

RFID BASED TRANSACTION AND SEARCHING OF LIBRARY BOOKS

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Abstract - In this paper, we have used Radio Frequency Identification (RFID) technology. RFID is a new technology which helps to automate business processes and allows identification of large number of tagged objects like books using radio waves. This paper proposes RFID based Library Management System that would allow fast transaction flow and will make it easy to handle the issue and return of books from the library without the much intervention of manual book keeping which benefits by adding properties of traceability and security. The proposed system is based on RFID readers and passive RFID tags that are able to electronically store information that can be read with the help of RFID reader. This system would also be able to calculate corresponding fine based on the time period of absence of books from library database.

I. INTRODUCTION

Radio Frequency Identification devices have importance in our daily life and will become appearing in the near future. The RFID technique uses electromagnetic coupling for data exchange between the reader/writer and the tag. An RFID system is made up of two components. One is the

RFID tag, which is located on the object to be identified, and another is the reader/writer [1]. The RFID tag normally does not have the power supply to work, so the reader/writer not only exchange data, but also supply the power and clock signal to the RFID tag. To do this, the RFID tag has an antenna or a coil as a coupling element for the communication. RFID technology is based on electromagnetic principles, can achieve non-contact data identification and data Collection, the recognition without human intervention and can work in a variety of harsh environments. It is a non-contact automatic identification technology, through RF signal to do automatic target recognition and access relevant data. RFID is a simple wireless systems composed of by tag, reader and antenna. The high speed moving objects and the labels are identified by the RFID technology.

II. LITERATURE SURVEY

Many researches have been carried out in design of library management system using RFID technology.

The author Kiyotaka FUJISAKI in "An RFID based system for library management and its performance evaluation" proposed the idea of electromagnetic coupling [1]. The resonant frequency was measured using grip dip oscillator under various conditions and was shown that as the volume of book increases the

resonant frequency becomes low. The resonant frequency changed according to the algorithmic function. It was also shown that after attaching the tag on goods the resonant frequency became appropriate and as the distance between the two pieces of tags becomes narrow the resonant frequency decreases rapidly. The environment condition humidity also affects the resonant frequency.

Dong Zhang in his paper "Self service management platform design for library based on RFID" over-viewed the necessity of new technology of self-service of book borrowing and returning system in library which will replace the barcode technology and accelerate the library's self service process. He showed that RFID technology can identify the high speed moving objects, even can identify the number of labels; the operation is fast and convenient. RFID is a simple wireless systems composed of by tag, reader and antenna [2].

Ioannis Markakis in his paper "Safe and efficient design of shelf antenna in an RFID based library management system" described the design process of shelf antennas for

RFID based library management system [3][5]. He showed that it is possible to design a shelf antenna, either on a wooden or metallic cabinet for RFID based library system which was able to correctly identify books on the active shelf with minimal false identification of books in neighbouring shelves. Continuous monitoring was achieved with the help of passive RFID tags and the antenna.

Afef Zakhama in "Software solution for RFID data management" focussed on the communication process between the RFID and the control unit [4]. He proposed the solution which allowed cleaning

data and errors identification when the communication is setting. The communication between the tags and the interrogators was set using the radio waves. When the tagged object entered the magnetic field of the interrogator it received radio-frequency signal from interrogator [6].

III. PROJECT OVERVIEW AND FEATURES

In the system, each book would be uniquely identified via the RFID tags attached to it and communication would be done wirelessly.

A RFID sensor would be placed near the library desk where one should only place the book near the sensor and it would get issued/returned depending on the actions required. 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.

IV. SYSTEM DESIGN

A. Concept

1. Book issue:

Self Check-in/Check-out primarily for self issue of books in Library without the assistance of library staff. User simply place their ID card on the RFID reader and then login to a Self Serve Station to issue books, check history or other member activities. Members borrow materials by placing them on the RFID reader pad which reads the tag ID allocates the materials to the member. With its inbuilt screen user can view transaction related information such as number of books issued, outstanding fine (if any) etc. At the end of the session the user is provided with the message about the operation he performed.

2. Book Return:

Library materials can be returned through one or more automated book/material drop boxes conveniently located anywhere in the library which makes returning material easy for the members. Members need to simply slide their returned materials through the access door and the automated RFID reader will read the materials RFID tag.

B. Components

The system consists of following components:

1. Smart Card:

Smart Card is issued to the library members/Users. Users are validated through smart cards. User details, library material details are stored in the centralized library database. The same smart card can also be used for auto fine debit / collection.



Figure 4.1: Smart Card

2. RFID Tag:

An RFID tag is an object that can be applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. RFID tagging is an ID system that uses small radio frequency identification devices for identification and tracking purposes. An RFID tagging system includes the tag itself, a read/write device, and a host system application for data collection, processing, and transmission. An RFID tag consists of a chip some memory and an antenna. RFID tags that contain their own power source are known as active tags. Those without a power source are known as passive tags. A passive tag is cheaper and smaller because it has no battery; instead, the tag uses the radio energy transmitted by the reader. RFID is one method for Automatic Identification and Data Capture.

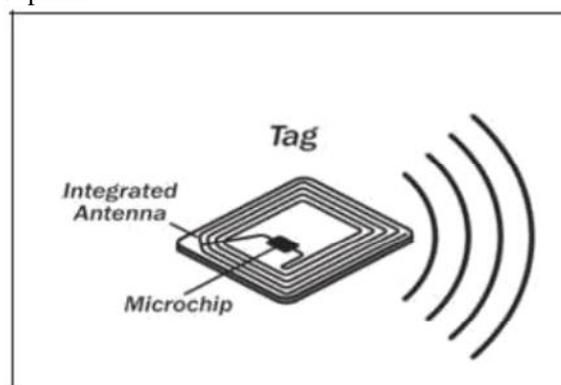


Figure 4.2: RFID Tag

3. RFID Reader:

RFID reader communicates with the tags through a radio frequency 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. Fixed readers are set up to create a specific interrogation zone which can be tightly controlled. This allows a highly defined reading area for when tags go in and out of the interrogation zone.



Figure 4.3: RFID Reader

4. Antenna:

The antenna resides inside the reader. It generates electromagnetic field. Whenever a tag comes in close proximity of the electromagnetic field it gets activated and it is able to read and write data to the reader by producing radio signals. Antenna behaves like a communication media between the tag and the reader and hence plays an important role in RFID technology.

C. Implementation

1. Setup of the system:

Whenever a new book is acquired by the library, an RFID tag is attached into the book with the relevant information like, Book name, Book author, book number, etc. The detailed information regarding the book is captured in the computer database. The computer database also stores all information for individual users of the library. Each user is supplied with registered RFID cards. These cards carry identification data and other associated details like: name, address, roll no., and mobile no. etc. for each user. The LOGIN dialogue box appears as soon as he powers on the system. The librarian then enters the corresponding password and enables the system for further usage.



Figure 4.4: Login Box

2. Edit book details:

In this module, we can edit the book details. If librarian wants to change the data like book ID, reference no. publisher etc. he can use this module. If there is the addition of the new books in the library ,

the database must be change at every time . So , while issuing of the books user get quick message from the system . We can also edit the book photo for the user. This is the additional advantage for the user, if there is the damaged of RFID tag , we can detect it by the photo. Location will define where the book is stored in the library. So, the searching of books becomes easy for the user.

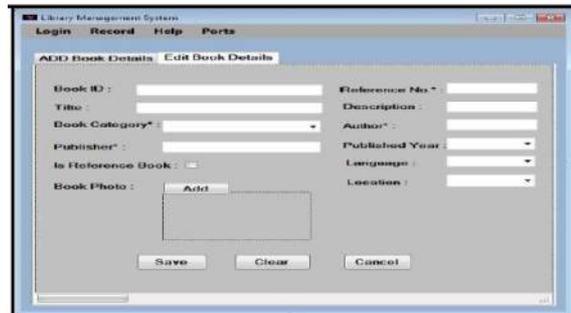


Figure 4.5: Edit book details

3. Add book details:

This module is used for adding of the new book details. We can add here the book ID , book category, book title, book price for the easy accessing of the books for user . This module is handled only by the admin. He has the rights to edit the database. Admin can change the details if there is new stock available in the library. By editing all this details, admin just have to save it for the future work .

Book ID is the RFID code which is used for issuing of the books.



Figure 4.6: Add book details

4. Book Issue:

This module shows issue of the new book by the user. It is visible to admin only and is helpful for the new entry in the database. While issuing of the new books user just have to keep the book and RFID card above the counter , reader will scanned it and update the database of that user. He will get the message with the due date of the book. The user image will be visible to him at the time of issue of book.



Figure 4.7: Issue of book

5. Book Return:

When the user wants to return books he simply flashes the book again in front of the RF ID reader and the book automatically are adjusted for return against the user's name.

The user during the time of returning the book gets the knowledge of the fine i.e. the GUI panel automatically returns fine (if any).



Figure 4.8: Book Return

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.

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