

Advanced Technologies for the User Authentication and Security of Library Collection

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***Abstract** -This paper emphasizes on technologies which can be implemented in the library to secure library collection by providing access to conventional and non-conventional resources to authenticate users. Usually various technologies such as Barcode, biometrics system, RFID, password, QR code etc. are used for user authentication and to ensure security of the library collection. These technologies related information regarding technological and functional framework, advantages and limitations are mainly discussed in this paper. The outcome of this study will help library professionals to understand and select appropriate technological solutions for user authentication and to secure library collection.*

Keywords: User authentication, Biometric systems, QR Code, Library Id card, CCTV, RFID, Password, Security systems.

Introduction:

Security of the collection in a public division like library, to identify various categories of users and accordingly to provide access to library resources are challenging tasks for library professionals. In the era of technological advancement, for the security management various technologies can be applied to serve the purpose. The aim of this paper is to study technologies used for user authentication and security of the library collection. The chief characteristics of these technologies, advantages, cost of implementation and limitation are studied in this paper.

Objectives of the Study:

- To identify advanced technologies for the security of library collection
- To identify advantages and limitations of these security technologies.
- To propose technological solutions to choose appropriate user authentication and security technologies.

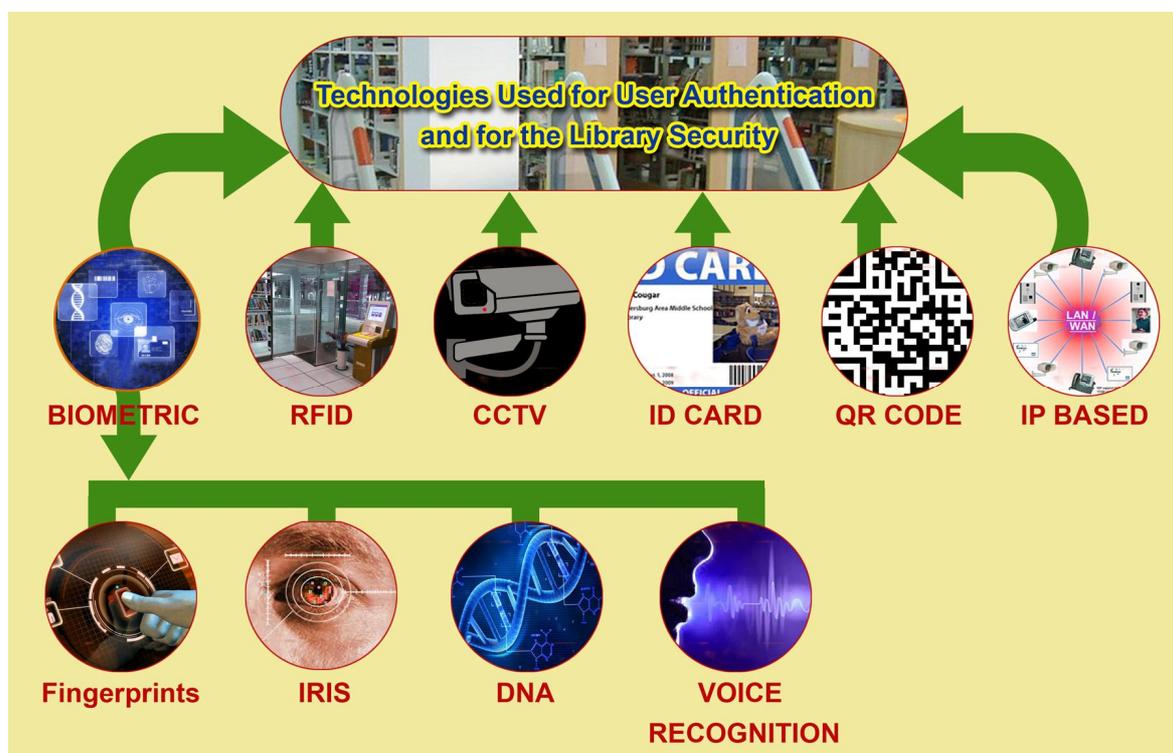
Literature Review:

Chien Le (2009) has presented a project of A Survey of Biometrics systems under the guidance of Prof. Raj Jain. He described basic criteria for biometrics security systems and

advantages and disadvantages of various biometric systems are discussed in the work. **Kuan-Chieh Liao and Wei-Hsun Lee (2010)** had studied A Novel User Authentication Scheme Based on QR-Code. The basic concept of QR code, proposed QR code based onetime password authentication scheme and security analysis are studied. **Simona Gheorghe (2011)** had studied integrated solutions for libraries: Implementation of RFID system. She described components of RFID systems, their functions and limitations in study. **A. Sankara Narayanan (2012)** in his study QR codes and security solutions had explained QR code data types, attack via QR codes and security solutions. **Espejel-Trujillo A., Castillo-Camacho I., Nakano-Miyatake M. and Perez-Meana H. (2012)** had presented study about Identity Document Authentication Based on VSS and QR Codes. QR code with Visual Secret Scheme, an ID document authentication scheme was developed in a smart phone. **David Pintor M. (2012)** explained QRP: An improved secure authentication method using QR codes. He studied system requirements of QR code, online-offline authentication system, computational costs and security issues. **Atul Bhatt (2012)** revealed that IT infrastructure in the health science library is in different stage of development and need to plan and implement ICT infrastructure in Medical college libraries of Gujarat **Drd. Andra Manuela Botez, Drd. AlexandruBejinaru-Mihoc etc. (2016)** had studied Library Security Management based on Biometric Methods. They explained facial recognition algorithms in this work.

Advanced technologies used for the user authentication and for the library security:

Library is considered usually as a service division rather than professional unit, simultaneously no service can be offered at the cost of safety. Safety of library resources is primary concern of any library professionals. The task of security become more complex especially in case of public and academic library as there is a fair number visitor’s approach the library every day. The **figure-1** demonstrates technologies which can be applied for user authentication and safety of the library resources.



Biometrics System:

Based on a person's physiological or behavioral characteristics, unique identity is formed and recorded by the biometrics technology. Use of biometrics technology for security purpose is utilized in the field of health services, banking systems, law, government, military, space research organization and forensics. Physiological characteristics such as fingerprints, face, eyes, ear, nose, iris, retina, DNA, voice etc. are mainly used to provide recognition of a person.

Fingerprint ridges are unique and permanent so this feature is used for security purpose. Biometrics technology based on fingerprints to create unique identity is cheaper than other biometric systems. The main limitation of this system is that dry and wet fingers can produce bitmaps with poor quality. Iris systems used in biometrics focus on the circular structure of the eyes and diameter of pupils. Colour of the eyes and pattern differs from person to person, it does not change throughout the life but this system is very expensive. About DNA based biometrics system, a person's DNA is collected from various sources of the body such as blood, saliva, hair, tissue etc. and then with special equipment's, each sample is break down into small parts which contain VNTR (Variable Number Tandem Repeat) to create DNA profile. This method is highly secure as it's impossible that two people have same DNA, however the process of creating DNA profile is time consuming and expensive. Besides this, biometrics based on voice recognition is also used for the user authentication. This system focuses upon voice tract and voice accent for identification of a person. No special hardware is required but several words sound the same and bad throat can create hurdle in this system. Apart from these ears, nose, gait, signature and heart beat based biometric systems are also used to create unique identity of a person.

RFID (Radio Frequency identification):

Many academic and special libraries have adopted RFID system for its special feature of security of library materials, inventorying functions and high speed circulation. The smart card in RFID system works as identification card. There are mainly four components in RFID system: 1. RFID tags, tags are electronically programmed with unique information. There are three types of tags: Read only, WORM (Write Once Read Many) and read/ written. Most of libraries prefer read/ written tags as information can be added or edited as per requirement. Tags are affixed to books, usually at the back side of library books and to read them, reader or exit sensor is used. The life of tags is longer than barcodes. In order to maintain more security magnetic stripes can be also used. They are pasted inside the book and difficult to remove; their main function is to detect unauthorized movement of materials. 2. RFID readers, to interpret the data stored on the chip in the tag the reader is required and these data sent to the server, which in turn, communicates with the integrated library system when the RFID system is interfaced with it. For charging and discharging books, for self check in, check out, at the book drop station and to check whether materials are properly shelved or not by handheld reader, RFID reader is activated. 3. Antenna, to activate tags, read and write data to it, antenna is needed. This function is done by producing radio waves and antenna plays role of mediator or channel between tag and reader. In this way it controls system's data acquisition and communication. 4. Server, it is heart of the system and transaction database is governed by the server. The RFID gate at the library exit are about four feet because the tags can be read at a distance of up to two feet by each of two parallel exit gate sensors and this security gate can operate even when ILS network is under maintenance. If the documents are

not properly checked out, RFID gate produce signal. About disadvantages, high cost and lack of common standards of RFID are key issues.

CCTV (Close Circuit Television):

Use of CCTV is very common at the public places, libraries and to track movements on the roads. In library scenario to keep watch for 24 hrs, CCTV can be installed. Installation of CCTV certainly provides safety to library resources and to identify unofficial visitors, it proved useful. It requires proper maintenance of cameras to serve efficiently. Moreover the cost is lower. About limitations, sometimes in crowd, to identify particular person will be difficult and maintenance of cameras will cost.

Library Identity card:

This is the most common method to identify official members in the library. With unique code or number, library Id card is generated and given to official members. To create it, no special training or hardware is used, just essential detail of users and unique number or barcode is created to design library Id card. These membership data can be easily merged with LMS. To ensure more safety, it is desirable to include photo of user in the library Id card. The members having Id card will be given access to resources. However it provides lower security while compared with the biometric systems.

QR (Quick Response) Code:

Due to advances in mobile communication technologies, it is easy to adopt QR codes which support many services besides user authentication. About historical background QR code is originated by Denso Wave Company of Japan in 1994. It became very popular then in Japan as it provides technological solution to some drawbacks of the barcode system. The chief features of QR Code are storage capacity, reconstructing ability, damage resistant when damaged by external factors, and can be read by any position. When it is compared with barcode system, barcode can store data in horizontal direction only while QR code contains information in vertical as well as horizontal direction and the cost of printing will not increase with increase in the amount of storage of information. A conventional barcode can store maximum 20 digits while QR code can store up to 4,296 alphanumerical characters. In the library scenario, QR code can be applied at two stages: registration stage and verification stage. Essential details of library patrons should be recorded to prepare database and then generated QR code can be pasted on library ID card. This QR code will be verified by scanning with smartphones in order to prevent unauthorized access to valuable library resources. The user will submit his user name, password and IMEI no. (International Mobile Equipment Identity) to verify the data. The omnipresence of Internet, smartphone and security features of QR code made it more convenient to utilize this technology. About limitation, mainly just by seeing QR code one cannot realize malicious attacks via QR code which can started just by scanning it once and in the library scenario this concept is new.

IP based authentication and password:

IP (Internet Protocol) based access proved useful to provide access to online resources within the campus. Various security models like VPN (Virtual Private Network), encryption, digital signature are considered to address security issues in wireless systems. However VPN supports IP. For remote log in, password is given to users in order to prevent unauthorized

accessand they do not need to visit the library physically to access e- resources. These are flexible, common and cheaper methods. From security point of view, average as it is easy to crack the password in case user failed to maintain confidentiality of the password.

Conclusion:

Library is a growing organism and usually within a few years the size of library resources increases. So to preserve them, to include new resources, provide timely services to authentic users and above all, serve as the custodian of library materials are expected from the librarians. With the advent of technologies, new ways are develop to steal and damage valuable resources of the library. In order to tackle security issues, it is necessary to use advanced technologies meant for user authentication and for the safety of the library collection. So these advanced technologies with their chief features, merits, demerits and from the perspective of cost of these systems are studied. Biometric systems are highly recommended for the user authentication compared with other security systems, however DNA and Iris based biometric systems are expensive. RFID system provides safety, reduce man power cost, self- check in, check out, stock verification facility and makes transaction of documents fast, the main drawback is high cost at the initial stage. This system is adopted by many academic and speciallibraries in India. QR code has better storage feature along with security, about possibility of virus attack is main limitation,while use of CCTV, library ID card, IP based and generation of confidential password for user authentication are considered average methods from security perspective but become popular and cost effective in the library scenario.

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