Non-invasive methods of registration and analysis of biosignals

N. Dorosh, H. Kuchmiy, N. Pushkarska, N. Ivanushkina

Abstract - **In this paper, the non-invasive methods of investigation of circulatory system and the results of photopletizmogram modeling are shown.**

Keywords – **photopletizmogram, spectral analysis.**

I. INTRODUCTION

One of the modern non-invasive methods recording and analysis of biosignals is photopletizmografics. Photopletizmografic signal is formed by changing the pulse volume of blood. Pulse volume of blood change accompanied by an increase of optical density, which allows using of optical sensors for registration pulsograms [1].

II. PULSOGRAM MODELING

In general, a form of radial artery pulse wave, obtained by using optoelectronic sensor, schematically represented in Fig. 1

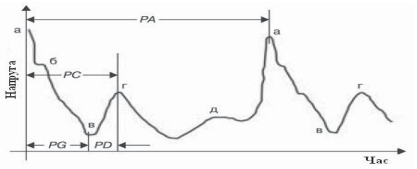

Fig.1 The form of pulse wave of radiation artery

In Fig. 1 – а-the systolic wave maximum (A-cog), б-late-systolic wave, в-the dicrotic wave-top, г- maximum of dicrotic waves, д- maximum of presystolic (postdicrotic) waves, PA-the main period of pulse wave, PC-time to achieve maximum dicrotic waves, PD-time recovery dicrotic waves, PG-time of fall katacrotic. Artery pulse signals are complex rhythmic structure, characterized by a set of different components that vary in amplitude, phase and frequency. The main method of treatment is pulsogram correlation-spectral analysis by the informative features formation. In the process of diagnosis automatically evaluated informative features is to build diagnostic and classification rules studied vectors [2]. Pulsogram simulation in normal state (Fig.2) and in pathology (Fig.3), and spectral analysis of the studied signals in the MathCAD software was carried out . The simulation results are shown on Fig. 4.

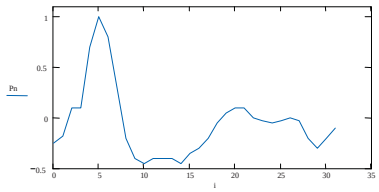

Fig.2 The photopletizmohram shape in normal state

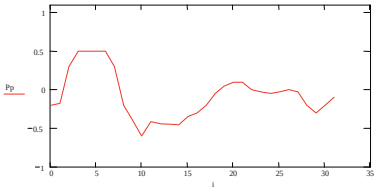

Fig.3 The photopletizmohram shape in pathology

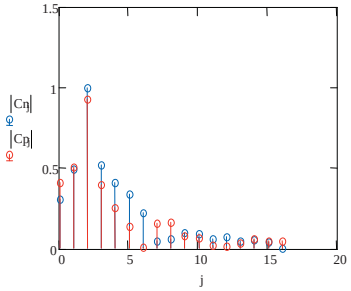

Fig. 4 The results of photopletizmohram spectral analysis

III. CONCLUSION

As a result of calculated probabilistic assessment of a tested signal belonging to one of knowable classes of diseases, and determined a number of diagnostic data due to signal pulse parameters (pulse rate, degree of arrhythmia, the ratio of pulse rate and respiration, several parameters of the circulatory system).

REFERENCES

[1] http://angioscan.ru/.

[2] Дорофеюк А.А. и др. Измерение, преобразование и обработка пульсового сигнала лучевой артерии в медицинской диагностике// Мир измерений. – 2009. – №1. –С.17–23.

N.Dorosh, H.Kuchmiy, N.Pushcarska - Lviv Polytechnic National University , S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail:nvdoroh54@mail.ru

N. Ivanushkina .- National Technical University of Ukraine “Kiev Polytechnic Institute", Polytekhnichna Str., 16, Block 12, off.423, 03056, Kiev, UKRAINE. e-mail: niva@phbme.ntu-kpi.kiev.ua