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**SYSTEMATIZATION AND QUALITATIVE ASSESSMENT  
 OF MODELS OF ACCESS FOR LASER TECHNOLOGICAL  
 COMPLEX BASED ON BIOMETRICS**

**Abstract**

The dynamics of capital investments in the development of biometric systems of access is shown. On the basis of heuristic method a list of modern biometric models of access which are acceptable for the use in the structure of laser technological complex is considered. The result of the systematization of models of access after biometric attributes is presented as a histogram, which confirms the priority of «fingerprints» biometric attribute at present. Qualitative assessments of biometric models of access, the use of which allows developers to accelerate design process, are offered. Due to the properties of biometric systems of access constant monitoring of access to microprocessor control system that fully satisfies safety requirements during laser technological complex operation is implemented.

**Keywords:** laser technological complex, model of access, biometric attribute.

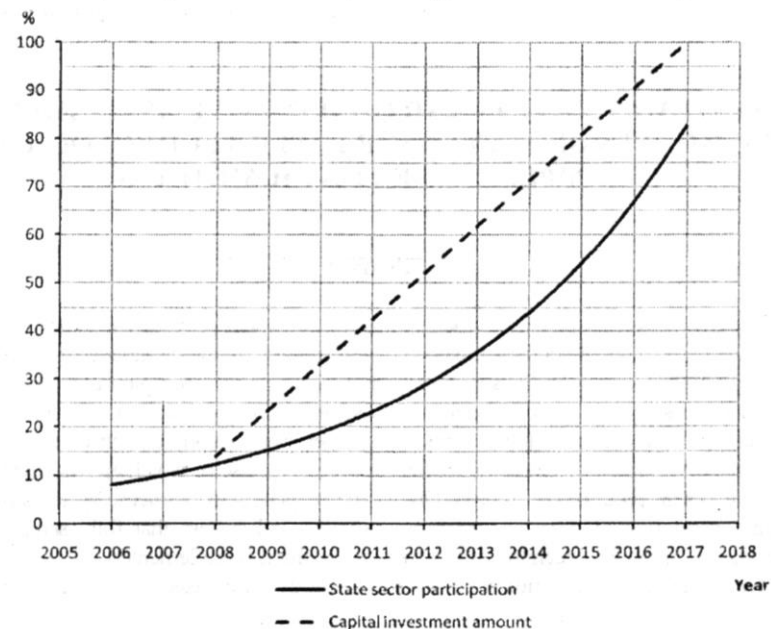
**I. Introduction**

Laser technological complexes (LTC) are flexible, universal, science intensive process equipment. Their use allows to ensure high performance, the ability of quick change of product range, full automation of the process, high accuracy, reliability and also high product quality, increasing the competitiveness at world market.

However, laser technological systems are the source of many hazards associated with the peculiarities of laser radiation, invisible to human eyes. Therefore, when designing LTC, the necessity to ensure safety engineering both for laser systems personnel and for the prevention of unauthorized access to microprocessor LTC control system to avoid accidental activation of laser emitter is a primary task.

The main functions of biometric systems of access are: the identification of a person after one of biometric attributes, the determination of access rights to an object, providing an access to the object of the person that has passed the verification, the fixation of information about each pass through the element of access, the registration of violation attempts, the prevention of unauthorized access, time tracking and others.

System analysis of modern models of access to the objects of critical application has shown that the preference is given, first of all, to the models based on biometrics. Both the dynamics of capital investments in biometric systems market in whole [1-3] and state sector participation in them in percentage wise are shown in Fig. 1.



**Fig. 1. The dynamics of capital investments in the development of biometric systems of access and state sector participation in them**

Fig. 1 shows that both the trend of biometric technology orders growth in whole and state sector participation in them are kept constant. For example, only during 2008–2011 overall increase in biometric technology orders has increased 3 times, and state sector participation in them – more than 2 times.

At product market, in the conditions of rapid development of modern micro- and nanotechnologies, many companies offer a large number of biometric models of access for different objects control.

Therefore the problem of system analysis of the main characteristics of biometric systems of access for LTC is urgent.

**II. Problem statement**

The determination of biometric attribute of the model of access for LTC on the basis of the systematization and qualitative assessments after the main characteristics of modern biometric systems is the **purpose of the paper**.

**III. Results**

It is known that biometric identification technologies are based on checking of unique physiological features of a person, which remain practically invariable throughout the life [4-5].

These features include:

- a retina;
- an iris;
- fingerprints;
- hand geometry;
- venous hand pattern;
- face geometry.

For conducting of system analysis the main characteristics of access control systems based on biometric technologies and their qualitative assessments depending on biometric attribute are shown in Table 1.

**Table 1 The main characteristics of access control systems based on biometric technologies and their qualitative assessments**

Model (company)	Biometric attribute (discount rate at the market)	Probability of unauthorized access, % (FAR)	Probability of false alarm, % (FRR)	Identification time (capacity), sec.	Disadvantages	Advantages
1. Eye-identify ICAM 2001 (Eyedentify)	Retina parameters (1 %)	0,0001	0,4	1,5...4	Complicated and long process, high cost, low market demand	High reliability, non-invasive method, large security
2. Iriscan (Iriscan)	Iris parameters (7 %)	0,00078	0,00066	2	High cost, sensitivity of identification aids to external factors	Statistical reliability, comfort, safety and security of the method

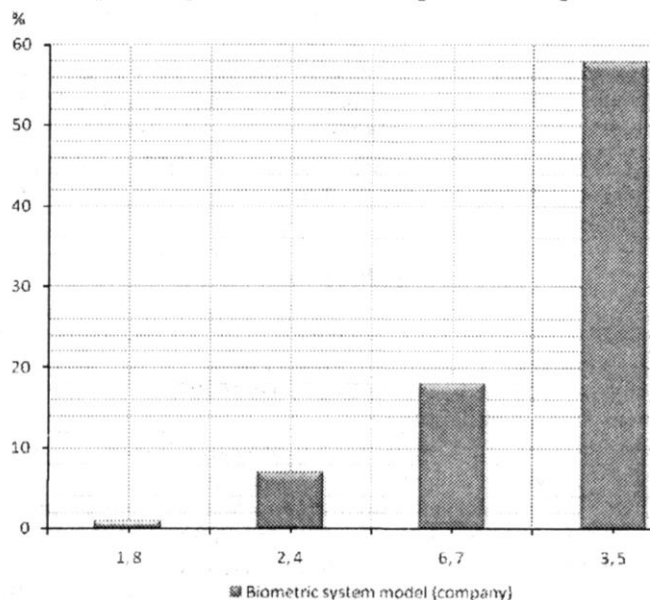
3. Finger-Scan (Identix)	A fingerprint (58 %)	0,0001	1,0	0,5	Insufficient protectability, papillary pattern fragility	High authenticity, low cost of devices, simple scanning procedure
4. BioMet	Hand geometry (7 %)	0,1	0,1	1	Reliability is comparable to fingerprints identification	High cost and large size of scanners, uncomfortable procedure for identifying
5. Veri-print 2100 (Biometric ID)	A fingerprint (58 %)	0,001	0,01	1	Insufficient protectability, papillary pattern fragility	High authenticity, low cost of devices, simple scanning procedure
6. Vocord	Face geometry (2D) (18 %)	0,01	0,2	1	Low authenticity, complexity of usage	Distant recognition, low cost of equipment
7. Geometrix, Inc. Bioscript	Face geometry (3D) (18 %)	0,001	0,01	1,5	High cost, sensitivity to facial expression changes	Distant recognition, low sensitivity to external factors, high reliability
8. Hitachi VeinID, Fujitsu	Venous hand pattern (1 %)	0,0008	0,01	1-2	Environments ensitivity	High authenticity, no contact with the scanner

An economic indicator – the cost of the model of access – is one of the most important qualitative assessments at present.

The analysis of qualitative assessments, listed in Table 1, shows that, while ensuring high reliability of 0.001 and a simple scanning procedure, the models of access of companies FingerScan (Identix), VeriPrint 2100 (Biometric ID) with

«fingerprint» biometric attribute have low cost. Therefore, the model of access with «fingerprint» biometric attribute has an absolute priority for LTC.

The result of systematization of models of access after biometric attributes at product market in percentage wise is shown in Fig. 2 as a histogram.



**Fig. 2. The histogram of discount rate at the market of the systems of access after biometric attributes**

Note:

numbers 1, ..., 8 correspond to the numbers of models listed in Table 1.

Histogram analysis (Fig. 2) shows that, owing to the high authenticity, low devices cost and easy scanning procedure, biometric systems of access based on fingerprints (58 %) have become widespread at the market.

Due to the impossibility of biometric data loss and transfer to another person, the use of biometric systems of access for continuous monitoring of access to microprocessor control system fully meets safety requirements during LTC operation.

#### IV. Conclusions

Both the dynamics of capital investments in biometric systems market in whole and state sector participation in them in percentage wise, which confirms the urgency of problem task, is shown.

The list of modern models of access of relevant companies is proposed, their qualitative assessments are represented.

System analysis of the main characteristics of biometric systems of access is conducted to determine biometric attribute of the model of access, which is acceptable for laser technological complex. This will allow developers to accelerate design process.

The result of the systematization of models of access after biometric attributes as a histogram of the dependence of discount rate at the market of models of access, which confirms at present the priority of «fingerprint» biometric attribute (58 %), is shown.

The further development of the topic should be directed to the improvement of existing models of biometric systems of access for LTC for the purpose of their functionality expansion.

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