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Smart Library Management Using RFID

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Abstract: *This research paper proposes a smart library management system that uses radio-frequency identification (RFID) technology. The system aims to automate various library functions, such as book borrowing, returning, and inventory management, and make them more effective, and secure. The RFID tags are attached to the books, and RFID readers are placed at a station in the library. The system can identify and track the books in real-time, and update the library database accordingly. This paper discusses the design, implementation, and evaluation of the proposed system, including its hardware and software components, user interface, security features, and performance metrics. The results show that the smart library management system using RFID can significantly improve the library's operations, reduce the workload of the staff, enhance the user experience, and prevent theft and loss of books. The paper concludes with recommendations for further research and practical applications of RFID technology in library management.*

Keywords: Library Management, GSM, PIC16F886, RFID Reader, RFID Tag, RFID Technology..

I. INTRODUCTION

The emergence of Radio Frequency Identification (RFID) technology has revolutionized the way libraries manage their resources. In the past, library operations were laborious and time-consuming, often causing inconvenience to both librarians and patrons. However, the introduction of RFID technology has simplified and streamlined these operations, making it easier for libraries to manage their collections and enhance their service delivery. This research paper will explore the implementation of a library management system using RFID technology, and its benefits in automating library operations, improving service delivery, and enhancing user experience. It will also examine the challenges involved in adopting RFID technology in library management systems and recommend ways to overcome these challenges.

This system is designed to automate day-to-day library operations such as borrowing and return of library items, inventory management, and member registration, among others. RFID technology enables the rapid detection of library items as well as members, enhancing the speed and accuracy of processes. The system consists of RFID tags attached to each library item, which can be easily identified and checked out by scanning them with an RFID reader. By using this technology, the smart library management system can offer a seamless and easier experience for librarians and their clients.

II. LITERATURE REVIEW

The Paper [1] introduces various barcoding techniques and examines whether they can enter big data with the same length. It provides secure data transmission by encoding data into barcodes. This article reviews current barcode technology. The Paper [2] explains the role of QR codes in reaching mobile users in academic libraries to increase the efficiency and effectiveness of library services for the next generation of students. It can hold more information than a barcode. If there is damage to the code, it often renders it unreadable.

Paper [3] reports the research on the implementation of smart libraries using the Internet of Things. The main purpose is to use RFID and Internet of Things technology to solve the problem that the library's data exchange is difficult to monitor due to problems such as slow operation, loss of manual data, and difficulty to update data regularly. The system will manage and manage all library information and benefit staff and students. The system is more efficient and takes less time to use.

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The paper [3] This paper presents a Library management application using Radio Frequency Identification technology. Sindh is a province of Pakistan and there is no prior RFID-based Library application available. The task has been accomplished with the C#.Net framework using object-oriented programming methods.

The paper [4] describes book tracking and theft detection using RFID technology. The system simply helps automate the process without human intervention and eliminates the disadvantages of barcode technology. The Paper [5] provides an overview of the current status and trends in RFID technology. It focuses on the challenges organizations face when deploying technology. Compiles the complete customer data received. It focuses on solving economic and security problems. The paper [6] describes the current implementation of RFID-based library management systems and the modern approach to achieving an efficient library environment.

The paper [8] presents the RFID system used in the library inventory management RFID antenna design and the actual test results it states that a real-made antenna includes a good gain and simple architecture and low manufacturing cost. The performance of omnidirectional radiation advantages and good detection accuracy is suitable for use in library shelves for large-scale book inventory operations and it can save a lot of manpower and reduce the risk of manual errors

III. METHODOLOGY

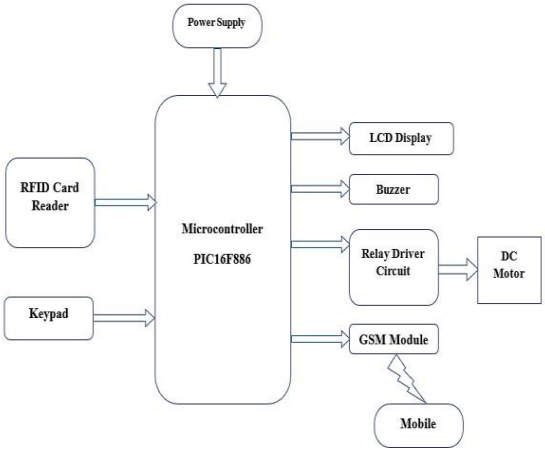

Figure 1 Block diagram of System Design (SLMS)

As per the block diagram of the system design, it has an RFID Reader to scan the RFID tag and a button to show the book output. An audible warning is given when a book is stolen from the library. The database is updated with information about students, book issues/returns, and deadlines.

- Tagging.
- Issue/Return process.
- Database update. 4 Theft Detection

All books in the library are RFID-tagged. Data stored in the tag provides an identification, storage location, and history of particular books. RFID tags are designed in such a manner that they can be placed on library media, such as books. The librarian has to classify the books and paste RFID tags on them. These tags help in tracking the books within the range of the RFID reader.

The user cards and RFID readers are used for the authentication of these tags.

Once the user borrows the book then the book is scanned and that scanned information is uploaded to the database.

After that, the issue/push button is pressed

Once the authorization is complete the shelf door will be opened with the DC motor attached to the shelf door.

Book Issue Process:

- Student goes through identification using a user card.
- Student will check if the required book is available
- If available, the student takes the book from the shelf.

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- Student shows user card to RFID reader, which is embedded with RFID tag.
- Reader reads and updates the database of the book and student.
- If the student had already taken the maximum number of books allowed to him then the buzzer will sound and a message will be shown on display stating that the user has already exceeded the allowed quota of books.

Book Returns Process:

- Student enters the library with book to be returned.
- Student displays the user card to the RFID reader.
- Student places the book to be scanned by RFID reader for RFID tag in the book.
- After verification of the book, the "Book Returned" message is displayed on the LCD and also the database is updated.
- And an SMS message will be sent to the student that the book has been returned.
- If the book is delayed above the permitted duration student will be charged with a fine and a message stating that will be sent to the student.
- Student exits the library after returning books.

Book Theft / Anti-Theft Detection:

- To prevent any kind of theft inside the library we have an Anti-theft feature in this system
- If someone tries to take any unissued book from the library without registering it in the library then the buzzer will get activated.
- Buzzer makes a sound and the LED lights on the system get activated.

User Status and SMS Transmission:

Every time a student borrows a book from the library an SMS will be sent to the registered mobile number of the student consisting of the name of the book time and date.

If the student had exceeded the allocated duration of the book, he will receive a message to return the book as soon as possible to avoid paying the fine.

IV. CONCLUSION

It can be used for RFID-based library management, library book identification, self-checking, anti-theft management, and notifying users about library activities. RFID technology effectively provides self-service inquiry to library staff and non-returnable books. Therefore, RFID technology is expected to replace existing technology. It provides intelligent library management that improves service quality while providing immediate and meaningful results for library managers and users. These practices can result in significant savings in labor costs, improved customer service, reduced book theft, and continuous updating of records for new collections. RFID readers and RFID tags should be fine for the best results. The biggest advantage of this project is that all activities including questions, and book updates feedback are digitized, and all these activities are recorded in the database. The information to be written on the symbol is very important for the effective use of the device.

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