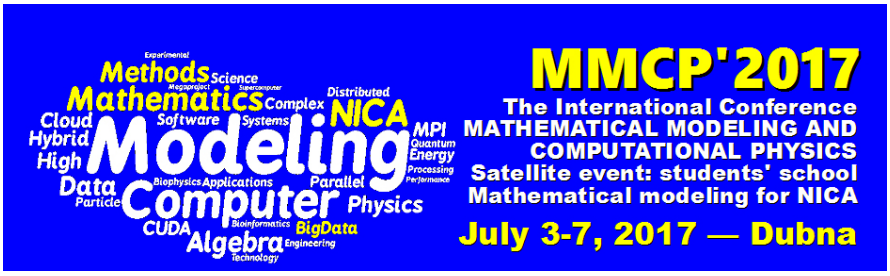

Contribution ID: **91** Type: **not specified**

Partial spectroscopy of alpha-rhythm and pathological activity of the human brain

Tuesday, 4 July 2017 15:30 (15 minutes)

The new method to study human brain activity was developed [1]. This method aims to determine spectral characteristics, specific to various regions and structures of the human brain. Said method combines two completely different sources of information: 1) anatomical information, obtained from magnetic resonance imaging(MRI); 2) information about human brain activity, obtained by multichannel magnetic encephalograph. To find activity sources from magnetoencephalogram functional tomography method is used [2]. Functional tomography finds corresponding unique spatial location for each coherent elementary oscillation. Spatial information about regions of interest(ROI) is extracted from MRI either by semi-automatic segmentation, or by direct selection. Combining these ROIs with functional tomogram one can obtain set of the field sources, corresponding to selected ROI. Frequencies and Fourier coefficients of these sources form partial spectrum of the studied region or structural element of the human brain. From this partial spectrum, multichannel time-series can be reconstructed, thus giving us partial encephalogram, produced by region of interest. Further analysis of such encephalograms can be used to determine connectivity between different regions and structures of the brain.
For verification, the method was applied to the records of the human brain spontaneous activity obtained from healthy subjects and from subjects with certain pathologies (multiple sclerosis and neuralgias of different genesis). The results obtained show good correlation with the generally accepted ideas about the localization of sources of such activity.

1. Rykunov S.D., Ustinin M. N., Polyanin A. G., Sychev V. V., Llinás R. R. Software for the partial spectroscopy of human brain, Mat. Biolog. Bioinform. 2016, V. 11, I.1, P. 127–140 doi: 10.17537/2016.11.127
2. Llinás R.R., Ustinin M.N., Rykunov S.D., Boyko A.I., Sychev V.V., Walton K.D., Rabello G.M. and Garcia J. Reconstruction of human brain spontaneous activity based on frequency-pattern analysis of magnetoencephalography data. Frontiers in Neuroscience. 2015. V. 9. P. 373. doi: 10.3389/fnins.2015.00373.
This work was partially supported by the Russian Foundation for Basic Research (grants 16-07-00937, 16-07-01000, 17-07-00677, 17-07-00686), by the Program I.33P for Fundamental Research of the Russian Academy of Sciences, and by the CRDF Global (USA) (grants CRDF RB1-2027 and RUB-7095-MO-13).

Primary author: Mr RYKUNOV, Stanislav (Institute of Mathematical Problems of Biology RAS - the Branch of Keldysh Institute of Applied Mathematics of Russian Academy of Sciences)

Co-author: Prof. USTININ, Mikhail (Keldysh Institute of Applied Mathematics)

Presenter: Mr RYKUNOV, Stanislav (Institute of Mathematical Problems of Biology RAS - the Branch of Keldysh Institute of Applied Mathematics of Russian Academy of Sciences)

Session Classification: Bioinformatics and computational biophysics (I)