

Malla Reddy University Central Library Full Automation with RFID Technology

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ABSTRACT

Using radio waves, the RFID (Radio Frequency Identification) technology automatically identifies objects or people. In the latter half of the 1990s, libraries began replacing their electro-attractive and bar code systems with RFID systems. The goal of this article is to learn more about the new RFID installation at Mallareddy University Central Library in detail. It focuses on the various system components and their standards. Under the direction of the university librarian, the Mallareddy University began utilizing RFID in 2017 for routine tasks including circulation, shelf management, stock verification, shelf rectification, and theft detection. It also provided an estimate of the total cost once the RFID system was implemented as well as the pertinent costs of the various components. This essay provides a quick overview of the functionality and significance of the newly developed Radio Frequency Identification (RFID) technology for library management systems. It also discusses the fundamental elements needed for the workout to function properly. It lists a number of RFID technology in libraries' benefits and drawbacks. Additionally, it emphasizes the use of RFID technology in the Malla Reddy University central library. This will provide other libraries fresh information about how to use RFID technology.

Keywords : Malla Reddy University, RFID, Central Library, Library Automation.

I. INTRODUCTION

The only private university created in 2020 that falls within the green field category is Malla Reddy University, Hyderabad (MRUH). The Telangana State Government authorised the Higher Education (UE) Department on May 16, 2020, in accordance with the

Telangana State Private Universities Act No. 13 of 2020 and G.O.Ms. No. 14. Our main goal is to meet the new demands of society and business. The Malla Reddy Educational Society (MRES), a division of the Malla Reddy Group of Institutions, is the sponsor of Malla Reddy University.

MRUH has a vision to become a Centre of Excellence through new initiatives that include building world-class infrastructure, fostering international collaborations, creating cutting-edge programmes, forming partnerships with industry, hiring highly qualified and trained faculty, showcasing talent, fostering research and innovation, and supporting outreach initiatives with a steady stream of funding. The campus has a built-up area of 100 acres that includes academic, administrative, and amenity buildings with cutting-edge infrastructure. It boasts a global vibe that draws in a variety of students from all around the world. Through knowledge collaborations, it fosters an atmosphere where students may have access to experienced teaching faculty that are highly qualified and have exposure to the global market.



Fig 1. MRUH campus overview.

New Age Technologies and Innovative Curriculum are part of our programmes to prepare students for the rapidly changing global environment. The global standards in the fields of research and publications serve as our inspiration to pursue academic excellence tenaciously. MOUs with numerous international universities are popular because they allow for faculty and student interaction through academic and research immersion programmes. International Collaborations are being promoted for the mutual benefit of the University and the Students. Through internship programmes, we introduce our students to

a variety of national and international businesses for the best on-campus placements.

II. OVER VIEW OF THE MRUH CENTRAL LIBRARY

The Central Library has two levels with a floor space of 13,000 square feet. It contains a specialised collection of around 25000 publications, including printed books, e-books, CDs, and DVDs, in the fields of engineering and technology, humanities, agriculture, allied health sciences, social sciences, and management. The Central Library has print and online subscriptions to both national and international journals. The government of India launched the National Digital Library (NDL), NPTEL video courses, ePGpathashala, Swayam Programme, and other online learning tools. In addition to implementing RFID technology with self-issue and return kiosks, WEB-OPAC (Online Public Access Catalogue), and an online renewal facility, Central Library uses Koha software for library automation. Additionally, the MRU Central Library set up its materials for simple access by students, faculty, and staff.

III. RELATED WORK

RFID is a cutting-edge automated library technology that allows for the tracking and identification of library materials automatically. Getting management support for the radio-frequency-based technology may be difficult since it may consider the Return on Investment (ROI) (Nabi Hasan, 2014). The ability of RFID to combine the functions of a barcode (as a unique item identification) and a security device (able to signal that an item is being withdrawn from the library without authorization) gives it a significant edge over all other technologies used in libraries for this purpose. It combines radio frequency technology with microprocessor technology. Since RFI chips can now be added to any type of document and are

getting smaller and smarter so they can be read and changed remotely, they are of great importance.



Fig 2. MRUH Central library.

Although it is generally acknowledged that the core technology dates back to at least the Second World War, the history of RFID is surprisingly disputed. The most recent technology to be used in libraries for a combination of automation and security activities in the well maintenance of documents either inside the library or goes out of library is RFID, which was developed in 1969, patented in 1973, and first used in harsh industrial environments in the 1980s. The MIT Auto-ID Centre was established in 1999. The group was tasked with creating a universal standard for item-level tagging. The seminal paper by Harry Stockman was most likely the first work on RFID technology. Published in October 1948, "Communication by Means of Reflected Power" (Christoph J. 2013). One of the fastest growing automatic data collection (ADC) technologies, RFID uses wireless radio communications to uniquely identify people or objects. It consists of one or more reader/interrogators and RF transponders, with data being transferred using appropriately modulated inductive or radiating electro-magnetic carriers.

IV. LITERATURE WORK

They discovered that RFID self-service has gained popularity among library patrons, has permitted substantial changes in the way library services are provided, and has made it possible for self-service to represent around 50% of all transactions. According

to Selamat & Majlis (2006), self-check counters increase automation in the borrowing and returning of books while requiring less interaction from librarians. A study of earlier research was done in order to evaluate the deployment and application of RFID in libraries. According to Yorkovich (2001), customers can check out materials on their own using the Self Check System without help from library employees. He continued the use of DLA makes libraries a more effective location to find information, and it is among the most groundbreaking technologies to have an impact on how libraries handle content. In a study on the implementation of the 3M digital identification system at UNLV libraries, Fabbi et al. (2002) found that thanks to the capabilities of the Digital Library Assistant, users were able to locate the books that had been neatly arranged on the shelves. This increased performance and efficiency of the library staff. In their investigation, Hopkinson & Chandrakar (2006) discovered that RFID not only provided a solution to the security issue but also the potential for self-service and stock management features not possible with conventional systems. This allows librarians to concentrate on doing more efficient work to better serve the library.

The volumes that were closest to the metal divider or the metal upright were consistently misinterpreted, according to Golding & Tennant's (2008) research. To get a reading, these volumes had to be physically taken from the shelf. Ching and Tai (2009) saw a 50% increase in check-outs of the Semi-Closed collection from the beginning of the UHF RFID pilot test in April 2008. Cunningham (2010) cited a number of issues with the deployment of RFID in libraries, including the lack of uniform standards, high costs, security risks, and connection with library administration systems.

V. RFID TECHNOLOGY FOR MALLAREDDY UNIVERSITY

Malla Reddy University, Hyderabad maintains global standards in all aspects. In the view of that we made library is heart of the university and sources of

knowledge. Quality matters everywhere hence we introduced a new approach of library management system by using introducing RFID technology in the campus. For the automatic identification and tracking of library materials, RFID is a cutting-edge automated library technology. It may be used to identify, track, sort, or detect library holdings and combines radio-frequency-based and microchip technologies. This is an efficient method of managing the library's collections and offering improved services to users, with advantages including reducing theft, locating lost books, inventory accuracy, stock verification processes, security control, etc. It is an autonomous data collection method that attaches small microchips and antennae to items.

RFID is essential in rethinking library operations to simplify the work of everyone involved, from users to library employees. It offers a framework for automating the majority of tasks carried out by library staff members, such as check-in and check-out, sorting, stock management, etc. A tag (or several tags), a reader or interrogator, and the required supporting infrastructure (including hardware and software) make up an RFID system. An RFID reader, also known as an interrogator, is a tool used to interact with RFID tags. Additionally, it transmits a radio signal that the tag can pick up. The tag then relays its data to the reader once more.

Readers can be either stationary objects that can be placed in key locations or portable handheld terminals.

The primary goal of today's libraries implementing RFID is to enhance library operations by boosting transaction efficiency, lowering workplace accidents, and enhancing services for library patrons. The staff at the library may be used to offer extra services with value added. RFID makes businesses more cost-effective by allowing for material and labour cost reductions. RFID aids the librarian in ensuring that users are making the best use of the resources at their disposal.

VI. RFID APPROACH IN MRUH

RFID has implemented in Central library, MRUH in 2016. Around 100000 books tagging were completed initial in 2016 through 3 trained staff of MRUH. Now almost crosses 35 thousand books & more are tagging of RFID.

In libraries, RFID technology is used in a number of modules, including the tagging station, which attaches an RFID label to every piece of library equipment, the patron self-check-out station, which allows users to borrow books electronically, the book drop station, which is used to return books, and the anti-theft security gates, which check that items have been checked out before they leave the library by detecting whether the RFID label on the item is activated. Finally, as for self-management.

The main library has implemented RFID technology to enhance self service. Using automated lending devices, which demand a library smartcard and PIN, users may borrow and return the goods. With this new technology, self service is significantly simpler. Sorting the returned books also significantly decreases the physical labour required by the library employees. The process of borrowing and tagging becomes more simpler as a result of the anti-theft feature of the RFID label, which eliminates the requirement for an additional alarm strip to be connected to the object.



Fig 3. Security with RFID Gates and biometric attendance at MRUH.

Sir this is user entry with biometric, attendance should be automatically we can take the report. Monthly and quarterly and yearly, sir.



Fig 4. MRUH Central Library Desk and catalog.



Fig 5. Self-service with Kiosk for issuing books to students.

S.No.:	Standard	ISO 15693
1	Brand	2CQR
2	Operating frequency	50-60 Hz
3	Screen size	24"
4	Weight	4-5 kg
5	Power	10 watt
6	Data	500 GB
7	Standard PC	Intel core 2 Duo J1800
8	Brightness	400 cd/m ²
9	colour	White

Table 1. Specification of RFID Kiosk

This component of an RFID system used for the self-issue /return, renew of the documents. It has connected with the ILMS and server. A printer is also attached with it where the user can take a slip of his/her circulation status. From here, we also get the statistics of circulation status of the library.

Kiosks with integrated RFID systems are used in a variety of different industries for a variety of different purposes. The main purpose of an RFID-enabled kiosk is to read and identify RFID tags, and access relevant, related information. Integrating RFID technology into an existing kiosk can be accomplished using embedded reader modules and RFID antennas. Library is equipped with RFID system which provides self-issue/return/renew of books using Kiosk. Users can use the Kiosk (near the security desk) to issue/return/renew the library book/s by themselves. This service will be operational round the clock.

Instructions:

1. Please carry your RFID ID cards for making use of this service. In case you do not have the RFID ID cards, please contact the circulation desk.
2. You will receive an email for every issue/return/renew transaction on your institute email ID.
3. After issue or renewal of books through the Kiosk, a print receipt will be issued at the Kiosk, which you need to deposit at the security desk, while leaving the library.

4. While returning the books no slip will be issued and the acknowledgement for return of books will be received in your institute email id.
5. Please note that the library will not stamp due date (return/renew) in the books issued through the Kiosk.
6. The staff assisted circulation service will continue as usual (09:00 am to 10:00 pm) on all days.



Fig 6. MRUH central library security gate.

This is a user self-service machine, called as kiosk it should be an issue per student at a time 3 books, and return should be more than 10 books.

The Standard Designer Clear Library RFID Security gates are the ideal security solution for libraries who need an aesthetically subtle security system that blends in with existing library architecture and interior design. These gates are made from high clear acrylic, so they are visually low-profile, blending into the background. The gates have the same form factor as the 63in Wide Designer Clear Library RFID Security Gates.

The Designer Library Security Gates have corridor specific alarming. Only panels of the affected aisle will light up when a secured item is passed through. The Designer Library Security Gates can be installed with an aisle width between columns of up to 47 inches. The distance of 47 inches provides an excellent read range in a 3-dimensional field.

This is the security gate, if the student should not issue the book the alarm will come. It's mean the book should be theft.



Fig 7. Working of RFID Chip at MRUH.

Electromagnetic waves are the foundation of RFID communication. A microchip and an antenna are found in identification tags (transponders, RFID tags, and RFID labels). A reader transmits the recorded information to the controller unit (middleware), which then interprets the signals it receives. Based on the data received, the middleware unit interacts with and receives instructions from the integrated system of the library.

In library RFID systems, communication between tags and devices (readers and writers) takes place at a high frequency (HF) of 13.56 megahertz [2].

The system's components

1. RFID label

The most crucial information required for document identification is stored on the RFID tag (transponder). Other identification data may be stored on the tag in some circumstances or in more complex applications.

These are the several kinds of RFID tags:

RFID passive tags are used on library books and other products. These tags are not powered independently. The electromagnetic field that the reader creates provides the necessary energy.

Semi-passive tags: These tags have just a little amount of autonomous power. RFID tags that are semi-passive

only send data when a response is received. Trade and logistics are where they are most frequently employed.

Active tags – These tags feature a battery as a power source. Active RFID tags have the ability to broadcast and receive data over great distances.

RFID reader cards are used to identify each and every library customer.

RFID readers 2.

RFID tags and cards must be recognised by readers in order to function. The reader devices have the ability to transmit and store scanned data. The desktop RFID readers can safely and rapidly complete the borrowing transaction. With portable, mobile, handheld RFID scanners, it is simple to locate goods that have been improperly categorised. These gadgets have the ability to transfer or save scanned data straight to the system or in their memory units.

RFID reader device categories:

Only the tags that are close to the middleware unit may be read and sent by read-only readers. The reading rooms at libraries are where these gadgets are commonly employed. Readers who just read are able to borrow books for themselves and collect them.

2. A fence that detects theft

Any type of theft security system relies heavily on the configuration of the detection and signal devices installed at entrances. For RFID library systems, the gate is a reader device that locates the documents' RFID tags and sends the information to the middleware. Following then, the middleware and integrated library system start exchanging data.

Devices that can both read and write to an RFID tag are known as writer/readers. These RFID applications are used by libraries in a number of contexts, including: when a new patron uses their library card at the circulation counter; throughout the acquisition work process at technical service; and when classifying and processing new resources. The RFID tag has to have the necessary information written on it throughout this operation. The tag must at the very least contain the unique identification used by the library integrated system. Beyond that, the tags can

hold any pertinent data that is required for other applications. As an illustration, tags can be used to hold information about a copy's depository allocation, allowing a portable reader to quickly filter out the enumerated document.

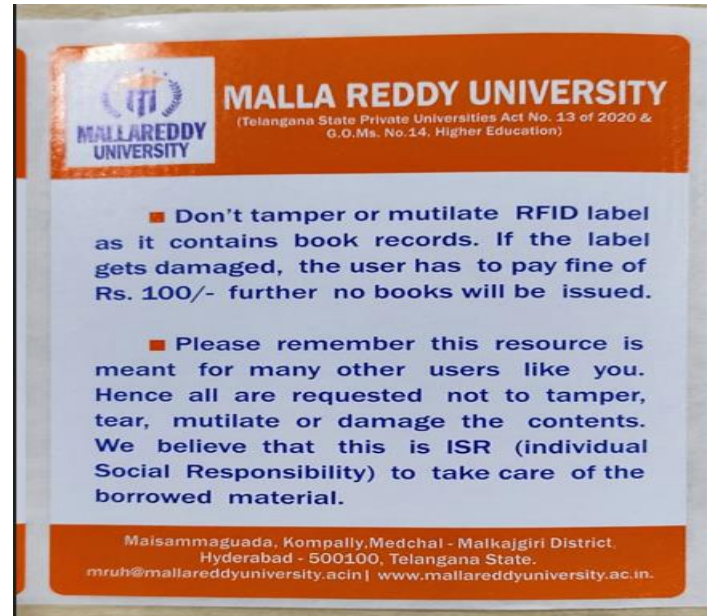


Fig 8. Anti theft stiker at MRUH.

If the tags don't individually identify the book, they have a sticker with a stack of 3 bits of foil. By applying a magnetic field, the strips can be magnetized and no longer "ring" (radio) when pulsed by an external field. (The big coils next to the doors send out pulses and then have electronics listen for the radio signal of a not deactivated tag).



Fig 9. Students' bio metric registration desk at MRUH central library.

Radio Frequency Identification (RFID) system is used in registration and anti-theft protection.

This system has helped in

- Speedy circulation activities
- Automation of many routine activities like check in/out
- Ability to take inventory/stock taking fast without manual intervention
- Frees staff for better interaction with patrons and other library work
- Provides librarian with details of check in/out from across the globe
- Security against intentional and unintentional removal of library material without checkout
- It provides 24-hour check in facility to patrons
- Automation reduces manpower requirements.
- Biometric attendance system:

Entry and exit for all users from the library register their attendance in the library through biometric attendance system. It documents the number of visitors and the time both being incorporated into ERP. Log-in report can be generated and tracked.

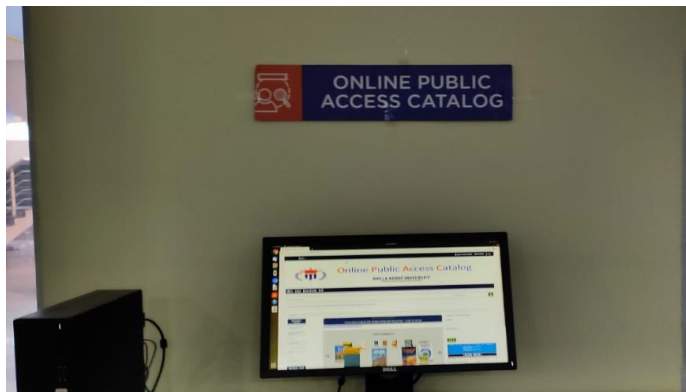


Fig 10. Online public Access catalog at MRUH central library.

A digital database of items maintained by a library or set of libraries, including text files, e-books, journals, etc., is known as an Online Public Access Catalogue (OPAC) or simply a Library Catalogue. Customers can search for any item under a library's control using the online cataloguing system. In order to help users rapidly access digital content, it presents the query search results in an easy-to-understand way.

An online repository of library holdings that is made accessible to the public is known as an Online Public Access Catalogue (OPAC). OPAC was first established as independent online catalogues that could be accessed via VT100 terminals or a mainframe library catalogue.

It is possible for the worldwide dispersed library authorities or librarians to update the catalogue, which typically takes little time.

7.CONCLUSION

I've discussed the system's inherent capabilities and the present RFID library security applications in this paper. The work processes and service activities of the library must get undivided attention when security and protection measures are being implemented. It must be remembered that a security system shouldn't restrict the actions of library users and personnel. The physical security of library resources, library stock protection difficulties, and anti-theft protection prior to the development of RFID technology. Then focused on the equipment and programmes that utilise RFID technology in library systems. Looked at how a self-borrowing system with an RFID-connected security gate and self-borrowing stations prevented theft. Finally, discussed several potential uses for RFID technology that might improve library security. The outcomes of the ongoing development of new RFID tools and solutions are helpful in various job processes in addition to library security systems.

More than 24 thousands of volumes of books and more than 300 CDs in the fields of science, social science, and humanities are available in the MRUH Central Library. The library started utilising KOHA, an open-source ILLMS, in 2010 and upgraded it in 2013 and 2016 respectively. Each item in the library has a barcode with an accession number that serves as an identification, and the scanner is used to check out materials. The decision to integrate RFID system with KOHA at AACL in 2017 was made to improve stock taking, circulation, and document security.

The primary uses of RFID, as well as standardization and innovation, are always evolving. Since the

technology's implementation is still quite new, several of its characteristics are not generally known to the general public. The conventional method is slowly being replaced by technology. Without needing to be sent to a different source, the RFID tag can include identifying details like a book's title or material kind. An RFID reader, which takes the place of the typical barcode reader often seen at a library's circulation desk, reads the data. The RFID tag that may be found on library publications can replace the conventional electromagnetic security strip and serve as a security device. The biggest issue facing libraries in India is the price of technology. RFID technology is not just a growing trend, but it is also a more practical, cost-effective, and effective method of securing libraries.

VII. CONCLUSION

In conclusion, this survey paper has provided a comprehensive overview of machine learning algorithms for risk-controlled algorithmic trading. The importance of risk control in algorithmic trading has been highlighted, emphasizing the need for robust techniques to manage and mitigate risks in the financial markets.

The paper explored various machine learning algorithms applicable to algorithmic trading, including supervised learning algorithms such as Support Vector Machines and Reinforcement Learning algorithms like Deep Learning. Each algorithm's strengths, limitations, and applications in algorithmic trading were discussed, providing insights into their potential use cases.

Additionally, the paper covered essential aspects of algorithmic trading, such as data pre-processing, feature engineering, evaluation metrics for trading strategies, risk management techniques, and performance evaluation through backtesting and simulation. These topics provided a holistic view of

the key components involved in developing and assessing algorithmic trading strategies.

Throughout the paper, the challenges associated with risk-controlled algorithmic trading and the application of machine learning algorithms were addressed. These challenges included data quality, overfitting, assumptions, and the need for forward testing to validate the performance of strategies in real-time market conditions.

By gaining a deeper understanding of machine learning algorithms and risk management techniques in algorithmic trading, traders and researchers can make informed decisions and develop robust strategies that enhance profitability while effectively managing risks.

Overall, this survey paper serves as a valuable resource for individuals interested in the field of algorithmic trading and machine learning. It provides a foundation of knowledge, highlights the key concepts, and challenges, and offers insights into the application of machine learning algorithms for risk-controlled algorithmic trading. With the continuous advancements in machine learning and the ever-evolving financial markets, this paper sets the stage for further research and innovation in the field.

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