DIAGNOSTICS OF NEURO-PHYSIOLOGICAL STATES PERSONALITY ON THE BASIS VOLTERRA MODEL AND OF THE EYE-TRACKING DATA

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The methods of neuro-physiological identification of an individual proposed in the project based on obtaining experimental data using the innovative eye-tracking technology and computing means of processing them allow monitoring and diagnostics of the state of cognitive processes during the educational activities of students and schoolchildren.

The information technology of indirect monitoring and diagnostics of neuro-physiological states of the personality on the basis Volterra models of the oculo-motor system (OMS) is offered. In this case, the OMS is considered as a nonlinear dynamic system, the identification of which is carried out using multidimensional transition functions (MTF) – integral transformations of Volterra kernels [1].

The *aims* are to develop instrumental software tools for constructing a nonparametric dynamical model of the human OMS, taking into account its inertial and nonlinear properties, based on data from experimental input-output studies using test visual stimulus and innovative eye-tracking technology; implementation of the received information models in practice diagnostics of states cognitive processes.

The experiments were organized in order to classify subjects by the state of fatigue. The data for constructing the model – the OMS responses to the same test signals, were obtained using the Tobii Pro TX300 eye tracker at different times of the day: "In the Morning" (before work) and "In the Evening" (after work).

According to averaged data of OMS responses on visual stimuli with a different distance from the start position on the basis of LSM the MTF $h_1(t)$, $h_2(t,t)$ and $h_3(t,t,t)$ of the OMS. In this case, an approximation of the OMS response in the form of a polynomial model of degree N = 3 is used [2].

A Bayesian classifier of a person's fatigue state in the space of features x_1 and x_2:

$x_1 = \arg\max_t h_1'(t)$, $x_2 = \arg\min_t h_1'(t)$.

The estimation of the indicator of recognition reliability – the probability of correct recognition is P = 0,9375.

References

1. *Pavlenko V., Salata D., Chaikovskyi H.* Identification of a Oculo-Motor System Human based on Volterra Kernels // International Journal of Biology and Biomedical Engineering. **Vol. 11**, Year 2017. Pp. 121-126.
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