



Library Automation using RFID Technology

Introduction

New technologies have always been of interest for libraries, both for the potential of increasing the quality of service and for improving efficiency of operations. At present libraries of all kinds whether public, research or special libraries are overwhelmingly looking forward to adopt new technologies due to its potential for cost savings in the operations and the management of books and patrons. One such technology which is gaining tremendous popularity among the various libraries is RFID technology since it revolutionizes the way a library operates.

Pain Areas

- **Time Consuming Stock Verification Process:** Often in a library where thousands and lakhs of books are involved, manual stock verification becomes a tedious task which may take about 4-5 days to get completed during which the library may have to be shut down for the members leading to inconvenience to them.
- **Weak Security:** Especially during peak hours when there is a lot of crowd in the library some students try to move away with the books without issuing it. It is a pain to keep track of such unauthorized movements.
- **Long queues for book issue and return:** Manual issue and return of books is a slow process leading to long queues in front of the counter during peak hours. This is a waste of time for the member as well as the library staff who can fruitfully utilize this time for their internal processes.
- **Tracking a misplaced book:** It often happens that a book say for example of fiction is wrongly placed in the non – fiction segment or the children's book segment. The patron generally has a tough time locating such misplaced books.
- **Getting information regarding a particular book:** Many a times a member may be looking for a particular book but may not have complete information about it.

Technology

Radio frequency identification (RFID) is a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly in a tag, using radio waves. Tags or Transponders are micro chips with an antenna which have a unique Identifier Number and memory which can be programmable according to the customer requirement. Tags are then affixed to the books either in the inside or hard bound in them.

Proposed Solution

Book Tagging

- Every Book has an Accession Number which is a unique serial number
- Every book is pasted with RFID tags. Tag Id is mapped to book id and its attributes in the database

Library Members

- Every member will have a unique member ID
- A member card (RFID card with unique Card ID) will be issued to each member
- Card ID will be mapped to the member id in the database

Book Issue/Return

- Member will come to the issue/return counter with the member card and Books
- Counter operator will scan the member card and the books using the desktop RFID reader attached to the system

Self Check in/Check out

- Member will come to the self check in/check out counter with the member card and the books
- He will scan the member id card and the books to make the issue/return

Book Drop

- A member can simply drop the book in the Book drop box for returning the book
- RFID reader installed in the book drop box will automatically read the book id and it will be marked as returned

Anti Theft control

- A long range RFID reader will be installed at the exit gate
- This reader will read all the books passing through the gate
- If any book read is not marked as issued in the system, an audible alarm will be generated.

Finding a book

- ID of the book to be find will be inputted to a hand held portable RFID reader
- User will move near the book racks with the portable reader
- Reader will read the book ids of the books in racks
- When the reader reads the initially inputted book id, it will make an audible alarm

Physical Verification

- Handheld portable RFID reader will be used for taking the physical inventory of the books

- User will show the portable reader to all books without removing the books from the racks
- After collecting all book ids, the reader will be connected to the server to transfer the data to the software and reports will be generated in software.




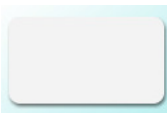




ADVANTAGE OF RFID IN LIBRARIES

- **High speed inventory:** A unique advantage of RFID systems is their ability to scan books on the shelves without tipping them out or removing them. A hand-held inventory reader can be moved rapidly across a shelf of books to read all of the unique identification information. Using wireless technology, it is possible not only to update the inventory, but also to identify items, which are out of proper order.
- **Self check in and check out:** It helps patrons to get their books issued or returned without the help of the library staff. This reduces patron queuing and improves productivity.
- **High Security:** The gate antennas provided at the entry/exit points will prevent any unauthorized movement of books out of the library thus ensuring high security and eliminating loss due to shrinkage and theft. In case any patron tries to walk away with a book without properly issuing an alarm would be raised at the exit gate.




- **Book Drop Box for book return:** Since a drop box allows patrons to return the books and get an automated receipt without the help of a library staff, it helps the library staff to contribute that time to more productive duties. It leads to cutting of queues enhancing customer satisfaction as well.
- **Patron Experience:** The biggest advantage that an automated library holds is increased patron satisfaction. Tracking books is no longer a pain for the patron. The patron has a pleasant experience when he walks in a library that is completely automated with smooth work-flows and no queues at the book issue counter.
- **Image Upliftment:** Smooth work-flows and increased patron satisfaction helps in uplifting the image of the library and hence the institution among all other leading libraries of the country.
- **Tag life:** RFID tags last longer than barcodes because the technology does not require line-of sight. Most RFID vendors claim a minimum of 100,000 transactions before a tag may need to be replaced.

Suggested Items

Item	Image	Description	Application
Alien Technology ALN-9640 Squiggle tag		EPC Gen 2(v1.2.0) compliant - ISO/IEC 18000-6C compliant - Worldwide RFID UHF operation(840-960MHZ) - Higgs TM IC with 800-bits Nonvolatile Memory -32 bit TID -64-bit unique TID -96-bit EPC Memory, extensible to 480-bits -512-bit user Memory -32-bit Access password -32-bit Kill password - Pre-programmed with a unique, unalterable 62-bit serial number(idea for authentication) - User Memory can be block Perma-Locked - User Memory can be Read Password protected in 64-bit blocks, prohibiting unintended Reads without an access password -	For pasting on each book
STA C08554 RFID Card		Dimensions: 85.6×54×0.8mm Substrate: PVC Memory: 96-bit EPC 64-bit UID 224-bit User Area Frequency: UHF (860~960MHz) Read distance: up to 5m/16.4ft	For issuing to each member
STA IR0507E Integrated Reader		UHF middle-distance integrative reader Frequency: 860MHz-868MHz(CE) Protocol : ISO18000-6B EPC G2 Reading Range: 5 m Power Consumed: DC+9V/12V	Book Issue/Return Self Check in/Checkout Book Drop
STA PT0702 Handheld Reader		UHF handheld reader with PDA Frequency: 860MHz-868MHz(CE) Protocol : ISO18000-6B EPC G2 Reading Range: 2M Connectivity: Wi Fi (802.11 b/g), USB CPU: Samsung ARM920T@533 MHz Memory: 128 MB RAM/1 GB Flash	Book Finding Physical Verification
STA Anti-theft Gate reader		Frequency: 860MHz-868MHz(CE) Protocol : ISO18000-6B EPC G2 Reading Range: 3M Power Consumed: DC+9V/12V Interface: TCP/IP Sound Alarm & LED glowing for theft indication	Anti Theft control (For fixing on Exit gate)
STA Library Self Check-in/Check-out Kiosk		Self Check-in/Check-out kiosk with touch screen, UHF RFID reader & thermal printer	Self Check-in/Check-out



STA Library book drop box		Book drop box with display monitor, UHF RFID reader & thermal printer	Book drop
Middleware Application for RFID readers			For integrating with the Library management software