on the tag. To obtain the best performance, RFID readers and RFID tags must be of good quality. Users find this system more secure and informative since a third person assist is not required here. Updating the book renewal dates and due is also included.

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