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Conceptual Aspects of The use Of Biometric Technologies in the Field of Counteraction to Criminal Offenses while Air Transportation

The article specifies that systematic and complex scientific researches on problems of the use of biometric technologies in preventive activity regarding detection and neutralization of threats to entities-facilities of air transport, companies staff, institutions and organizations which work in this field have not been considered yet. The results of researches and scientific papers of representatives of the Ukrainian forensic community had been analyzed, which determined the need for theoretical-legal and forensic research in the field of identification and verification of a person with the use of biometric technologies to solve tasks of counteraction to crime and civilian tasks of managerial and controlling content..

Keywords: biometrics, legal problems, identification, neural network methods, algorithm, voice profiling.

Introduction. The most common preventive measures regarding identification and neutralization of threats to air safety are the introduction of levels of admission of personnel to a specific designated area.

The basis for granting such permits is the collection and analysis of information on candidates for positions and determination of the need for admission of a particular person to specific areas and facilities, based on biometric identification.

Innovative technologies for ensuring the security of facilities include the introduction of biometric, multibiometric, multimodal and multifactorial methods for identifying probable entities of criminal offenses.

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Analysis of publications where this problem solution is initiated. The analysis of research in the field of Law and Law Enforcement indicates the lack of systematic and multidisciplinary researches on the use of biometric technologies in preventive activity as to identification and neutralization of threats to air transportation entities-facilities, personnel of enterprises, institutions and organizations performing activities within the specified infrastructure.

The constant development and cheapening of biometric identification systems enable to use these tools more and more extensively and actively in various solutions for ensuring information security of computer and telecommunication networks, in corporate systems of working time accounting (especially for control of business processes requiring clearly defined personalization and personal responsibility)[1].

For the last time, research has been conducted on various issues of securing biometric data, moral and legal problems of using biometric technologies. Over the past ten years, a number of research papers by such scientists as V. P. Zakharov (2015), V. I. Rudeshko (2015), A. O. Moroz (2011)[2], Yu. S. Syniekop, O. P. Mintser, K. V. Ruzhytska, V. B. Milin (2008)[3], PR. Iu. Tsarov (2016)[4], A. V. Movchan, D. A. Movchan[5] (2009), V. V. Nehrebetskyi [6] (2019), V. A. Shvets, A. A. Fesenko[7] (2013) and others have been published. In addition to the general legal aspect of studying issues on using biometric identification in combating crime, particular attention should be drawn to research papers on the development of problems of biometric identification in the following directions:

- modern methods of biometric identification and determination of promising research areas: P. Bediuk, V. Bondarchuk[8] (2009);
- use of biometric identification methods based on the features of a person's thermograms: O. O. Fraze-Frazenko [9] (2013);
- problems of facial biometrics: S. Novikov, V. Hudkov (2010), O. Chernomordyk[10];
- fingerprint recognition: H. Kukharev[11] (2001), A. Telnykh;
- neural network methods of biometric identification: A. Ivanov, A. Malyhin;

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CONCEPTUAL ASPECTS OF THE USE OF BIOMETRIC TECHNOLOGIES IN THE FIELD OF COUNTERACTION TO CRIMINAL OFFENSES IN THE AIRLINE INDUSTRY

The article specifies that systematic and complex scientific researches on problems of the use of bibliometric technologies in preventive activity regarding detection and neutralization of threats to entities-facilities of air transport, companies staff, institutions and organizations which work in this field have not been considered yet. The results of researches and scientific papers of representatives of the Ukrainian forensic community had been analyzed, which determined the need for theoretical-legal and forensic research in the field of identification and verification of a person with the use of biometric technologies to solve tasks of counteraction to crime and civilian tasks of managerial and controlling content. The article purpose is to define current problems of the development of the newest directions of biometric technologies use in counteraction to criminal and other types of offenses; formation of theoretical principles of algorithmization of the use of biometric technologies in preventive activity.

The use of the complex of general and special research methods

has made it possible to identify factors and content of reasons and conditions for solving the present day tasks with the use of biometric technologies in security and preventive activities. Such approach has helped to draw the conclusion that the most promising directions of biometric technologies application are: security guaranteeing and ensuring access control to certain areas and space activity facilities; creation of a person identification systems; introduction of reliable and economic means of delimitation of access to the territory of facilities, buildings and internal premises of space activity entities; efficiency and personnel management; information protection of multifunctional user identification systems in information networks, operating systems, various add-ons for typical software.

Keywords: biometrics, legal problems, identification, neural network methods, algorithm, voice profiling.

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КОНЦЕПТУАЛЬНІ АСПЕКТИ ВИКОРИСТАННЯ БІОМЕТРИЧНИХ ТЕХНОЛОГІЙ У СФЕРІ ЗАПОБІГАННЯ КРИМІНАЛЬНИМ ПРАВОПОРУШЕННЯМ НА ПОВІТРЯНОМУ ТРАНСПОРТІ

У статті констатовано, що поза межами предмету сучасних досліджень залишилися системно-комплексні розвідки проблем використання в превентивній діяльності біометричних технологій щодо виявлення і нейтралізації загроз суб'єктам-об'єктам повітряного транспорту, персоналу фірм, установ та організацій, що провадять свою діяльність в межах означеної інфраструктури. Проаналізовано результати досліджень і праць представників української криміналістичної школи, що визначило необхідність теоретико-правових та криміналістичних досліджень у сфері ідентифікації та верифікації людини з використанням біометричних технологій для вирішення завдань протидії злочинності й цивільних задач управлінського та контролюючого змісту. Метою статті є визначення

- recognition based on the parameters of the hand wrist: L. Mestetskyi;
- standardization and biometric technology: I. Spyrydonov[12];
- -automation of researches in the area of biometric identification: V. Dymkov, V. Synitsyn;
- human voice recognition: S. Bochkarov;
- multibiometrics: O. Ushmaiev.

Among foreign researches in the area of biometric identification research papers by such specialists as A. Masnfield, A. Pentland, A. Ross, D. Maio, D. Maltoni, D. Zhang, J. Daugman, J. Wayman, K. Bowyer, M. Turk, N. Ratha, P. Griffin, P. Grother, P. Phillips, R. Bolle, A. Jain and others should be emphasized.

Recently, in other countries, works are performed at the level of dissertations and monographs by the following scientists: Akhtar Z.[13] (2012), S. S. Kumar[14] (2012).

Despite the considerable attention of the world scientific community to biometric identification in the areas of combating crime, physical protection of facilities and other areas of national security, there are a number of theoretical, conceptual and technological-tactical issues of using biometric technology in this area.

Examination of the results of the above researches and works of representatives of the Ukrainian criminalistics school demonstrates the necessity for theoretical and forensic researches in the field of human identification and verification using biometric technologies to solve crime counteraction and civilian tasks of managerial and control content.

The outlined circumstances conditioned the development in the article of theoretical, applied and legal issues on the use of biometric technologies in the area of security of Ukrainian air transport.

Aim. The aim of the article is to determine modern problems of formation of the latest trends in the use of biometric technologies while counteraction to criminal and other kinds of offenses in management activity and other areas of the present.

Results and discussion.

In the present conditions, the methods of biometric identification in law enforcement are applied to:

- search for missing persons and identification of persons who evade investigation, trial and sentence serving[15];
- identification of persons suspected of criminal illegal activity (especially terrorist one) and those involved in the activities of transnational criminal organizations[16];
- identification of persons in payment systems to prevent financial fraud;
- neutralization of threats of interference in cybersystems;
- protection of air transport and other structural elements of critical infrastructure from unlawful interference in their activities;
- counteraction to illegal migration and human trafficking by entering biometric data into the Unified State Demographic Register (digitized

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sample of a person's signature, digitized image of a person's face, digitized fingerprints of a person) and corresponding databases of law enforcement agencies[17];

- creation of systems of control over access to certain facilities and territories as well reaffirmation of the right to admission to certain activities[18];
- recognition of persons identified while police surveillance[19].

Analysis of publications of scholars and analytical outputs of institutions engaged in the development of person identification systems to solve tasks of law enforcement, implementation of monitoring functions while admission to relevant facilities, has proved that the most common biometric identifiers are fingerprints (58%), facial geometry (18%), iris (7%), hand geometry (7%), voice (5%), handwriting / signature (1%) etc.[20] (E.g. Fig.1).

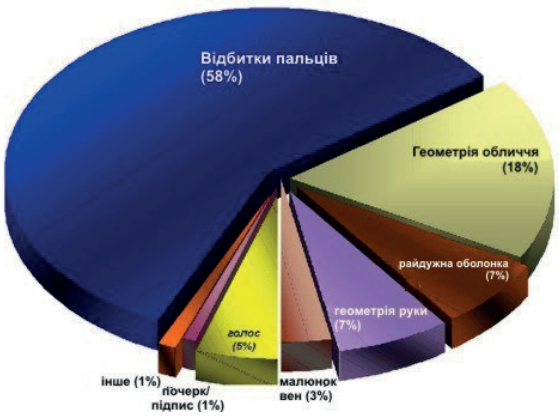

Fig. 1. The most common biometric identifiers.

The above is evidenced by only a small number of human biometric identification methods.

It should be stressed that the experience of law enforcement agencies of various countries, as well as aviation security services shows that the application of the biometric method is performed in combination with the use of the profiling method to create a behavioral model of alleged persons[21].

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[21] Шинкаренко І. Р., Шинкаренко І. І. Профайлінг як метод убезпечення об'єктів авіаційної інфраструктури. Актуальні проблеми експертного забезпечення досудового розслідування :

сучасних проблем формування новітніх напрямів використання біометричних технологій у протидії кримінальним та іншим видам правопорушень; розробка теоретичних засад алгоритмізації використання біометричних технологій у превентивній діяльності.

Використання комплексу загальних та спеціальних методів досліджень дозволило визначити чинники і зміст причин та умов вирішення завдань сьогодення з використанням біометричних технологій у безпековій та превентивній діяльності. Такий підхід допоміг дійти висновку, що найбільш перспективними напрямами застосування біометричних технологій є: гарантування безпеки і створення контролю доступу до відповідних зон та об'єктів-суб'єктів космічної діяльності; створення ідентифікаційних систем особи; упровадження надійних й економічних засобів розмежування доступу на територію об'єктів, споруд і внутрішніх приміщень суб'єктів космічної діяльності; оперативність та управління персоналом; захист інформації щодо використання багатофункціональних систем ідентифікації користувачів в інформаційних мережах, операційних системах, різних додатках до типового програмного забезпечення.

Ключові слова: біометрика, правові проблеми, ідентифікація, нейромережеві методи, алгоритм, голосовий профайлінг.

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КОНЦЕПТУАЛЬНЫЕ АСПЕКТЫ ИСПОЛЬЗОВАНИЯ БИОМЕТРИЧЕСКИХ ТЕХНОЛОГИЙ В СФЕРЕ ПРЕДОТВРАЩЕНИЯ УГОЛОВНЫХ ПРЕСТУПЛЕНИЙ НА ВОЗДУШНОМ ТРАНСПОРТЕ

В статье констатируется, что за пределами предмета современных исследований остались системно-комплексные изыскания проблем использования в превентивной деятельности биометрических технологий по выявлению и нейтрализации угроз субъектам-объектам воздушного транспорта, персонала фирм, учреждений и организаций, осуществляющих свою деятельность в пределах обозначенной инфраструктуры.

Проанализированы результаты исследований и трудов представителей украинской криминалистической школы, что определило необходимость теоретико-правовых и криминалистических исследований в области идентификации и верификации человека с использованием биометрических технологий для решения задач противодействия преступности и гражданских задач управленческого и контролирующего содержания. Целью статьи является определение современных проблем формирования новейших направлений использования биометрических технологий в противодействии криминальным и другим видам правонарушений; разработка теоретических основ алгоритмизации использования биометрических технологий в превентивной деятельности.

Использование комплекса общих и специальных методов исследований позволило определить факторы и содержание причин и условий решения задач сегодняшнего с использованием биометрических технологий в области безопасности и превентивной деятельности. Такой подход помог сделать вывод, что наиболее перспективными направлениями применения биометрических технологий являются: гарантирование безопасности и создание контроля доступа к соответствующим зонам и объектам-субъектам космической деятельности; создание идентификационных систем личности; внедрение надежных и экономичных средств разграничения доступа на территорию объектов, сооружений и внутренних помещений субъектов космической деятельности; оперативность и управление персоналом; защита информации относительно использования многофункциональных систем идентификации пользователей в информационных сетях, операционных системах, разных приложениях к типовому программному обеспечению.

Ключевые слова: биометрика, правовые проблемы, идентификация, нейросетевые методы, алгоритм, голосовой профайлинг.

TThus, In the United States, Transportation Security Administration has developed a program in which 3,000 covert agents-observers who travel to American airports studying facial expressions, gestures of people in search of terrorists[22]. The borders of the aerodrome are directly monitored by video surveillance systems, electronic alarm sensors responding to unauthorized entry into the restricted access territory.

For example, Aviation Police Service of Chicago Air Complex has several thousand video cameras in the common area. Such number of means helps to monitor the behavior of natural persons and the movement of vehicles that hold a permit for it.

Based on the results of covert measures and the accumulation of behavioral information, lists of unreliable passengers have been compiled in the USA. There are two such lists. In the first: those who are suspected of terrorist activities. These people are not allowed to obtain airline tickets. The second list includes those whose activities arouse suspicion in law enforcement agencies. Usually in such cases an additional luggage control is performed. There is also a list of categories of people whose behavior is recommended to pay particular attention to. These categories include passengers who buy tickets at the last minute or one-way tickets, as well as those who pay in cash.

Thus, the efficiency of securing aviation infrastructure facilities depends not only on the use of technical means but also on the availability of special skills in psychological profiling in the staff of police, border control and aviation security services.

Currently, scholars from different countries study the legal, moral, organizational aspects of the use of biometric technologies:

- transparent and controlled use of biometric characteristics to identify certain individuals and standardize such activities in accordance with international law to ensure human rights guarantees: K. Khusti-Orban, F. Ni Aolein[23] (2020);
- ciris scanning and foot scanning to identify a specific person by “voice imprint”, as well as face recognition by video and photo materials: M. Dastbaz[24] (2013);
- issues of legislative embodiment of biometric confidentiality: Tiffani K. Li[25] (2020);
- development of a strategy for the use of biometric technologies to solve tasks of securing various aspects of activities[26];
- a specific direction of discussion in the area of using biometric technologies to solve different tasks of counteraction to criminal activity and neutralization of threats to specific entities and facilities is the issue of the right to dignity[27].

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Combination of innovative technologies, creation of state and interstate databases, including biometric data ones, improvement of the process of information exchange between various state and interstate bodies that must counter terrorism, an obligatory close cooperation of intelligence, police, military and other power structures and their capacity regarding the use of modern security systems should lead to related outcomes in the "war on terrorism", and, as a result, to enhance the attainment of the required level of detection and neutralization of alleged persons based on the principle of identification of anyone anywhere in the world. The basis for the implementation of this principle is the technology of iris scanning and foot scanning, as well as the identifier of the voice pattern and face recognition technology.

It should be stressed that the identification of the voice pattern in combination with the use of voice profiling while passengers' interviews during the pre-flight inspection at the airports of the world to identify potentially dangerous people are rather effective[28]. The training and use of specialists (profilers) to detect potentially dangerous passengers as to the possibility of committing illegal acts, primarily terrorist, was first implemented in Israel. A specially trained employee invites the passenger to the counter to interview in greater detail, based on how he looks and talks. The voice profiling system evaluates not what the passenger says, but how he says it, and also the level of his excitement, voice fluctuations, etc. It's an ordinary handset that the inspector is holding, and all he has to do is answer four or five questions. The whole procedure lasts less than one minute[29].

OExcept for the use of biometric technologies to secure airports, air and other modes of transport in general, biometric identification systems are irreplaceable in combating illegal immigration, illegal border crossing, human trafficking, forgery and theft of non-biometric identification documents, criminal elements activity.

To optimize the use of biometric technologies in law enforcement and determine a set of methods and measures using them, it is required to abstract the problem-solving process to some extent from the subject and aim. Scholars claim that all problem-solving processes have the same structure and form. Thus, the distinguished inventor G. S. Altshuller developed an algorithm for solving technical problems, which later became known as the theory of solving inventive tasks. It turns out that no matter who the inventor is, no matter what he invents, the form of his activity always goes through the same stages and is the only functional scheme. And this scheme reflects the form of problem-solving activities and makes up an algorithm of actions[30].

CIt should be noted that the idea of developing standard algorithms of actions is not new in criminalistics and air transport security activities. Issues of algorithmization of investigative actions have recently been considered in research papers by H. K. Avdieieva, R. S. Belkin, I. Ye. Bykhovskyi, M. B. Vander, I. A. Vozghryn, H. A. Hustov, Ye. P. Ishchenko, L. M. Karnieieva, I. Kertes, P. M. Lantsman, N. S. Polovyi, L. O. Soia-Serko, K. O. Slyvynskyi, V. Yu. Shepitko, A. Z. Shatalov, L. H. Edzhubov, A. A. Eisman and others[31].

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I. Shynkarenko, V. Zakharov, I. Shynkarenko, O. Zakharova

ASPECTS CONCEPTUELS DE L'UTILISATION DES TECHNOLOGIES BIOMÉTRIQUES DANS LE DOMAINE DE PRÉVENTION DES INFRACTIONS CRIMINELLES RELATIVES AU TRANSPORT AÉRIEN

L'article indique qu'en dehors du sujet de la recherche moderne, il restait une intelligence complète du système sur l'utilisation des technologies biométriques dans les activités préventives pour identifier et neutraliser les menaces pour les sujets du transport aérien, le personnel des entreprises, des institutions et des organisations opérant dans l'infrastructure indiquée. Les résultats des recherches et des travaux des représentants de l'école criminalistique ukrainienne ont été analysés, ce qui a déterminé la nécessité de recherches théoriques, juridiques et criminalistiques dans le domaine de l'identification et de la vérification humaines à l'aide de technologies biométriques pour résoudre les problèmes de lutte contre le crime et des tâches civils de gestion et de contrôle du contenu. L'objectif de cet article est d'identifier les problèmes modernes de formation des nouvelles directions d'utilisation des technologies biométriques pour lutter contre les délits criminels et autres; développement de bases théoriques d'algorithmique de l'utilisation des technologies biométriques en activité préventive.

L'usage d'un ensemble de méthodes de recherche générales et spéciales a permis de déterminer les facteurs et le contenu des causes et des conditions de résolution des problèmes actuels avec l'utilisation des technologies biométriques dans les activités de sécurité et de prévention. Cette approche a permis de conclure que les domaines d'application les plus prometteurs des technologies biométriques sont: assurer la sécurité et créer un contrôle d'accès aux zones et objets-sujets pertinents des activités spatiales; création de systèmes d'identification de la personne; mise en place de moyens fiables et économiques de délimitation de l'accès au territoire des objets, constructions et locaux internes des sujets de l'activité spatiale; efficacité et gestion du personnel; protection des informations sur le terrain concernant l'usage des systèmes multifonctionnels d'identification

des utilisateurs dans les réseaux d'information, les systèmes d'exploitation, diverses applications aux logiciels standards.

Mots-clés: isométrie, problèmes juridiques, identification, méthodes de réseaux neuronaux, algorithme, profilage vocal.

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It is believed that the purpose of any algorithmization is to optimize a particular activity and organization of processes of rapid development and criminal proceedings, increase the efficiency and objectivity of results, create real conditions for the development of automated systems for processing and evaluating information (criminal analysis), decision making in certain typical situations[32].

Analysis of research papers of the Ukrainian forensic tactics school allows us to indicate that, on the one hand, tactics is a theory that is part of criminalistics, and on the other: is the practice of implementation of a set of investigative (search) and covert investigative (search) actions to solve criminal proceeding tasks. In practice, it is a kind of technology for performing investigative (search) and covert investigative (search) actions, as well as preventive and other measures.

Given the above, modern science must justify the maximum number of algorithms for determining the methods and algorithms of using different types of biotechnology to solve specific tasks in certain situations. It should be agreed with scholars that algorithmization in its generally accepted meaning is an approach to detecting and documenting criminal activity, based on automated evaluation of information and provision of suggestions for the best course of action using biotechnology depending on the tactical situation.

One of the principles of the algorithm is its effectiveness: finiteness, ending with the appropriate result through a corresponding number of steps (actions). There are two main ways of fixing algorithms: in the form of step-by-step verbal description and in the form of flowcharts, which is more visual and easy to use as well as helps to translate them into a programming language.

In this case, it is advisable to clearly articulate tactical recommendations and propose tactical techniques by modeling possible particular situations and actions for their solution[33].

In the theory of information and cybernetics (E. I. Vilkas, E. Z. Maimynas)[34] the algorithm determines the order for the technology of obtaining and processing information.

The analysis of opinions of scientists and practitioners of police, aviation security services, border guards and customs service allows to state that for development of the general algorithm for the use of biotechnologies irrespective of a specific kind of criminal activity it is required to conduct information generalization of the following factors:

- the presence of information model of different types of criminal activity and a certain typology of actions that indicate criminal activity;
- expediency of algorithmization by scholars from different areas of activity on the use of biotechnologies in general and some of its types;
- availability of substantive grounds for the implementation of a set of measures on the use of biotechnology;

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- availability of already established in practice recommendations regarding the organization and tactics of biotechnology use.

It should be emphasized that the formation of the algorithm will be influenced by a number of factors (mostly of an objective nature):

- current situation,
- provision of formal grounds for the use of biotechnologies;
- availability of experienced workers with skills in the use of particular biotechnologies;
- availability of information-analytical and logistical support;
- a specific task that should to be solved with the help of biotechnology.

The algorithm can be detailed depending on a specific situation, the selected type of biometric data, which establishes a specific biometric technology to be used. To date, a significant number of recognition methods have been registered: combinations of methods and techniques based on recognition of facial shape, voice, fingerprints, retina, iris, geometry of the wrist, palm and finger, dynamics of signature and typing, lip movement, thermography of the face, hands and fingers, walk, body odor, DNA, ear shape, vein patterns on the hand or finger.

Currently, more and more experts believe that biotechnology in combination with nanotechnology will identify counters and patterns of the 21st century. But at the same time, this concept is not yet familiar to most of us. Today it is clear that the development of this technological trend will require radical changes in the activities of national security of the state and will lead to the same changes in law enforcement.

Conclusions. ПThe performed research and comparison of its results with the recommendations of scientific exploration in other countries of the world allows:

1. To identify areas of biometric technologies application regarding:

- ensuring security and creating access control to corresponding areas and facilities-entities of space activities;
- implementation of large-scale projects to create personal identification systems;
- access control: introduction of reliable and economic means of differentiation of access to the territory of facilities, constructions and internal premises of space activity entities;
- working time accounting: helps to reach reliability and efficiency in the management of such a key asset as personnel of space activity entities;
- information protection: large-scale and multifunctional systems of users identification in information networks, operating systems, various add-ons to standard software are introduced.

2. The most significant factors that should be taken into account when considering the feasibility for implementation of a particular biometric technology and the formation of the algorithm for its use are: accuracy, security, availability, ease of use, the ability to verify results, acceptance by users, cost, optimality

3. The general algorithm for the use of biotechnology consists of the following actions:

- 1) collection and analysis of primary information on the preparation or implementation of specific criminal activities and evaluation of a corresponding situation;
- 2) receiving a sanction for the use of biotechnology;
- 3) modeling of situations in which the use of biotechnologies is planned;
- 4) the choice of the monitored facility;
- 5) the choice of a method and means for solving addressed tasks;

- 6) the distribution of functions-tasks between the entities and participants while the use of biotechnology;
- 7) implementation of planned actions;
- 8) analysis of the results of biotechnology use

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