

INCLUSIVE M-HEALTH SYSTEMS ARCHITECTURE BASED ON USING FILM NANOTECHNOLOGY TECHNIQUES

Singatulin R.A.¹, Ablyazov K.A.², Ablyazov L.K.²

¹Russia, Saratov State University

²Russia, Firm «Narat-K»

***Abstract.** Inclusive m-Health systems market based on using film nanotechnology techniques is developing rapidly. In several years to come we can expect appearing of advanced mobile oriented solutions in the area of medical service. Creating the intermediate systems for personal diagnostics, preventive measures, rehabilitation support, and treatment process correction is currently a priority direction*

***Keywords:** m-Health, inclusive architecture, nanostructures, biomedical diagnostics, therapy*

Introduction. The industry of the modern biomedical equipment used in m-Health has been moving steadily from micro to nanotechnologies [2]. Bringing developments to industrial production will help to reach a new qualitative level of providing medical services in accordance with the individual characteristics of a patient over the following decade. The inclusive medical approach is the proper and necessary direction for development of modern civilization. Personalized health systems are gradually moving closer to the "smart house" technology; it is a part of a unified concept called the Internet of Things. Along with diagnostics, the mobile systems should provide a therapeutic effect on a patient in real-time. The technologies related to the use of thin-film and aerosol coatings, which enable to control the properties of materials at the atomic level, are of particular interest. The utilization of organic LEDs in m-Health systems based on the technology of atomic layer deposition allows using these heterogeneous systems for therapeutic purposes. The heterogeneous m-Health systems are being used, and their practical application is constantly expanding in medicine.

Material and methods. At present, there are m-Health systems based on flexible micro and nanoelectronic technologies. The architecture of such system is based on the film nanotechnology by means of applying ALD coatings on flexible substrates. Thus, the flexible substrates are considered to be the building blocks of a personalized system, for example, a biomedical waistcoat [1]. Hardware and software m-Health system support is based on the architecture focused on providing access to software components and data via web-interface; it enables a unified access to the system whether through LAN or WAN networks. The ALD-coatings operation (organic light-

emitting diodes) is performed with the help of a self-learning system (neural network). Heterogeneous m-Health system together with a neural network enables choosing classification features of the measured physiological parameters. The neural network makes a selection out of the personal preferences in order to solve a problem of processing and recognizing images and signals; it allows to make a prognosis with a continuous data adjustment in real time.

Results. The projects on development of inclusive m-Health systems based on using micro and film nanotechnologies are being successfully implemented in IT laboratory of humanities and natural science research in Saratov State University in collaboration with the company Narat-K. Basic functions of m-Health systems under development are preventive measures, rehabilitation medicine, diagnostics of physiological data in real-time mode (including 12 parameters), emergency mode immediate alert, motor stimulation, and therapeutic procedures (infrared and ultrasonic impact). The distinctive feature of the complex under development is the integrated module of external visual control of motor functions based on web-cameras. M-Health system connects the objects or image fragments obtained from web-cameras to the system of coordinates by means of automatic identification of objects with the corresponding images from the database. Application of the developed system is mostly for the diagnostics of typical motor pattern, non-optimal dynamic stereotype, atypical motor pattern, and some other cases. The system is designed for actively moving patients, and for preventive diagnostics of chances of developing the musculoskeletal system disease (the system evaluates the asymptomatic period time-line). The standard set consists of a mobile device equipped with GLONASS or GPS, a waistcoat with the integrated system of sensors and active elements of impact based on using film nanotechnology techniques. Prospects for further integration of m-Health systems with personal biomedical data processing centers provide opportunities for creating global databases that will take into account the characteristics of a particular person.

References

1. Ablyazov K., Ablyazov L., Singatulin R. Geoinformation Interactive Mobile Medical System. InterCarto/InterGIS 2016. Vol.22: Issue 2. 44-51 pp.
2. Gazit E. Plenty of room for biology at the bottom. An Introduction to Bionanotechnology. London: Imperial College Press, 2007. P. 183