RFID ENABLED AUTOMATED LIBRARY

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***Abstract*— The idea of this paper is to implement automated library based on RFID (Radio Frequency Identification) technology. We are developing this project for integrating the RFID system in the library so to reduce the work load in the library. The scope of work of the paper is to develop an automatic library management system to assist the librarians for more efficient management of library by helping to find any misplaced books on the library shelf, books verification, stock management and allowing the students to issue and return books by themselves along with efficient searching facility. The proposed system will also be able to provide security in the library premises by detecting book theft. Graphical User Interface (GUI) for the system will be developed using Microsoft C#.Net. The tasks handled by GUI are to store details on information of the book, members of the library to the database and will perform all the functions related to library management.**

Keywords- RFID; automated library management; GUI

I. INTRODUCTION

RFID enabled automated library is a complete solution for a library that will be useful to track items, orders made, bill paid and patrons who have borrowed books. Library management is essential because today library contains thousands of books, pamphlets, journals, periodicals, CDs and others. Library needs a good coordination of information of the entire item above in addition to library management. Library management should be automated otherwise it is very time consuming for all the members of the library to manage all the tasks, resulting in heavy working load for librarians and long waiting queues of book borrowers.

The existing library management system today uses bar code technology for managing books. This technology was introduced 40 years back and is today becoming obsolete. Moreover every book needs to be scanned separately using barcode technology which is very time consuming and results in long waiting queues increasing load on librarians. Also there is no facility of theft detection. At the end of the day the librarian needs to put back all the returned books at their proper position which is a very hectic job for him.

Drawbacks of Existing System

- Requires more man power
- Time consuming
- Requires large volume of paper work
- Need manual calculations
- No automated notification facility
- No automated searching facility
- Chance of book theft due to lack of attention

To avoid all these limitations and make the working more accurately the system needs to be improved by using latest RFID technology.

Radio Frequency Identification (RFID) is a wireless automatic identification technology that utilizes the Radio Frequency as the medium of communication [1]. With the capability of carrying and retrieving data, RFID offers a wide application in the automatic identification areas [2]. Nowadays, RFID is continuously spreading throughout many areas of application such as access control, transport payment, healthcare, etc. [3]. The implementations of RFID have become more common in various industries. One of the early adapters of this technology is automated attendance system [4].

Fig. 1 illustrates the basic RFID system. The system consists of tag, reader and host pc. Reader will energize the tag to transmit data it carries and an application in the host pc will manipulate that data.

The aim of this project is to develop an automated library management system. The system will assist the librarian to carry out all the management process thus reducing human intervention.

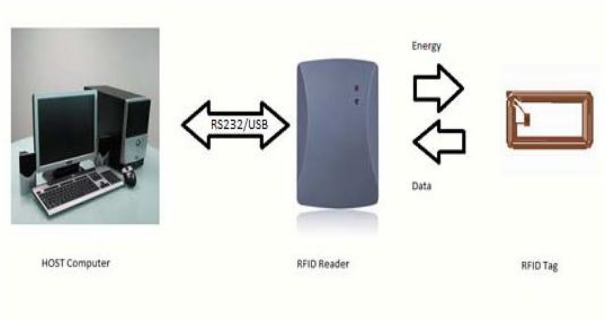

Figure1. RFID System

The system will also assist book borrowers to issue and return multiple books at a time by themselves reducing the time and effort of the librarian. The system employs RFID technology as a medium of an identification technique.

Fig. 2 depicts the conceptual design of the system. Whenever new books are purchased every new book should be affixed with a RFID tag and its entry is to be made in the database by the librarian. Then the system will show the shelf position for the book to the librarian and librarian will place the book in that shelf. If particular books are to be sent for rebinding then separate entries for such books will be maintained in the database.

If a borrower wants to issue some particular books then firstly he will search those books in the library by the help of the advanced search facility provided by the system. If such books are available then system will give the exact location of the books to the borrower. Borrower will get the books from the respective shelves and then will place those books in front of the RFID reader. System will then scan those books and will make the entry in the database.

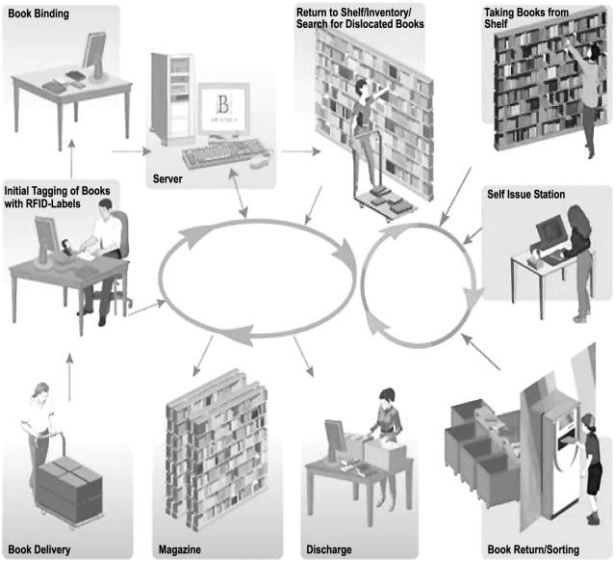

Figure2. Conceptual Design

While searching if the books are not available then system will save the request of such borrower and will give him a notification via SMS whenever the books become available.

If a borrower wants to return books then he will have to place the books in front of the RFID reader and system will scan those books and will calculate fine (if any) and will update database appropriately.

The librarian can get the total count of the books in the library using this system.

II. BACKGROUND

A. Background of RFID technology

1) RFID tags :

Most RFID tags contain at least two parts: one is an integrated circuit for storing and processing information, modulating and demodulating a radio-frequency (RF) signal, and other specialized functions; the other is an antenna for receiving and transmitting the signal. [4]

RFID tags can be either passive, active or battery assisted passive. Passive RFID does not use a battery, while an active has an on-board battery that always broadcasts or beacons its signal. A battery assisted passive (BAP) has a small battery on board that is activated when in the presence of a RFID reader. [4]

2) Fixed and Mobile RFID :

Depending on mobility, RFID readers are classified into two different types: **fixed RFID and mobile RFID**. If the reader reads tags in a stationary position, it is called fixed RFID. These fixed readers are set up specific interrogation zones and create a "bubble" of RF energy that can be tightly controlled if the physics is well engineered. This allows a very definitive reading area for when tags go in and out of the interrogation zone. On the other hand, if the reader is mobile when the reader reads tags, it is called mobile RFID. Mobile readers include hand-helds, carts and vehicle mounted RFID readers from manufacturers such as Motorola, Intermec, Impinj, Sirit, etc. [4]

B. Background of Library Management using RFID

The investigation of the usage of RFID technology in library has been already done in various research and study. For example, Shamsudin et al. (2006) [5] developed RFID Based Intelligent Books Shelving System. The system uses a handheld scanner as a device to locate misplaced books on the shelf. Software that displayed the status of the books location was also being developed. A rail was equipped on top of the books' shelf. This rail is for the reader to propel and scan all the tag as it moves along the rail. The system is

using Lab view as an Interface and MySQL as a database. However, the capability of RFID tag carry certain amount of data is not considered. The RFID system data was checked with the database information making the system less efficient.

III. PROJECT PLAN

The integration between the RFID system hardware and the host PC will be realized by the development of the Graphical User Interface (GUI). The development of the GUI will be done using Microsoft C#. Net.

Fig. 3 shows the plan of our project. Project will have two different user roles i.e. member and admin. Admin will have all the rights to the system. Admin would be able to do all types of data entry, stock management, etc. Members on the other hand will have rights just to issue and return books. Before issuing the book member will check for the availability of the book. If the book is available then system will give the shelf co-ordinates of the book so that it is convenient for the member to find the exact position of the book. Once member finds the books he can issue that book directly by himself without depending on the librarian. This is the most distinguishing feature of the automated system.

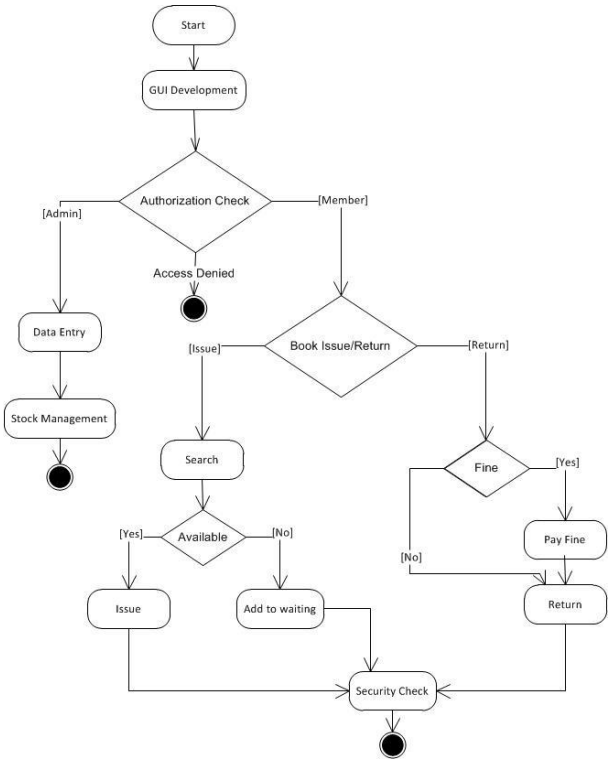

Figure3. Project Plan

IV. CONCLUSION

The project plan discussed in the previous section gives a clear perspective that RFID technology will give the better benefits over the traditional barcode system. The system built using RFID technology will preserve all the functionality provided with barcode technology and will add many more functionalities to existing system making the system automated and thereby reducing human workload. The performance will grow if the powerful devices are used. However further studies need to be done to find system's best performance in terms of time requirement of RFID reader for sending signal to the tag and receiving back signal from the tag.

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