

Biometric network: problems, prospects, concepts

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Abstract—in this paper, we propose about and history biometric network, the essence of the problem and identification. The system finds facial images in auto mode via video camera, encodes them, and identifies them using the images available in a database. The joint use of integrated or distributed biometric database is one of the main goals. For this purpose, the used data is very important to be in accordance with international quality standards.

Index Terms: Biometric network, identification, image, neural.

I. INTRODUCTION

The researches on the biometric features, such as human face, fingerprints, hand shape, sound parameters, iris and etc., and the development of new biometric identification systems are of great importance. The use of computer search engines for the human face recognition has become widespread in modern times. Note that the key data used in the scientific and practical issues includes the images of the studied objects. Availability of different types of pattern recognition systems expands the scope of the solved issues [1]. High quality identification maximum accuracy can be achieved by using biometric features, such as human face, fingerprints, and iris. Dimensions of the data bases and the quality of the stored are very important for biometric systems. The joint use of integrated or distributed biometric database is one of the main goals. For this purpose, the used data is very important to be in accordance with international quality standards. Thus, the two-dimensional images, including the three-dimensional images are appropriate to be created [1]. In some works proposes a new biometric-based user authentication mechanism in heterogeneous wireless sensor networks [2].



Fig 1. Fingerprints and eye-socket of the person's

In law enforcement bodies use the databases with a large number of human photo portraits. The photos images of criminals are compared with the photos such databases and found. In modern times, false documents, and photos taken by mobile phones, the photographs taken from social networks are widely spread. Identification basing on the facial image has developed

rapidly, and connected to the information infrastructure of law enforcement agencies all over the world. The efficiency of the recognition algorithms has significantly increased in recent years and approved by the experiments. In a network, the success of the algorithm depends on the length of the key that user uses [4].



Fig 2. Database and network environment



Fig 3. Taken through a video camera and image

The system finds facial images in auto mode via video camera, encodes them, and identifies them using the images available in a database. In this case, the algorithms intended for three-dimensional images are

used more commonly for recognition. The system forms electronic or print reports, which contain full facial information in the database, including personal information. The system includes integrated interfaces, which realize information exchange with image databases of law enforcement agencies and other departments. Using three-dimensional models improves the quality of recognition significantly. In this case, the quality of the cameras is of great importance [1]. In some papers to mitigate the security breaches, also proposes a new biometric-based user authentication scheme without using password for WSN [3].

The followings shall be taken into account to solve a number of issues:

- Improving the quality of the obtained images before their automatic evaluation, search, and sending to recognition servers;
- Maintaining all the characteristics the Database Management System shall be realized basing on the mobile facilities.



Fig 4. Mobile devices

Biological neural networks are commonly used for the combined application of distributed biometric databases. Biological neural network is composed of chemical neuron groups or connected neurons. A neuron can be connected to many other neurons, and the total number of neurons in the network and their connections can be overwhelming. The location of neurons connection is called synapse. Transmission of the impulses is carried out by the mediator or electricity through transmission of ions from one cell into another. Some researchers try to imitate some features of the biological neural networks in their studies in the cognitive field of artificial intelligence and modeling. Artificial neural networks are successfully applied in the development of program agents or various robots for the recognition of images and speech in the field of artificial intelligence. Currently, the majority of artificial neural networks used in the field of artificial intelligence is developed basing on the statistical methods, optimization and control theory. In some works explores the problem of look-alike faces and their effect on human performance and automatic face recognition algorithms [5].

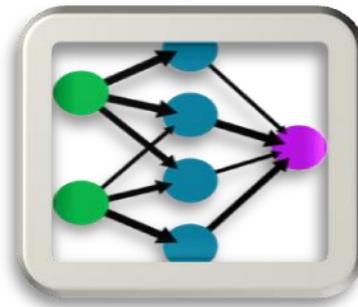


Fig 5. The simple neural network: green- input layer, blue - hidden layer, and purple - output layer

Let's inform about some of the scientists involved in biometric network. Bain is one of them. As for Bain, any action leads to the activation of a certain neurons collection. Connection between these neurons is improved during the repetition of their performance. According to his theory, this repetition leads to the formation of the memory. Those times, his theory was regarded with suspicion by the international scientific society, because the neural connections in the brain are excessive. The human brain has an extremely complex structure, and it is able to function simultaneously in multiple issues [4]. The theory of another scientists James is similar to the Bain's theory, however, at the same time, James assumed that the formation of memory is realized due to the transmission of the impulses between the neurons, without requiring connections of neurons for each act of remembering or action.



Fig 6. Man Wolfpack

In 1943, Mc.Culloch and Pitts developed computer model for neural networks based on mathematical algorithms [6]. They called the model "threshold logic". In late 1940s, Canadian psychologist and physiologist

Donald Hebb, basing on the mechanism of neural plasticity, suggested the hypothesis of training interpretation known as Hebb theorem. Hebb theory is viewed as a typical self-learning, which studies the issue directly without intervention of the expert system [7].

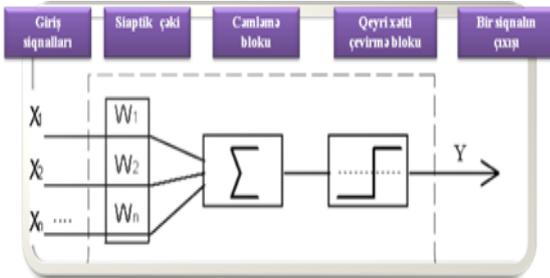


Fig 7. Neural network processes

Neural Networks Researches stopped after the publication of computer learning by Minsk and Papert in 1969. They found two main problems related to computing machines, so they were processing neural networks. The first problem was that logical computation was not possible in one-layer neural networks. The second major problem was that computers did not have enough computational power to process a large volume of calculations necessary for the efficient neural networks. Neural Networks Researches were delayed until computers achieved massive computing power. One of the major achievements was the development of a method of backward propagation of errors, thus, the logical computation enabled the problem solution. Summation block (denoted by net) is the sum of the multiplied appropriate weight coefficients (w) of total input signals (x).

$$net = \sum_{j=1}^n W_j x_j$$

Multi-layer neural networks "Cognition" developed by K. Fukusima in 1975, was one of the first papers in this field. The actual structure of the network and methods used for Cognitron to provide relative weights of relations was replaced by another strategy, so that each of the strategies had its pros and cons. The networks were able to distribute information in only one direction or to drop the information from another end, however, all nodes did not activated, and the network was not finite. To achieve two-way transfer of information between neurons nodes was possible in Hopfield network (1982), and it was first included in the hybrid networks for specific purposes. In the mid-1980s, parallel distributed processing algorithm known as connectives was developed (connectives is based on network theories, which are difficultly organized and self-organizing systems). Rumelhart and McClelland (1986) made full use of connectives for computer modeling of neural processes.

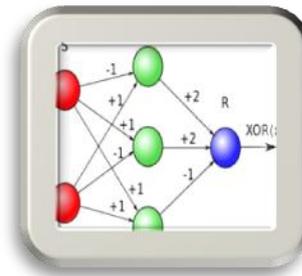


Fig 8. Hopfield network

The spread of the method based on backward propagation of errors caused great enthusiasm, as well as much controversy in the scientific community. Thus, there was a doubt whether this study can be realized in the brain or not, because backward transmission mechanism of the signal was not known then. In addition, in 2006, a number of training algorithms of neural networks were proposed. These algorithms can be used with and without output signals to comprehend the main features of sensor signals distribution, which move in each layers of neural network, and to study the intermediate presentations. Algorithm for parallel distributed data processing was known as connectives for in the mid-1980s. Rumelhart and McClelland (1986) made full use of connectives for computer modeling of neural processes. Neural networks used in the field of artificial intelligence are traditionally viewed as the simplified models of neurons of the brain. Thus, artificial neural networks of any size reflect the real structure of the brain. Theoretically, the main subject of researches is the complexity in neurobiology and its properties, so they should have the separate neurons.

II. CONCLUSIONS

In this paper, we propose history single biometric network. With that end in view widely used neural networks. Neural networks used in the field of artificial intelligence are traditionally viewed as the simplified models of neurons of the brain. Thus, artificial neural networks of any size reflect the real structure of the brain. Theoretically, the main subject of researches is the complexity in neurobiology and its properties, so they should have the separate neurons.

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In 1982, he defended a doctoral dissertation at Kazan State University on specialty of "01.01.07-Applied Mathematics" on the subject of "Initial solution difference methods of bounded problems for mixed type equations".

As of 1978, he worked at head engineer at ACS department under Institute of Cybernetics of Azerbaijan Academy of Sciences. In 1979, he was appointed to the post of leading engineer, and in 1980 – to the post of head project engineer.

As of 1986, he works as head of department at ANAS Institute of Information Technologies. During this period he participated in establishment of automated control systems of agriculture, material aid to the population, education of technical specialties.

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AUTHOR'S PROFILE



Safagat Mahmudova is head of sector at the Institute of Information Technologies of ANAS. S. Mahmudova has the degree of Doctor of Philosophy of technique. She is the author of 30 scientific works and 35 theses. Sh.J.Mahmudova was elected deputy editor-in-chief of International Journal of Intelligent Information Processing (IJIIP), and a member of editorship of Gconference.NET portal, and a member of the International Association for Pattern Recognition (IAPR). Sh.J.Mahmudova was elected a reviewer of International Journal of Automation and Power Engineering. The journal is published by the Science and Engineering Publishing Company (Riley, Indiana, USA). Sh.J.Mahmudova was elected a reviewer of Journal of Control Engineering and Technology (JCET). Was elected as a member of the International Association for Pattern Recognition (IAPR). At present, she the "Human face based on photo-portraits of methods and algorithms for the recognition of racial identity" is engaged in scientific research on the subject. She teaches at Education Center of ANAS Institute of Information Technologies.



In 1973 Tofiq Kazimov graduated from mechanical-mathematical faculty of Azerbaijan State University with honors.