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Implementation of Near Field Communication Technology in library management system.

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***Abstract*—Library management needs a lot of manual work and the manual work is nothing but making the book issue/return entries in the database.For that lots of softwares is available.Still human involvement is required.To avoid that human involvement the IoT provides a feasible and efficient solution. Till date various systems proposed and developed to improve the quality of issuing and returning book from/to library. This paper proposed system which will be physically fixed in library. The machine works with smart-card and electronic magnetic waves. The smart card uses Near Field Communication Technology (NFC). This new concept will reduce cost of labor, time management and paper consumption using IoT sensors.**

In the given Paper,we have used NFC technology for Library Transactions to make it more feasible and efficient. We have used Magnetic sensors which generates magnetic waves and activates the chip mounted on smartcard required for transactions.IoT provides the solution using NFC tags.Those tags will store the data automatically in a computer when it comes in a range of electromagnetic waves. Also automization in a work reduces the human efforts and minimises the errors in a system.This will also keep a record updated.Due to this loss of book will be minimized.

***Keywords*—Near Field Communication Technology(NFC), Internet of Technology(IoT), Library management System(LMS), Radio Frequency Identification(RFID).**

1. INTRODUCTION

The Internet of things (IoT) is a system of connecting multiple devices with internet and form a huge network for sharing data without human-to-human interaction.

Library management using traditional technique i.e. using pen and pencil has many drawbacks. The user data is not managed in efficient manner. It is difficult for the librarian to keep the record of loosed books due to manual and inefficient performance of the slow management systems. Also, updating the information on regular basis is also not possible.

Along with this, there is requirement of huge amount of paper in manual system which harms the nature. In libraries there is huge collection of books belonging to different fields and to manage them, we require large number of employees.

In this paper, we will discuss about a machine which manages library transactions (i.e. book borrowing, returning and updating) using IOT based System. This system will reduce the human requirement for library transactions as well as reduce the paper requirement.

2. LITERATURE SURVEY

Radio Frequency Identification (RFID) Technology is used for LMS which consists of RFID readers and passive RFID tags. These tags contains the information which is read by RFID reader . The reader transmits a signal which is received by a tag; modern tag has small Integrated circuits and Antenna and are passive (i.e. no need of power for working charged by the signals transmitted by reader). [9] used this system in smartcards for Library Transactions. They have given separate database for librarian to manage data according to his/her need. This system is less time consuming, fast with no manual work.

In [10], Uppala Mamatha and Dhanalakshmi M Compared the RFID with CDAC system of LMS. They have described the use of RFID for automated Library transactions with hardware specifications and appropriate tag positions along with its benefits.

In [2], author has used Radio Frequency Identification (RFID) Technology. It uses radio waves to identify people or objects. This system can be used for library operations and reduces security threats thus, helping the library staff to reduce the time spent on scanning the barcodes. The cost of such RFID based library system is high.

In [3], author has introduced the use of IOT to provide services to patrons in academic libraries. It is also stated by the author that the efficiency in the academic libraries can be increased by proposed technologies, Magic Mirror, Pressure Sensor pads through wireless sensor networks.

In [4], author has used RFID which is wireless non-contact system that uses radio-frequency waves to transfer a data using tags attached to objects. It consists of three important parts tags, readers and middleware. tags could be passive, active or semi-passive. RFID reader also known as transreceiver transmits an encoded radio signal for interrogation of tag [5].Its main function is to activate tag, structure the communication sequence with tag and transfer data retrieved from tag between application software and middleware [6].

In [7], NFC technology is used in library system in which it is embedded in books and user cards. This could be readable by handheld NFC reader. Firstly, user searches for the book from the shelf and then, the book having NFC chip will be scanned to get soft copy. Furthermore, if user wishes to borrow book from library he has to scan his ID and the librarian will update the information after the user has returned the book.

Mohit Gupta, etl mentioned in their research paper that the data was managed and sorted on the basis of recommendations and rating was given by teacher and students [1] . In this, Library system of Bundelkhand university is managed using mobile application.

In the QR-based library management system, the books which were issued were scanned using QRcode (each book has unique code) and the information is updated into the database [8].

I.

	Paper [3]	Paper[7]	Paper[1]	Paper[8]
Title	Internet of things applications in academic libraries	Internet of Things for library Management System	Library in Everyone's Pocket	Developing a QR Code-based Library Management System with Case Study of Private School in Surakarta City Indonesia
Objective	To Design a system using IOT through Magic mirrors, Pressure Sensor pads through wireless sensor networks.	To Design a system using NFC technology for retrieval of soft copy of books and issuing of book ;and bydefault updation of user Information in Database.	To Design a system which does Library Management on the basis of recommendations and rating was given by teacher and students .	To Design the QR-based library management system, where reader scans the QR-code on books and processess the required information.
Year of Publication	2016	2017	2018	2018
Conference	International Journal of Information Technology and Library Science.	International Journal of Engineering Science & Computing (IJESC)	5th International Symposium on Emerging Trends and Technologies in Libraries and Information Services (ETTLIS)	Third International Conference on Informatics and Computing (ICIC)
Limitation/ Research Gap	Hardware required for implementation of this system is quite expensive.	Searching the book from shelf and inserting NFC chips on books are time consuming.	It is a software based solution for the books retrieval. Also, ebooks(softcopies) which are not so feasible for users to read are available through this.	Time consuming work of inserting QR- code on each book.

Summary for Literature Review

3. DRAWBACKS OF PREVIOUS SYSTEMS

The previous Systems were Software Based in which there was no physical management of the library system. In this System proposed in this paper, there is physical management of books in which there is no problem of arranging the books after the users has issued the books.

4. SYSTEM DESIGN

A. *Concept*

Near field communication is a Technology used for short-range connectivity of devices. It also has other applications such as monitoring patient's health, boarding of passengers at airplane, etc. Smartcard is made from NFC technology (Nearest Field Communication). Then, the user need to bring card close to library desk and swipe/move the smartcard onto the machine. It can do 1 lakh transactions. There are two components required for this, one active and one passive-

1. Smartcard(passive)

2. Component which produces magnetic field (active)-This activates Smartcard when it comes in range of active component and the above operations are performed.

Every card has unique Id. when the smartcard comes in range of magnetic sensors mounted near desk, the electronic microchip on smartcard will be activated and required actions (i.e. issue, return,reissue/update) can be done. All this information is updated onto the card automatically without manual actions. Thus, it saves time as well as helps librarian to use data as per his/her need. As Id (containing information regarding borrowed book) is unique for every card, it doesn't require separate database to manage data.

B. *Components*

The system consists of following components:

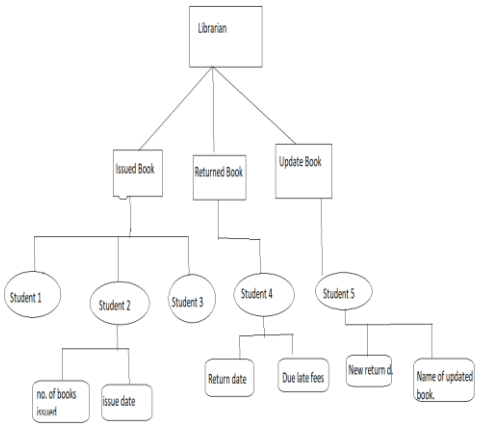
Magnetic Sensors, Electronic Chip.

Many of the magnetic sensors have the capability of real-time monitoring and low-power consumption. Some of the sensors used in healthcare are-

Sensors	Function
AMS SL13	Wound pH monitoring
SL13A	Gas monitoring
M24LR	Soil Moisture measurement
SL13A, ams AG	Measuring the UV dose
NFC-WISP	Food safety monitoring

C. *Database management*

Students are distributed their individual smartcard containing their basic information; after usage information about borrowed books are recorded into it. This student details are maintained into the computer's database managed by librarian.All the information generated by system is stored in database including card- id which is unique for every card. We can create Database using Structured Query Language (SQL) on MYSQL where we can insert, delete, and update, read data that is stored. This will be quite secure inorder to prevent valuable information safe. Only the librarian has access to database, he/she can view, insert, delete or update it.



Block Diagram

Librarian can see following data of students

Book Issue -

card Id	Book name	Author
1401	1.Concepts of Operating System 2.Head first Java	Galvin T.N.Rao
…	……	……
…	……	…
…	……	……

Return book -

Card Id	Book issued	Issue date	Return date	Book return
1401	OS Java	11/1/2020 12/1/2020	19/1/2020 20/1/2020	
1488	…	…	…	

Update book-

Card Id	Book issued	Issue date	Last return date	Update book	Last date
1401	OS Java	12/1/2020 14/1/2020	19/1/2020 21/1/2020		26/1/2020 28/1/2020
1402	Java	13/1/2020	20/1/2020		27/1/2020
…	…	…	…	…	…
…	…	…	…	…	….

System Overview

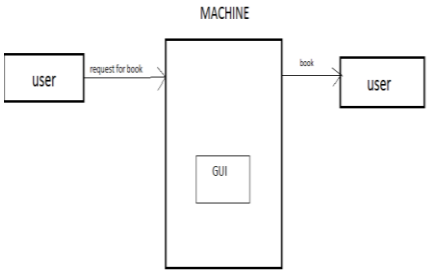


Diagram. Overview of system

D. Website or Mobile app

We can also create a college Library Website or Mobile application where student can view their transactions and different available books after logging in into their account. It will be less time consuming than going to library and searching for the availability of books.

5. Advantages of proposed system

1. No humans are required for library management.
2. More efficient for transaction purpose and deduct money.
3. When Students takes book from library, they don't keep books properly. This will not happen in this system.
4. Paper work is reduced (no need to enter entry and write information on register. Card will automatically do that).
5. Secure, less chances of being hacked.

6. CONCLUSION AND FUTURE WORK

We have proposed an IOT based fully automated library management Machine which makes book issuing, returning and updating very easier. It reduces the time required for this process and it is reliable, secure and safe. With this System, Users can easily do all the transactions easily in very less time.

The future work contributes in developing the entire module for our library which includes linkage of smartcard with the university enrollment number so that user can view the books issue date, return date, updating date, deducted amount due to late returning of book in the Student Portal of the University Website.

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