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**INFORMATION TECHNOLOGY OF PHOTOPLETHYSMOGRAPHIC SIGNALS
ANALYSIS**

8.05010101 «Information Control System and Technologies»

Abstract of a Master's Thesis

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The thesis has been carried out at the Computer Science Department of Ternopil Ivan Puluj National Technical University, Ministry of Education and Science of Ukraine

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GENERAL CHARACTERISTIC OF THE THESIS

Actuality of the thesis. Photoplethysmographic signals (PPGS) are time rhythmic variations of light absorption in some organs of a human body caused by changes of their perfusion by blood. These signals characterize the functional state of live body tissues by indexes of blood filling dynamics on the level of the microcirculation system. This system has the most important role in the provision and support of the tissue homeostasis. Disorders of the microcirculation system functioning are sources of the development of practically all pathological processes.

It is difficult even to list all fields of photoplethysmography applications in medicine; they are physiology, therapy, surgery, dermatology, gynaecology, neuropathology, stomatology, paediatrics, etc. Clinicians can use photoplethysmography as an additional method both for disease diagnostics and for scientific researches. Besides, photoplethysmography has a subsidiary diagnostic and prognostic importance for study of many cardiovascular and neural diseases, which are now the most often cause of deaths and disabilities of young people. Photoplethysmography can be useful also for hygienists, for sports doctors as well as for doctors, specialized in the space medicine field.

That is why the development of information technology for the medical diagnostics using photoplethysmographic methods is very important.

The aim of the thesis: development of informational technology for PPG signal processing and its features extraction.

Thesis tasks:

1. To justify the methods of PPG analysis and diagnostic features extraction.
2. To study the Mathematical Background of Information Technology.
3. To develop the information technology for medical diagnostics on the base of PPG signal processing using orthogonal decomposition (Fourier transformation) of this signal.
4. To present the results of PPG signal analysis.

The object of the research: the methods of PPG signal frequency analysis.

Novelty of the results: the method of PPG signal analysis using its discrete Fourier transform has been further developed.

The practical significance: the information technology can be used for clinical diagnostics using the analysis of the PPG signal in frequency domain.

Thesis approbation. The results have been reported at the V International scientific and technical conference of young researchers and students «Current issues in modern technologies», Ternopil, November 17-18, 2016.

The structure of the thesis. The thesis consists of explanatory notes and graphical presentation. The explanatory notes consists of introduction, 5 sections, conclusions,

references, and appendices. The thesis size: explanatory notes – 111 pages of the A4 format, graphical presentation – 7 sheets of the A1 format.

MAIN CONTENT OF THE THESIS

In introduction the importance and actuality of the subject of the thesis have been represented.

In the first section analytical review of research method has been carried out. That is, the fundamentals of photoplethysmography have been analysed, mathematical background, including functional spaces, orthogonal decomposition, Fourier transform, has been presented. Also the results of information technology development have been considered.

In the second section the main characteristics of the Mathcad have been considered, because that software has been used to implement the program part of the developed technology.

In the third section estimation of costs involved in designing the architectural structure of information system and estimation of budget and calculation of cost of goods sold for monitoring data exchange between information systems have been analysed.

Forth section is devoted to the problems of health and safety regulations. That is, the problems of electrical safety in the laboratory, static electricity and spark hazards etc. are considered.

Fifth section deals with ecological examination law of Ukraine, environmental protection and ecological development.

Conclusions

1. The method of PPG analysis and diagnostic features extraction using orthogonal decomposition of the signal has been justified as the base of information technology development.
2. The Mathematical Background of Information Technology has been study.
3. Information technology for medical diagnostics on the base of PPG signal processing using Fourier transformation has been developed.
4. The results of Fourier analysis of PPG signal have been presented, the diagnostic features have been extracted.

LIST OF PAPERS PUBLISHED BY THE AUTHOR OF THESIS

1. Catarina Solange Sumbo Placido, B.B. Mlynko. Information technology of Photoplethysmogram Signals Analysis / Book of abstract of the V International scientific and technical conference of young researchers and students «Current issues in modern technologies», Ternopil, November 17-18, 2016, vol.2. – Ternopil, TNTU Press. – 6 p.

ANNOTATION

Master's thesis is devoted to the development of information technology and information system of Photoplethysmographic Signals analysis. In the thesis presented a structure of this information system, that includes different blocks, main of them: block of Registration of photoplethysmographic signal Realizations (BRR), block of statistical Estimation of Diagnostic Parameters (BEDP), block of Diagnostic Space forming (BDS). As a result, the information technology and system was developed. Statistical estimation of covariance function were calculated and presented. New informative factors for FPG-diagnostic - orthogonal decomposition coefficients of the signal mathematical expectation in the basis of discrete exponential functions (DEF) have been identified und have been investigated.

IT must therefore be applied as an instrument subject to the goals of medicine, so the main results can be applied in the Decision Making Support Systems in Medicine.

Keywords: Information technology, Information system, light biosignal, photoplethysmographic signal, orthogonal decomposition, diagnostic features.