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THE TECHNIQUES AND ALGORITHMS IN THE BASIS
OF THE COGNITIVE MODELING TECHNOLOGY

The cognitive modeling technology (CMT) was developed for the analysis and the improving in the efficiency of functioning of the information environment of the automated (remote) training system with the properties of adaptation based on the parametrical models ("The proceedings of "IHEAS"", №3, 2006 y.) and is represented the iterative cycle, including the sequence of stages: the identification (the collection of primary presentations about the researched object or the changing of requirements, tasks and restrictions), the conceptualization (the development of the conceptual scheme of researched situation or the modification of a set of concepts, describing the object of research), the structuring (the structured knowledge about the object of research or the modification of conceptual scheme), the formalization (the construction of the first and second levels of the structure of the cognitive model or the changing of the way of its presentation), the structural analysis (the verification of the first level of the structure of the cognitive model), the parametrical analysis (the verification of the second level of the structure of the cognitive model), the realization (the placement of the obtained model in the basis of the automated educational environment and the revealing of discrepancies), the modeling (the modeling based on a holistic approach, the elimination of the problems of measurement and accounting of the parameters), the analysis (the statistical processing of data, obtained using the cognitive model), the subject interpretation (the interpretation of obtained dependencies and the scientific justification of the obtained results), the synthesis (the accumulation of acquired knowledge about the dynamics of development of the situation in the subject area or the addition of new aspects of consideration of the object of research).

The cognitive model (CM) reflects the features of functioning of the considered object of research in a certain subject area, is represented the modified in width and depth two-level repertoire of parameters, echeloned into a set of portraits (PR_1, PR_2, …, PR_i) according to a set of selected scientific aspects and stratified into a row of sets: the first level – a set of kinds of properties ($KP_1, KP_2, ..., KP_j$) and properties ($Pr_1, Pr_2, ..., Pr_k$), the second level – a set of the vectors of parameters ($VP_1, VP_2…, VP_l$) and the elementary parameters ($P_1, P_2, ..., P_m$).

CM of the subject of training contains a set of parameters, characterizing the individual features of personality of the subjects of training at the perception (the physiological aspect), processing (the psychological aspect) and understanding (the linguistic aspect) of the content of information fragments in the cycle of disciplines, at the same time includes ("The proceedings of "IHEAS"", №3, 2006 y.):

- the physiological portrait – the influence of the features of information perception by the visual and auditory sensory systems: the presence / absence of anomalies of refraction, perception and color-perception; the violations of functions of the outer, middle or inner ear;
- the psychological portrait – the influence of the specifics of information processing: the level of development of the convergent and divergent intellectual abilities, cognitive styles, learning-ability;
- the linguistic portrait – the influence of the features of understanding of the content of information fragments: the presence / absence of language problems (the level of proficiency in the language of statement of the material).

CM of the means of training aggregates the parameters of visual and sound representation (the physiological portrait), the way and style of presentation (the psychological portrait), the linguistic aspects (the linguistic portrait) of generation of the information fragments by the means of training:

- the physiological portrait – the influence of the features of representation of visual and sound information by the means of training: the parameters of background; the parameters of font; the color schemes; the parameters of playback of the audio stream;
- the psychological portrait – the influence of the features of the way and style of presentation of the information fragments: the kind of information; the inclusion of additional capabilities; the style of presentation; the speed of presentation of the information fragments;
- the linguistic portrait – the influence of the features of statement of the material (the choice of language and the level of statement).

The techniques and algorithms in the basis of CMT on the various stages realize the solution of a row of private tasks.

The technique of using of CMT formalizes the sequence of using of the stages of technology for the analysis and increase in the efficiency of functioning of the information environment of the automated (remote) training with the properties of adaptation based on CM.

The algorithm of formation of the structure of CM allows to form the structure of CM by means of the formal (logical, graph and theory of sets) or nonformal (the structural or conceptual scheme and ontology) model of presentation of data (knowledge).

For the formalization of the structure of CM the two ways of representation are proposed: the formal – the oriented graph and nonformal – the structural scheme, providing the possibility of expanding and modifying of the structure of the cognitive model in width and depth.

The technique of research of the parameters of CM of the subject of training allows to organize and carry out the automated diagnostics of the parameters of CM of the subject of training by means of the applied diagnostic module.

The algorithm of processing of a posteriori data of testing allows to form the interval scale of estimation and the function of estimation, to carry out the preparation of software to the holding of diagnosis of target indicators (the level of residual knowledge and the individual features of personality of the examinees), and also to provide the statistical processing of a posteriori data using a set of coefficients: the coefficient of difficulty of the task, the summary result of execution of the tasks by the ith trainee; the summary result of execution of jth task by all trainees; the average level of testing based on the results of execution of all tasks; the average level of execution of jth task by all trainees; the dispersion of the summary points of examinee; the standard deviation of the summary points of trainees; the dispersion of the results of testing on j^{th} task; the standard deviation of the results of testing on j^{th} task; the estimation of correlation of each jth task with the sum of points by the whole test; the average arithmetic mean of expert estimates; the standard deviation of expert estimations; the coefficient of correlation of the results of testing and independent expert estimations (the validity of test).