COMPUTING MEASURING SYSTEM FOR BIOPOTENTIALS OF VISUAL ANALIGER INVESTIGATION

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The visual system secures obtaining a considerable amount of information by the man, and so the problem of the medical diagnosis of its state is extraordinarily important. Among the most effective methods of diagnosis are electrophysiological ones, which are based on the recording and analysis of electric signals of various visual system elements: electroretinography, electrooculography, visual evoked potentials, rheography of the eye [1].

This report contain information of theoretical and practical aspects of biosignal measurement in diagnostic equipment for visual system investigation. We shall consider some properties of signals being recorded, give the block diagram of a recording and electroretinograms preprocessing system and analyze some obtained results.

The value of the electric potentials registered is rather small - a few microvolts to 0.5 millivolt, with the signals recording process accompanied by considerable stochastic interference both of the internal and external origin. Besides, the ERG-signals recording time is limited by the period of the loss of the light adaption as well as by the appearance of destabilizing factors in consequence of some discomfort for the patient. All this imposes heavy demands on the methods of measurement, data processing and analysis.

The former investigations of ERG realizations give a possibility to assume that the ERG-signal $y(t)$ comprises a "usable" determinate component $x(t)$ and a random component $\xi(t)$:

$$y(t) = x(t) + \xi(t), \qquad (1)$$

where t is the time corresponding to the observation interval $[t_0, t_1]$, and as regards summands, we have every reason to hold that the process $x(t)$ has the energy spectrum falling on the 0 to 100 Hz, and the energy spectrum of the $\xi(t)$ process occupies a more wide frequency range.

As a model of the random component a stationary linear stochastic process of the following form is proposed [3]:

$$\xi(t) = \int_{-\infty}^{\infty} \varphi(t-\tau)\,d\eta(\tau), \quad t \in [t_0, t_1], \qquad (2)$$

where $\varphi(s), s \in R$ is a real nonrandom function square integrable with respect to s :

$\{\eta(\tau), \eta(0) = 0, \tau \in R\}$ is a homogeneous stochastically continuous random process with independed increments. The model (2) makes it possible to take into account stochastic properties of the interference that acts as measurements are being taken and is handy when used owing to the fact that there exists, for linear stochastic processes, a common representation of their characteristic functions. The one-dimensional characteristic function of the process $\xi(t)$ (case of Levy representation) is of the following form [2]:

$$f(u) = \exp\left\{ iu\mu \int_{-\infty}^{\infty} \varphi(s)\,ds - \frac{\sigma^2 u^2}{2} \int_{-\infty}^{\infty} \varphi^2(s)\,ds + \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} \left(e^{iux\varphi(s)} - 1 - \frac{iux\varphi(s)}{1+x^2} \right) dL(x)\,ds \right\}. \qquad (3)$$

where μ and $\sigma > 0$ are real constants; $L(x), x \in R$ is a Poisson jumps measure of the process $\eta(\tau)$.

To test the validity of the above assumptions and to analyze in greater detail the ERG signals and stochastic noises appearing in the recording process, a computer-aided measurement system, that can record and accumulate in its memory measurement data, was created [2]. The measuring system is made up of the following principal assemblies: sucker-electrode of special design (Certificate on invention No.1105200); vacuumizing microdevice, having a control facility; a controllable photostimulator for the general stimulus; a biopotentials amplifier; the personal computer IBM PC/AT with the standard peripheral equiment and

optional interface measuring-and-controling module connected through the ISA system bus, The system functions by an algorithm devised on recommendations of the international committee for clinical electroretinography of vision, with regard to the doctor methods of the Moscow Helmholtz Research Institute. Through such systems there was collected a concsiderable experimental material in several clinics, which material is in the form of patients databases taking into account preliminary diagnoses. We have carried out the analysis of amplitude and phase spectra of a considerable amount of signals. The obtained results enable us to conclude that:

1. The major portion of the power of the "usable" signals' component concentrates within the frequency range of up to 50 Hz.
2. The investigation into the behaviour of the initial phase of the ERG-signall harmonics testifies that in the indicated range the phase varies according to a certain linear close to law. Beyond the range of 50 Hz, it has signs of the random process phase. This suggests that the direct component and the harmonics higher than 50 Hz result from the process $\xi(t)$.

As confirmed by the experiment, the ERGs after filtration alow to measure local criteria to a higher accuracy, in particular, the time of so-called waves "A" and "B", which are in considerable use.

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INTRODUCTION OF COMPUTOR TECHNOLOGEIS INTO THE PROGRAMME OF STRUGGLE FOR HUMAN HEALTH: RESULT AND PROSPECTS

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The automated information seeking system "Flora" in the field of phytopharmaca and phytotherapy was created is a result of scientific investigations of many years. Its introduction made it possible to raise effectivenese of health-improving programmes, conducted under the leadership of SPCPA specialists,and in the first instance, in pediatrics.

Contemporary health-improving systems suggest wide application of plant drugs. The choise of phytopreparations in them however, has as a rule, empirical character. Principles of such herb treatment are based up on the traditions of folk-medicine rather than upon profound scientific research. The examples of employing up-to-date highly effective technologies ake also rare (1).

Much experience has been accumulated at the SPCPA in the sphere of creation of phytopreparation and princinples of thein application for prophylaxis and therapy of varions widely distributed illnesses (2, 3, 4). The results of long investigations made it possible to create a unique automated information-seecing system (AISS) "Flora" which is intended both for ensuring therapeutic-prophylactic work and for scientific research, training and retraining specialists in the field of phytopharmacy and phytotherapy. The following sections of the AISS: "Medicinal plant raw material " (528 species), "Phytotherapy" (more than 400