

Application Opportunities of Biometric Technology in Electron Libraries

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Abstract: The paper provides information about biometric technologies, traditional and electronic libraries. Opportunities and prospects of the use of biometric technologies in libraries are analyzed. When using traditional methods data loss or theft may occur, whereas emergence of such threats is not possible in biometric identification/ Application of biometric identification systems is very vital in some certain applied areas such as border stations, passenger registration, electronic identification document and cards control, and in some security issues. Library is one of these application areas. Technology is rapidly developing, at the same time, safety rules are violated, and fraud is growing all over the world. Therefore, all businesses, as well as libraries need for biometric technologies for the control and security. Advantages and disadvantages of introduction of biometric technologies in libraries are explained.

Keywords: Biometric Technologies, Library, Fingerprints, Multimodal Biometrics

1. Introduction

In modern times, scientific and technical progress has stimulated of the rapid development of biometric technologies. Application of biometric technologies plays an important role in the prevention of dangerous incidents. Prevention of hazardous phenomena such as international terrorism, transnational organized crime, as well as weapons and drug trafficking, and illegal migration is of great importance.

The three main application areas of biometric technologies are distinguished [1, 2]:

1. Economic and scientific-technical areas: information security (computers, databases, credit cards, cell phones, etc.), medicine, agriculture, banking, analysis of social processes, psychology, linguistics, oceanography, chemistry, nuclear and space physics, and so on.
2. Governing: identity card, passport, visa, driving license, border stations, passengers registration, control of electronic identification documents, and so on;
3. Forensic science: study of criminal incidents, and so on.

The three main application areas of biometric technologies are shown in Figure 1.

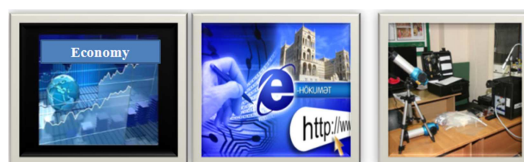


Figure 1. Governing, economic and forensic areas.

Biometric characteristics includes: [3]:

1. fingerprints;
2. hand shape;
3. iris;
4. voice parameters;
5. facial elements;
6. facial thermo gram;
7. signature, and so on.

The examples of biometric technologies are shown in Figure 2.

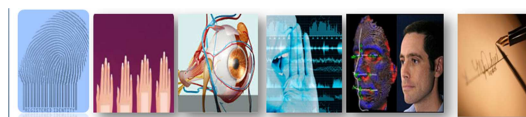


Figure 2. Examples of biometric technology.

Biometric authentication is widely used to prevent unauthorized access to a building, ATM machine, computer, and so on. Biometric security is more reliable than passwords, PIN-code, smart cards, tokens, and so on.

It is impossible to find two people in the world having the same biometric features. In biometric identification, information is digitized with a special reader or scanner, and stored in a reliable database, where it is compared to the hand patterns, images, iris, and electronic voice samples available in the database. The user accessing the system submits personal biometric settings through a microphone, scanner or other devices. The system determines biometric data of the person and compares them to the database samples and identifies the person [4, 5].

When using traditional methods data loss or theft may occur, whereas emergence of such threats is not possible in biometric identification.

Application of biometric identification systems is very vital in some certain applied areas such as border stations, passenger registration, electronic identification document and cards control, and in some security issues. Library is one of these application areas.

Technology is rapidly developing, at the same time, safety rules are violated, and fraud is growing all over the world. Therefore, all businesses, as well as libraries need for biometric technologies for the control and security.

Library is considered to be a "temple of knowledge", so it plays a key role in the formation and development of an information society [6].

Certain resource storage areas of traditional libraries are limited. While, electronic libraries have a high potential to store large information, and are relatively simple due to the electronic data, which occupies very little space. Thus, the cost for the maintenance of electronic library may be significantly reduced compared to traditional library. Both types of library require the cataloging of information. The examples of traditional and electronic library are shown in Figure 3.



Figure 3. Examples of traditional and electronic library.

2. Advantages of Electronic Library

Advantages of electronic library [7]:

1. availability at any time;
2. multiple access;
3. simple data search;
4. storage and security;
5. large coverage;
6. easy access and so on.

It is undeniable that, libraries are safe and secure places. However, they face various problems such as book theft, causing damage to library materials non-ethically, and so on.

3. Application of Biometric Technology in Electron Libraries

The majority of libraries, especially academic libraries are open access systems, so they provide users to take full advantage of resources in the library. In most cases, due to open access systems, the pages of the books on the library shelves are often torn and damaged. In some cases, such books are impossible to be recovered [5, 8].

All scientific libraries of different countries face similar challenges. Books theft or damage is not a new problem. It is common for all libraries of the developed countries (US, UK, etc.).

Providing safe and secure environment for library staff, library resources and facilities is a foremost issue. In this regard, the use of biometric technology is convenient for library professionals. Various biometric technologies are used in libraries. One of these technologies is fingerprint identification [8].

Examples of fingerprint identification is shown in Figure 4.



Figure 4. Fingerprint identification.

Fingerprint identification applied in libraries has numerous advantages compared to others:

- comfortable identification;
- confidence of customers;
- prevention of theft and vandalism;
- prevention of unauthorized or illegal use;
- ensuring security;
- high accuracy of identification, and so on.

Fingerprint identification applied in libraries has two main procedures, which include:

- registration;
- authentication.

Obviously, each person's fingerprint is individual, not the same as others.

The use of fingerprints recognition in libraries makes it impossible to misuse of the library card and the associated problems are eliminated [8, 9].

One of such libraries is Auckland library in New Zealand. Auckland Library is the largest library in Australia and neighboring countries [10].

Special software and the database containing the data of library staff and subscribers are located on the central server. This software identifies library staff and members and determines non-members. Passwords are set for the management and control of library computers, Web sites, software and corporate networks. The file TELLER related to the server software is used for access. Working hours and attendance of the staff is controlled through software installed on the central server. To prevent theft ID is used for each library employee and member. In addition, automated access through internal and external gates is provided through the opportunities of the central server.

4. Application of Biometric Technologies in Libraries

Most academic libraries use computers, the Internet and network services to provide users with an effective and high-quality information services.

It is known that, in libraries computers are used for various purposes, such as books circulation, cataloging, information services, information acquisition and processing.

Biometric technologies are widely used to provide safety of the library's valuable collection, infrastructure and human resources [11].

Biometric technologies are very useful for professionals library information system (LIS), so that it ensures library administrators to control library resources, computers, Internet access, and software from single point. Furthermore, LIS staff deals with big database processing, and provides access to on-line journals and on-line catalogs through passwords within the network, which plays an important role in the prevention of cyber-crime. To this end, it is very important to know the role, prospects, challenges and application of biometric technologies in LIS [12].

Librarians must identify the person consuming the services of the library. In this regard, all modern libraries use ID cards.

Three main features of biometric technologies applied in the management of library system are as follows [13]:

- rapidity;
- accuracy;
- decency.

Most libraries so far let in their users with ID cards. It also caused long queues. It should be noted that the cards can also easily be lost.

By using biometric technology, libraries identify their

seers with the help of fingerprint recognition. Biometric technology called Heritage identifies a person with the scanned fingerprints, which ensures security.

When it comes to a library, information about the specific section and shelf of the book ensures to avoid a long queue and librarian's extensive search.

Hand Key II facilities provides the probability of FRR (False Reject Rate) = 0.001%, and of FAR (the second type of error) = 0,000001%. Another well-known manufacturer is Biomet Partners Inc. (Devices: Finger Foto, Very Fast, Bio Smart + Digi-2 based on biometric terminal).

American Recognition Systems Inc. operating in Russia implements biometric hand scan through one of the most famous and popular devices. This device has two modifications [14]:

- Hand Key (ID-3D);
- Hand Key II.

The examples of Hand Key (ID-3D) and Hand Key II shown in Figure 5.



Figure 5. Hand Key (ID-3D) and Hand Key II.

The device scans the profiles of palms and fingers (their length, thickness, width). The hand placed in a special terminal is scanned by means of infra-red light (signal is recorded by a special camera). In this case, the user's PIN-code is dialed on the keyboard before scanning or any identifier (e.g., PROX-card) (contactless card is a common name of unconnected devices in integral schemes) is read. The responsible person is warned to enter his/her palm pattern, and entered pattern will be compared to the previously entered patterns or to the original data stored in the database. Initial entry of the code or card reading allows reducing identification duration many times.

In modern times, different countries as North American, European and Asian countries tend to integrate biometric technologies used in their libraries [16].

Collections of digital libraries are stored in electronic formats, and computers are available for their use. Digital library data can be stored on local or global networks.

Many academic libraries take an active part in the creation of digitization of books, articles, dissertations and so on.

Certain models are offered for such libraries [17]. Proposed models ensure the confidentiality of information within the Internet. In some cases, multimodal biometric systems (Secure Digital Library Accessing System SDLAS, Using Multimodal Biometric System - MBS) are used for such libraries, which include fingerprint scanning, human face images and so on. The example SDLAS shown in Figure 6.

SDLAS with functional facilities will be designated as data processor, and will include protocols and references to ensure connection between client and server.



Figure 6. Example SDLAS.

5. Conclusion

The paper highlights the application possibilities of biometric technologies in the field of library. As in any other fields, there are advantages and disadvantages of these applications in the field of library.

There are some advantages of the use of biometric technologies in libraries, which are:

- a unlike passwords, biometric signs are impossible to be lost or forgotten;
- b biometric signs are difficult to copy, distribute, or send;
- c use of biometric technology requires the authentication of a person;
- d system is effective from the economic point of view.

Along with the advantages of using biometric technologies in libraries, there are some drawbacks. Some of them are as follows [16]:

- 1. breach of confidentiality;
- 2. biometric technologies are useless unless comprehensive models ensuring safety is developed.
- 3. some biometric technologies are of discriminative nature;
- 4. accuracy is not fully evaluated when using biometric systems;
- 5. values of errors are high.

Further problems are planned to be solved and possibilities of biometric technologies will be used in all libraries.

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