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ANALYSIS OF BIOMETRIC TECHNOLOGY METHODS

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The field of biometric technologies has undergone significant changes due to the large-scale implementation of biometrics in everyday life. A person directly encounters biometrics in life - from obtaining a passport or visa to purchasing a modern gadget [1].

Biometric identification and authentication technologies are used by the majority of people in different countries of the world. Significant projects are realized by governmental and commercial structures. The use of biometric technologies is one of the most important factors that determine the success and competitiveness of any subject of public life - a private person, company, or state [2].

The main advantage of biometrics is the possibility of quick and easy identification or authentication (verification) without inconveniencing the individual [2].

Many human traits and characteristics are used in practice, among them the most common ones are fingerprint, iris, and facial image recognition.

Identification in any biometric system goes through four stages [1]:

- recording – a physical or behavioral pattern is remembered by the system;
- extraction – unique information is extracted from the captured samples and analyzed by the system;
- Comparison - the resulting sample is compared to an existing sample;
- match/non-match – the system determines whether the submitted biometric samples match and makes a decision accordingly.

Now there are two groups of biometrics methods, static and dynamic [2].

Static methods – based on the physiological and unique characteristics of a physical person, which is provided from birth, is an integral part of a person and does not change over time [1].

Fingerprint – a unique pattern of papillary patterns on the fingers. The fingerprint is taken by a scanner, turned into a digital code, and compared with the sample stored in the system.

Palm shape – individual geometry of the palm, hand, or finger. Using a special device consisting of a camera and several diodes, a three-dimensional image of the palm is built up, from which a convolution is formed and the person is recognized.

Vein pattern on the palm or finger of the hand – an infrared camera is used to read the vein pattern on the front side of the palm (hand) or finger, the obtained image is processed and the corresponding digital convolution is formed according to the vein pattern.

Iris – for its scanning a portable camera and specialized software are used, with the help of which the corresponding part of the face is scanned and the image of the eye is selected, from which the pattern is separated and the corresponding digital identification code of the person is formed.

The retina of the eye is the pattern of blood vessels in the eye fundus. In order for this pattern to become visible and possible to record, a person needs to look at distant light source-vessels, and then the illuminated eye fundus is scanned by a special camera.

Face shape – formation of a two-dimensional or three-dimensional image of a person's face. The contours of eyebrows, eyes, nose, and lips are marked on the face, the distance between them is calculated, and not only the image of the face is formed, but also its many variants in case of face rotation or inclination, as well as changes in expression.

Thermogram of a face, thermography of a hand or a finger – the uniqueness of distribution on each part of a human body of arteries which provide blood supply to the chosen area of skin and form a specific thermal background on it. Special infrared cameras are used to obtain thermograms.

DNA – the methods used for obtaining and processing DNA are rather labor-intensive and time-consuming, so the systems applying this method are mainly used only for specialized expertise.

Dynamic methods – based on the analysis of behavioral characteristics, features of mobile actions, and subconscious facial movements [1].

Handwriting – a person's signature is usually used. A digital identification code is formed depending on the required degree of protection and availability of necessary equipment.

Handwriting identification is of two types [1]:

- by the signature itself;
- by the dynamic characteristics of the signature writing.

Keyboard handwriting – uses a set of codewords and does not externally require any special equipment other than a converted standard keyboard.

Voice – there are many ways to form voice identification codes, but usually they are different combinations of frequency and statistical characteristics of the voice.

Generalizing the characteristics of all methods and techniques of biometric identification and authentication they can be divided by quantitative indicators [1]:

- the presence of "first kind" errors (not allowing "one of your own" into the system) – due to the dependence on hardware quality it is very difficult to compare these methods;
- the second kind of error (to let "someone else" into the system) – the general sorting of the most common methods by quality looks like this (from the best to the worst) [1]:
- DNA;
- iris, retina;
- fingerprint, facial thermography, palm shape;
- shape of the face, location of veins on the hand and palm;
- signature;

- keyboard handwriting;
- voice.

Static identification methods are considered to be of much higher quality than dynamic methods, but are also much more expensive [2].

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