Analysis of biometric authentication methods of users in clouds

Shafagat Mahmudova

Institute of Information Technology of ANAS, Baku, Azerbaijan

Abstract
Nowadays cloud computing is widely used in various fields. Ensuring security of users in clouds is one of the main problems. In this study, one of the biometric authentication methods, that is human face recognition methods for providing security in clouds are analyzed. Problems in this field are studied.

Keywords: cloud computing, security, authentication, recognition, face descriptions, biometric signs

1. Introduction
Cloud computing provides the creation and utilization of computer technology infrastructure and software indirectly in the network environment. Castro (2013) [5] reported that user's data is stored and processed in cloud systems, and results are reviewed through this technology.

Cloud computing is the newest technology. The user can access the files or data on clouds from anywhere over the Internet. The use of cloud computing has its own advantages, such as high availability, low costs, and so on. On the other hand, there are some security shortcomings in this field. Akshay *et al.* (2013) [1] have reported that one of them is the cloud usage time recognition of the authorized user, thus, the authentication must be provided for the user access to clouds. Authentication is the process of verifying the identification of the user-provided information.

The methods of biometric authentication of users are widely used in computing clouds. One of them is ensuring security through face recognition.

In this paper, solution of security issues through the face recognition of users as the biometric authentication method. Existing methods for the human face recognition in clouds are analyzed and the problems in this area are explored.

Most researchers have focused on ensuring safety through the human face recognition so far. It covers a large area of research. Law enforcement agencies are benefiting from the human face recognition and successfully applying in their work. Automatic detection of suspects' data from police database enables quickly identifying the potential suspects. Software for human face recognition requires real-time response and application on a mobile device, providing portability (compactness).

Mobile Cloud Computing (MCC) is also widely used in recent years. The increase in the MCC and the dynamic mobility of the network necessitate the resource accessibility of the mobile customers and their adaptation to the environment. Li *et al.* (2017) [12] have reported that these may be processed through big data benefiting from cloud computing capabilities for the data. Ayad *et al.* (2014) [4] have reported that the use of mobile devices in MCC also causes many problems. Mobile services in MCC are presented as a potential technology for data transfer, processing and storage and for solving mobile resource issues.

2. Ensuring security through the use of users' face recognition method as a bioometric autentification
Security is one of the key issues in the human recognition process in the network environment. Modern studies contain considerably much information on human recognition in ensuring the networks security. The process of studying new devices and technologies is actively going on, as they are implemented and developed in different areas. The information on face recognition systems, iris scanners, fingerprint identifiers, smart cards, explosive detection systems, radio devices and other new technologies are provided in many studies.

The research on human face signs, fingerprints, hand shape, sound parameters, iris, other biometric characteristics, and the development of new biometric identification systems are of topical issues. In modern times, the use of computer search systems for the human face recognition are widely applied. In the network environment, different methods are used for human recognition, which results in improved recognition. This depends particularly on the capacity of the database. Note that, when the various databases are integrated in the network, and the number of patterns stored in them is high, the recognition process becomes even more challenging.

Human recognition based on images requires great computing power of the computer. Research in this field involves the interaction of people and computers, including recognition of face and gestures, and the recognition of objects. The number of images uploaded online on social networks, such as Twitter, LinkedIn and Facebook, is growing rapidly. However, there is a serious shortage of applications in this area. The dissemination of information about human images requires an exploration of thorough analysis of the image sets. Such studies are the basis for competition since default tools and procedures are not intended for the processing of big data sets. Sun *et al.* (2015) [14] have reported that in addition, the images are complicated multidimensional structures and

require high computing technologies for recognition.

Ensuring total security in different systems is one of the key issues. These issues also include the protection of air passengers; however, airports in this area usually work independently of each other. The work of many providers is implemented by existing individual networks of new technologies, requiring installation of new equipment and expensive cable systems for each of them. Many airports have a huge number (sometimes over 50) of independent communications networks which sometimes obstructs their effective management. Many of these networks may ensure proper functioning of multiple surveillance cameras, X-ray systems, load scanning systems and access control systems. The number of networks is growing even more during the expansion of security systems. The lack of a single biometric network makes it difficult for local and federal law enforcement agencies to transmit information inside and outside the airport.

In order to gain the confidence of air passengers, it is necessary to use a combination of new security-related devices, to raise consumers' confidence, and to optimize their identification and information sharing.

Expansion of the highly coordinated network providing the security of data transfer between airlines, airport administration and security personnel will prevent a significant reduction in the number of airline connections and flight delays by the low enforcement agencies, from which air passengers are currently suffering much.

Biometric technologies are widely used in security systems.

The main advantages of biometric technologies are their high reliability, maximum protection of unauthorized access, and ease of use.

Various biometric technologies are available:
- iris identification technology;
- voice identification technology;
- fingerprint identification technology;
- hand-patterns identification technology;
- human face identification technology based on image, etc.

Information available to internal affairs agencies, criminalistics banks and databases are quite dispersed and mostly local. This causes certain difficulties in the fight against inter-regional offenders. This reduces the opportunities of searching for suspects in the practice, i.e. ends without applying the process of identification of a person.

The biometric features of human as speech and facial expression can be actively used in solving operative-search issues.

Kazimov *et al.* (2015) [9] have reported that traditionally, biometric identification methods have a number of advantages over different methods:
- biometric signs are very difficult to be falsified;
- identification reliability is very high due to the uniqueness of the biometric signs;
- biometric identifier cannot be forgotten as a password or can not be lost as a plastic card.

Safety is very difficult to be measured quantitatively. The increasing threat of terrorism and the need to improve the security systems have led to the recent increase in the volume of biometric equipment market. The principal customers of biometric systems include not only commercial enterprises, but also government agencies. Particular attention is given to the places, where mass surveillance systems are needed, such as airports, stadiums and other facilities.

Elements of face of any person are individual biometric characteristics. The photos attached to the documents are most widely used for identification, and related standards are adopted for all countries.

Biometric identification based on photographs has many advantages as follows:
- The photo or video of a person's face does not require the direct contact with the person and can be considered confidential in the course of the identification;
- Databases of photographs are more accomplished and widespread rather than other biometric databases;
- The application of this technology is not related to the serious changes to the state legislation;
- Uniqueness and relative stability of inherited biological parameters of a human, etc.

Cloud computing is a new technology in the market, and its introduction in different areas has its own advantages. As noted, users can access the files or data in cloud from anywhere over the Internet. Advantages of cloud computing may include reduced costs, security, and so forth.

Akshay *et al.* (2013) [2] have reported that the advantages of computing clouds are as follows:
1. High usage opportunities. Fewer workers perform more work in a short time in the clouds;
2. Cost reduction. The users in the clouds often divide computer hardware, software and data into several parts, thus, there is no need to spend more on hardware or software;
3. Easy access. The user can access the data in cloud and files at anytime and anywhere over the Internet;
4. Less training is required. Cloud computing requires less employees for performance.

The National Institute of Standard and Technology (NIST) (2011) [17] defines cloud computing by four key characteristics:
- self-service on request;
- expanded network access;
- flexibility;
- unifying resources, etc.

According to IDC, cloud counting also have particular problems. They may include safety, efficiency, and other specific features. Vinay *et al.* (2015) [16] have reported that Face Recognition System (FRS) system is used to address security issues specifically for authorized user identification. These types of systems are also varied with own specific functions. Depending on the purpose, the recognition process is performed through a variety of developed methods and algorithms. These systems also have advantages and disadvantages. For example, when using eye retina for recognition of a person, high accuracy and recognition stability is ensured, however expensive equipment and additional costs are required.

3. Analysis of the methods for human face identification in clouds

Recently, biometric technologies of face recognition (FR) have been widely applied in different areas, which require a variety of software improvements. Research on big data, cloud computing, social networking and machine learning analysis has shown that Computer Vision can handle these serious problems. Therefore, the concepts of Cloud Computing, Big Data, social networking and machine learning are reviewed from a modern perspective of face recognition, and a new method is offered for the FR approach based on Extreme Learning Machines (ELM). For example, Face Tagging (FT) method for social networks working with big data. The proposed approach incorporates the appropriate features of the above-mentioned concepts, which increases its effectiveness.

De Silva et al. (2008) [6] have reported that a new method based on neuronal network for complete face recognition using modified Radial Basis Function (RBF) and six images of the person's static universal face expression. The new Cloud Basis Function (CBF) uses different weight coefficients to highlight the features related to the discrimination of the classes.

The growing prospective potential of cloud computing enabled the development of a number of cloud-based systems and services for healthcare. Cloud computing allows healthcare personnel to adapt to smart-portable devices to remotely monitor the health of the patients. To this end, a new cloud-based face and voice recognition system is proposed for the monitoring of the health of elderly people.

Hossain et al. (2015) [8] have reported that cameras are sensing the speech and images of individuals and send them to the cloud server for analysis and classification.

Tracking the people through the monitoring system often generates a large amount of data from the devices of the Internet-of-Things (IoT). Face recognition is performed in clouds as they are located next to observation cameras, which in turn requires mass data transfer to the processing center. Amin et al. (2016) [3] have reported that on the other hand, the process of the face matching is implemented using the vector-function of a person's face in cloud, which increases the quality of performance.

A person's face is very complicated and dynamic object, as they are used as biometric elements in the recognition of individuals. Recently, biometric systems have been recognized in terms of security, since recognition of users and their matching with the listed ones are performed daily. To facilitate this process, the organizations must support them by using great computing tools. Some studies use the Principal Component Analysis (PCA) method face recognition using cloud computing. Kisku et al. (2016) [10] have reported that it is implemented with the use of Scaling-Invariant Feature Transform (SIFT) by reducing the amount of invariant points.

Face recognition is one of the most important aspects of ensuring security. Currently, experts mainly focuses on the monitoring in this area. Some articles suggest the monitoring for the face recognition in the documents to be performed in the cloud systems. It consists of a customer module of monitoring for cloud computing module for face identification and detection, and data visualization. In this case, Gabor's localization and segmentation of the centralized signs into a double template is proposed. Li et al. (2017) [11] have reported that this method supports substantial local functions, reduces the difficulty of Gabor filter, and provides a periodical stability on the texture and more accurate information.

Some studies introduce Smart Rank approach to reduce the load of mobile applications using cloud computing. Silva et al. (2017) [13] have reported that this approach is used for symbols' recognition based on resource assessments using the cloud computing metrics. Other methods are also used for the evaluation, for example, Markov chain. Tian et al. (2015) [15] have reported that application and implementation of cloud robot system. Thus, access to distributed computing resources is interconnected with the cloud infrastructure, and multiple tasks, such as face detection, recognition, and so forth are performed. Cloud Robot System (CR) is used for face recognition. The results of the trials have shown that an automated robot cloud system can effectively resolve the issues. The International Data Corporation (IDC) analyzes and provides forecasts in the field of information technology (IT). Gens (2016) [7] reported that according to the center's surveys conducted in 2006, the cost of building cloud computing is predicted to increase from 101 billion to 213 billion in 2020 or the table (Fig.1).
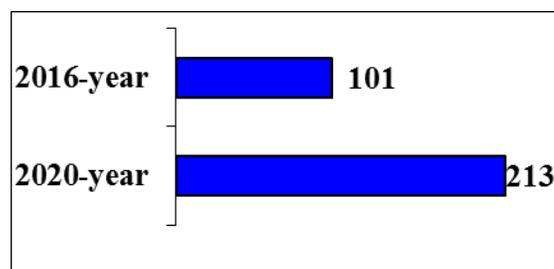

Fig 1: Estimated costs of building cloud computing (billion USD)

4. Conclusion

The paper highlighted an importance of the use of the biometric authentication techniques for the cloud users in ensuring security. Large volumes of data are stored in these clouds. As in other issues, one of the biggest issues here is the users' security. In this paper, it was recommended to use different biometric authentication technologies, including face recognition systems to ensure the security of access to clouds in the future. The use of biometric authentication technologies in clouds can play an important role in the provision of the security of the users, which can lead to increased efficiency of performance.

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