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# PERSONAL DATA PROTECTION WITH SMART CARDS USING EYE-GROUND IMAGE RECOGNITION TECHNIQUE

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Diabetes-induced pathologies are among the major causes, worldwide, of poor sight and blindness and are nowadays the least identifiable and treatable diseases. The resultant severe pathological changes entail persistent loss of visuality functions in patients over 50 [1, 2, 3, 4]. In recent years, such pathologies tend to become "younger". Actually, early manifestations of diabetes-triggered eye-ground pathological changes are ophthalmoscopied even at the age of 12 to 20 years [5]. It is noteworthy that a significant rise of morbidity rate is observed among the able-bodied categories of the population, inasmuch as the longevity of older people has increased, thereby increasing their share in the overall population [6]. In the USA, eye-ground pathologies hold the second place, after diabetes, among the causes of blindness. In Ukraine, the situation, as to the extent of diabetes-induced eye-ground pathologies, is worsening all the time [7]. For instance, for the last 20 years, the annual quantity of the first-revealed sight-disabled patients suffering from such pathology has increased 2.5 times [6].

The public health industry makes an intensive use of automated systems which allow to store data electronically. Such systems enhance the data exchange efficiency between health institutions, enable a remote access to health data systems, simplify and speed up patients' check-in procedure with the use of an electronic reception desk. Therefore, we can assert that health electronic information serves as a basis for many processes in the present-day health industry [8, 9, 10].

However, the major shortcoming of the modern computer systems lies in the fact that the access to a patient's case record for entering, modifying or deleting any information there is granted without the knowledge of the patient. As a result, such systems are not safe, inasmuch as they cannot ensure confidentiality and integrity of information. The systems that handle such important data as information about human health should be well secured [11, 12,].

The main attention should be focused on ensuring safe access to information, protection of the data being transmitted and usage of electronic signatures. The solution to such problems consists in using doctor's and patient's smart cards for definite identification of a doctor and a patient in a unified base of electronic medical cards (records). The use of such smart cards in computer systems would ensure a safe access to information and safe storage of confidential data of a patient. The safety of such information resources is provided with cryptographic methods [13, 14].

The objective of this work consists in upgrading of diabetes-induced eye-ground pathology recognition method and software tools, usable for pathology identification, and to demonstrate its possibility of person authentication to ensure confidentiality and integrity of the corresponding medical data system [15,16] and reduce risks of data breaches.

The database for the experimental research was furnished by Filatov Eye Pathology and Tissue Therapy Research Institute of the Academy of Medical Science of Ukraine. It contains over 500 images obtained with the use of a ZEISS VISUCAM LITE fundus camera (Germany). Upon enhancing the quality and pre-processing of such image, it is necessary to analyze its parameters. Having delineated the contours of the image items of interest (entities), we arrive at the respective eye-ground outline pictures (EGOPs). The next step is to identify all items so outlined for existence of a pathology, if any, and for the area thereof.

The analysis of the results demonstrates that the bulk-information-based segmentation method, based on assessment of the quantity of information, as developed by the authors hereof, exceeds by 5 to 25 % in terms of the FOM criterion, and is not much inferior, in terms of RMS criterion, to Roberts, Prewitt and Sobel operators.

Upon outlining of the image items of interest (entities), acquisition of EGOP, localization and assessment of the area of pathologies, it is necessary to perform clustering and diagnosing of such eye-ground pathologies. In practical ophthalmology, the following parameters are deemed to be clinical implications of pathology:

– location of an item in question (post-equatorial location, equatorial location, location within the disk of optic nerve, etc.);

– color (black, pigment-free, pink etc.);

– size (diameter, height).

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# LOGIC-NEURAL NETWORK METHOD TO ANALYSIS OF AUDIT DATA

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Nowadays the scientific and technical issue of the modern information technologies in financial and economic sphere of Ukraine is forming of the methodology of planning and creation of the decision support systems (DSS) at the audit of enterprises in the conditions of application of IT and with the use of information technologies. Modern automated DSS audit are based on the automated analysis of the large volumes of data about financial and economic activity and states of enterprises with the multi-level hierarchical structure of heterogeneous, multivariable, multifunction connections, intercommunications and cooperation of objects of audit. The tasks automated DSS audit are expansion of functional possibilities, increase of efficiency and universality of IT-audit.

Currently, the analytical procedures used during the audit are based on data mining techniques [1, 2]. Automated DSS audit means the automatic forming of recommendable decisions, based on the results of the automated analysis of data, that improves quality process of audit. Unlike the traditional approach, computer technologies of analysis of data in the system of audit accelerate and promote the process accuracy of audit, that extremely critical in the