

# IDENTIFICATION OF A PERSONALITY

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**Abstract.** Biometric technologies are based on biometrics, measurement of the unique characteristics of a certain person. These are the unique signs received by a person from birth and acquired characteristics that can change under the influence of time or external environment. This article discusses the principles of operation, types of biometric identification systems, describes examples and areas of their application.

## 1 Biometric technologies

Are based on biometrics, measurement of the unique characteristics of a certain person. They may include unique signs received by a person from birth, such as DNA, fingerprints, iris; as well as the acquired characteristics that can change under the influence of time or external environment, such as handwriting, voice or gait [1, 2].

Principle of operation. All biometric systems work almost identically. First, the system remembers a sample of the biometric characteristic (this is called as a recording process). During the recording, some biometric systems may ask to make several samples in order to make the most accurate image of the biometric characteristic. Then the received information is processed and transformed into a mathematical code. In addition, the system may ask to make some additional actions in order to “ascribe” the biometric sample to a certain person. For example, a personal identification number (PIN) is attached to a specific sample, or a smart card containing a sample is inserted into the readout device. In this case, a sample of the biometric characteristic is made again and is compared with the presented sample:

- by fingerprints (dactylography);
- by iris;
- hand geometry;
- by speech characteristics;
- by face;
- by handwriting.

Biometrics is the technology of identification of a personality that uses physiological parameters of the subject (fingerprints, iris, etc.). Biometric parameters include static fingerprints, hand geometry, iris, etc. Dynamic parameters include the dynamics of reproduction of a signature or a handwritten keyword, voice, etc.

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## 2 Fingerprints

This method is the oldest and the most common among identification methods using the physiological characteristics of the organism. It is used in all countries by the law enforcement agencies for identification of criminals [3].

Nowadays, dactyloscopy (identification of fingerprints) is the most developed biometric method for identification of a personality. The method is very well developed because of its wide use in criminology in the 20th century.

Each person has a unique papillary fingerprint pattern that makes identification possible. Usually algorithms use characteristic points on fingerprints such as the end of the pattern line, the branching of the line, single points. In addition, information about the morphological structure of the fingerprint is used: the relative position of the closed lines of the papillary pattern, of the “arched” and spiral lines. Specific features of the papillary pattern are transformed into a unique code, which preserves the information value of the print image. “Fingerprint codes” are stored in the database used for search and comparison. Transferring the fingerprint image into the code and its identification depends on the database size and usually does not exceed 1 second. The time of taking fingerprints is not taken into account.

## 3 Speaker recognition systems

This is one of the oldest biometric technologies. Currently, its development has become more active; specialists think that it will have a great future and wide use in building “intelligent constructions”. There are many ways to construct the identification code by voice; as a rule, they include different combinations of voice frequency and statistical characteristics (Figure 1).

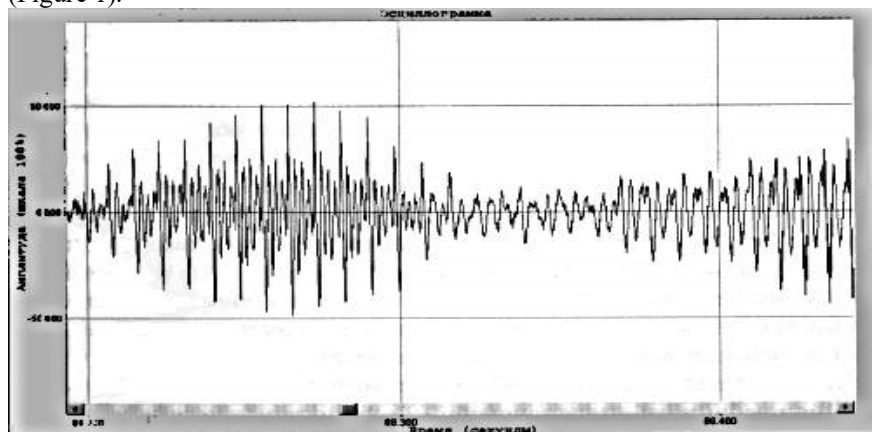


Fig 1. Speech identification systems.

## 4 Iris recognition systems

This is the most simple and convenient method, but less reliable. Iris is a unique characteristic of a person. The iris pattern is formed on the eighth month of intrauterine development; it finally stabilizes at the person’s age of two and practically does not change during life, except because of severe injuries or sudden pathologies. The method is one of the most accurate among other biometric methods.

The iris recognition system is logically divided into two parts: the device for image capture, its preprocessing and transmission to the calculator, and the calculator that compares

the current image with the images from the database, and transmits the admission command to the executive device [4].

The time of image preprocessing in modern systems is approximately 300...500 milliseconds, the speed of comparison of the obtained image with the images from the data base is about 50000–150000 comparisons per second (on an ordinary PC). Such speed of comparison does not impose restrictions for application of the method in systems for access in large organizations.

## 5 Facial recognition systems

When using this method of recognition, a three-dimensional image of a person's face is constructed. The contours of eyebrows, eyes, nose, lips, etc. are outlined on the face, the distance between them is calculated, and not a simple image is constructed, but many possible variants for cases of face rotation, flexion, and change of expression. The number of images varies depending on the purpose of application of this method (for authentication, verification, remote search on large territories, etc.).

## 6 Hand geometry recognition systems

In respect of technological structure and level of reliability, the method of identification by hand geometry is quite comparable with the fingerprint identification method.

## 7 Signature recognition systems

Typically, a person's signature or writing a code word (sometimes) is used for a person's identification. Depending on the required degree of protection and availability of equipment (graphic tablet computer, screen of a handheld Palm computer, etc.), two types of the digital identification code can be formed:

- By the signature itself (just the degree of coincidence of two images is used for identification);
- By the signature and dynamic characteristics of writing (identification is conducted based on the convolution, which includes information about signature, time characteristics of making signature and the statistical characteristics of the pressure dynamics).

## 8 Conclusion

Biometric technologies are actively used in many areas related to protection of access to information and material objects, as well as in the tasks of unique identification of a personality in order to provide:

- access control;
- information protection;
- identification of clients.

Comparison of the cost of identification systems:

- Fingerprint identification system (dactyloscopy)—827 rubles.
- Iris recognition system—17400 rubles.
- Hand geometry recognition system—47200 rubles.
- Speaker recognition system—803 rubles.
- Facial recognition systems—27900 rubles.

Currently, our team is developing a method for secretive collecting and analyzing biological information. We will present it in detail in the future publications.

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