euromedica
hannover 2008

Internationaler Kongress & Fachmesse

Moderne Aspekte der Prophylaxe, Behandlung und Rehabilitation

Programm Abstracts

O.Yu. Mayorov
V.N. Fenchenko

CHAOS PARAMETERS FOR EEG RESEARCH - A NEW APPROACH

Kharkiv Medical Academy of Postgraduate Education, Kharkiv, Ukraine
Institute of Medical Informatics and Telemedicine LTD, Kharkiv, Ukraine
Institute of Children and Adolescents Health Protection AMSci, Kharkiv, Ukraine
Physicotechnical Institute of Low Temperatures attached to NASci of Ukraine, Kharkiv, Ukraine; E-mail: Institute-MiT@ukr.net

The conventional EEG spectral analysis method is not believed to possess an adequate information value and has practically exhausted its potentialities. We propose herein that a new approach to the EEG signal analysis should be used, which combines the conventional methods of correlation and spectral analyses and new techniques.

Detection of cerebral formations with common organization features. The above mentioned approach allows to detect at the first stage cortical and subcortical brain structures temporarily involved in a particular functional system (according to P.K. Anokhin) for the purpose to realize behavior acts, accomplish "blockade of influences" of other brain systems, detect and quantify at the third stage the "contribution" of separately chosen structures in the system activity and, thus, outline the real architecture of the functional system. Having chosen from a multitude of signals coming from different leads the ones being most "similar" to signal y(t) with similar organization features and real "physical" linkage, enables us to single out cortical and subcortical structures involved in integration with the investigated brain region.

Detection of "main" system signal. Upon defining architecture of the functional system under study, the "main" signal of this system should be singled out. The use can be made in this case of the known Karhunen-Loeve method. We apply the Karhunen-Loeve expansion to signals from the leads only involved in the functional system, which is under investigation, and, therefore, all such signals are "like". We proceed from the assumption that a singled out "main" signal of the functional system being studied is described by a certain dynamic system.

Selection of delay value To be successful, the process of reconstruction has to correlate with the correct choice of the delay value. However, the methods that are commonly applied (autocorrelation method, method of mutual minimum information) do not invariably produce acceptable results. That is why we have developed the new method, basing on estimation of the "form" of the attractor to be reconstructed. The displacement value is chosen so that the reconstructed attractor dimensions can be as close as possible in all axes. The distinctive feature of such method is that the displacement value depends on the embedding dimension involved and, as shown by the results of numerous experiments, this enables to improve materially the quality of reconstruction of EEG attractors.

Determination of neurodynamic system chaos parameters. At the next stage – executing reconstruction of attractor structures, to estimate its dimension, to calculate a Kolmogorov-Sinai or correlation entropy of the process, to evaluate the maximal Lyapunov exponent, modeling dynamics of cerebral system.

Conclusion. It appears from the results obtained that our method of restoring the attractor basing on the "main" signal of the neurodynamic system formed by a group of cerebral structures temporarily involved in the integrative activity being studied provides much better results than all earlier methods of restoring chaos parameters basing on a single-lead signal. The effects of increasing the sampling volume on account of the use of several stationary sites of EEG signal recording promote the accuracy and reliability of the results of calculations that were brought to analysis in our report. The model we suggest allows to identify and quantify with a higher accuracy degree the influence exercised by external and internal factors on the character of appropriate chaos parameters relating to the brain neurodynamic system under study.

The offered approach has been realized in the system for computer EEG "NeuroResearcher®-Chaos'2005-2007". It was used for EEG analysis in the group of patients with schizophrenia and in the control group of healthy volunteers - pilots and has shown good results.

E.Y. Merkushova

PERSONAL APPROACH TO SPEECH DEVELOPMENT OF SCHOOLCHILDREN

RUDN, Moscow, Russia

Forming communicative competence in children is one of the main tasks of modern school. Communicative competence is a necessary prerequisite of a modern person's existence in a social environment, his efficient interaction with people, ability to perceive and critically comprehend a great amount of information. But unfortunately, the number of schoolchildren experiencing difficulty in mastering different aspects of speech is constantly increasing.

A reasonable number of researches have so far been devoted to the problem of forming learners' communicative abilities. Many researchers of this problem have also repeatedly noted the connection between the learning of the native speech and the child's personality's development. Russian psycholinguistics for example, studies the theoretical problems of linguistic development of a person, concentrating on stages and mechanisms of forming human personality as the subject of speech activity. However only recently methods and ways of speech development have become the subject of research, which might be important considering a process of personal development.

In our opinion the study of speech development should be conducted with account of such character traits as sociability, initiative, self-discipline and self-confidence. We suppose

EURO
PÄISCHE
AKADEMIE
DER NATUR
WISSENSCHAFTEN
HANNOVER E.V.

www.congress-euromedica.de