EFFICIENCY OF OPTICAL-ELECTRONIC SYSTEMS AND METHODS APPLICATION TO THE ANALYSIS OF STRUCTURAL CHANGES IN THE PROCESS OF EYE GROUNDS DIAGNOSIS

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Introduction. Progress in the development of image processing technologies reached the sphere of diagnosis. Among numerous branches of medicine, ophthalmology plays an important role. Therapy of ocular diseases includes the analysis and interpretation of images, obtained as a result of diagnosis, carried out. Nowadays there exists various techniques of eye examination. We will distinguish main directions: external examination, slit lamp examination, examination by means of light passage across the apple of the eye, ophthalmoscopy, diaphanoscopy, ophthalmodynamometry and fluorescent angiography, biomicroscopy, echo-ophthalmography, electro-retinography.

Method. Optical coherence tomography is a method of diagnostics, that enables to obtain *in vivo* 2D cross-section images of the retina, optic papilla and structures of frontal part of the eye [1, 2, 3]. This technique is often compared with virtual biopsy.

But this method has some limitations: limited number of data points; limited application in case of posterior subcapsular and cortical cataracts; lack of quality automatic control; very high variability of the normative base of healthy people creates complications during the first study; ocular movement makes impossible repeated scanning in the same position; necessity of additional midriasis; high price of the equipment.

Experimental research. Studies were carried out in Vinnitsa Pirogov National Medical University. The image of macular area tomograms of the retina were obtained by means of SOCT Copernicus device.

To create the data base of pathologies and norms of macular area of the retina 103 patients (164 eyes) participated in the research. 41 (82 eyes) of them were without ophthalmologic and accompanied somatic pathology

and 62 (96 eyes) - with available macular pathology. Age of the patients was 28-74 years, greater part of them were women (73%), pathologies on both eyes were observed in 42% of patients [2].

Unit of preprocessing comprises the following components: unit of image filtration, unit of color image conversion into half-tone one; colors inversion; unit of images binarization; unit of contour enhancement on the image; second inversion; mask-layer coating on initial image.

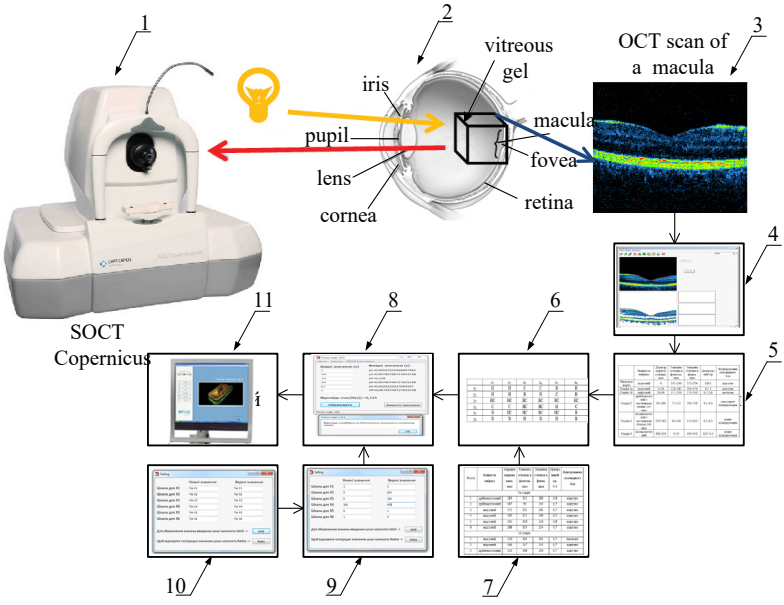

Fig 1. Graphic interface of the system, developed for processing and analysis of biomedical images of the macular area of the retina

Realization of the unit of information input and its processing by the system of structural changes analysis in the process of macular pathology diagnosis is shown in fig.1, where 1 – open the file; 2 – close the file; 3 – save the file; 4 – initial image; 5 – color (represent the value of R, G, B); 6 – contour enhancement; 7 – graph plotting; 8 – improvement of image parameters; 9 – full screen mode; 10 – help; 11 - analysis of images histogram [4].

Conclusions. The analysis of scientific engineering and medical literature showed that optical coherence tomography is the most expedient and informative method of investigation for the diagnosis of macular area,

it reflects the structure of biological tissues of the organism in transaction with high distributive capacity that provides the obtaining morphological information on microscopic level. It shows that in the process of analysis of macular area tomograms, obtained by means of optical coherence tomography, a number of drawbacks, connected with exact determination of transition boundary between macular of the retina and vitreous body revealed that stipulated the necessity of development the technique of high accurate processing of the obtained tomograms.

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VIDEO-POLARIMETRIC SYSTEM FOR OPTIMIZATION OF DATA ACQUISITION TO IMPROVE THE ACCURACY

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The analysis of the polarization of light is usually carried out using modulation schemes. In this case, optical components rotate at a particular frequency and the unknown output state of polarization of light is determined by several measurements. One of the most widespread methods of modulation uses a rotation quarter-wave plate, and a fixed linear polarizer. Such arrangement makes it important the advancement of efficient calibration techniques. The optimization of the set of measurements is closely