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THE REALIZATION OF THE ADAPTIVE TRAINING IN THE AUTOMATED EDUCATIONAL ENVIRONMENT BASED ON THE COGNITIVE MODELS

For the realization of adaptive training in the automated educational environment based on the parametrical cognitive models block the cognitive modeling technology, the technique of its use, the algorithm of formation of the structure of the cognitive model and the complex of programs are offered

The information-educational environment, the automated (remote) training system, the cognitive model, the parametrical cognitive models block, the cognitive modeling technology, the algorithm of formation of the structure of the cognitive model

In the light of the informatization of establishments in the sphere of science (SRI) and education (HEI) the system analysis and the increasing in the efficiency of functioning of the automated (remote) training (ART) system acts as the difficult diverse scientific problem (the complex of scientific tasks), causing the creation of various approaches, methods, technologies and algorithms [1-5].

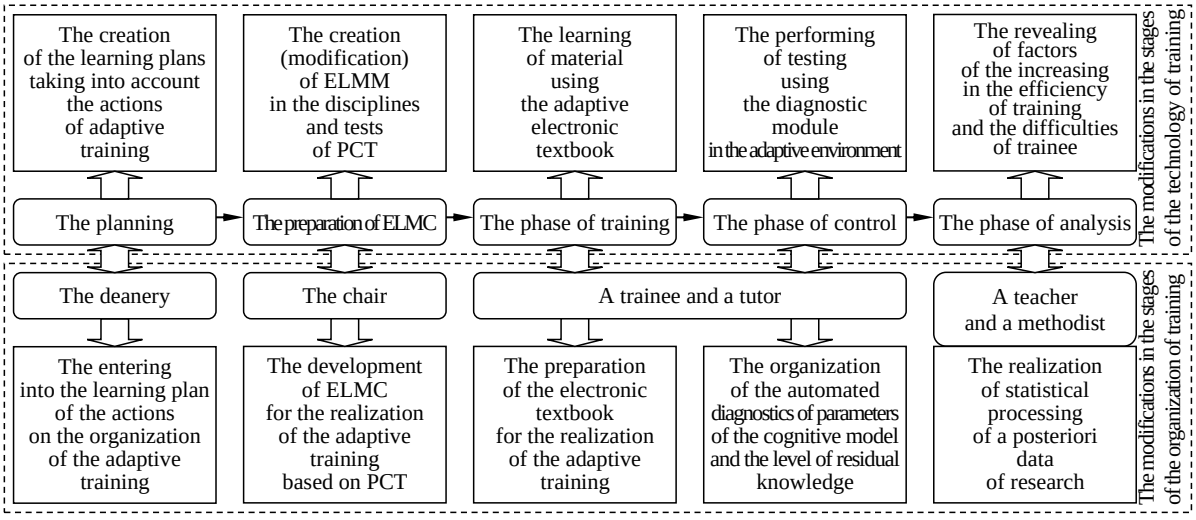
The individual orientation of technological process of the formation of knowledge of the trainee in the automated information-educational environment (IEE) is directly achieved due to the practical use of the technologies of individual, individualized and adaptive training (at distance), initiating the significant interest to the new scientific aspects (approaches) of research of the information interaction of the subjects of training and the means of training [6-10]: psycho-physiology of perception (V.F. Sazonov, Ch.A. Izmailov, V.M. Krol, A.V. Baru, G.V. Gershuni), cognitive psychology (I.P. Shkuratova, A.I. Rakitov, R.K. Potapova, V.N. Druzhinin, M.A. Kholodnaya) and cognitive linguistics (M.L. Gik, N.A. Kobrina, T.P. Zinchenko, V.V. Petrov).

The training (at distance) is considered as the technological process of the controlled formation of knowledge of the trainee, including a row of stages of the processing of information: visual representation, perception, understanding, development of skills, the formation of skills and aggregation of the obtained information into knowledge, therefore the level of residual knowledge of the trainee depends from the diverse features of sensory perception (the physiological aspect), processing (the psychological aspect) and understanding (the linguistic aspect) of the content of information fragments by the psycho-physiological construct of the head brain of the organic individual (human).

The approach proposed by the author involves the synthesis of the cognitive modeling technology (CMT) for the system analysis and the increasing in the efficiency of functioning of IEE of ART system [11-13], and also allows to realize the individually-oriented formation of knowledge of the trainee using the adaptive generation of educational influences based on the innovative parametrical cognitive models block.

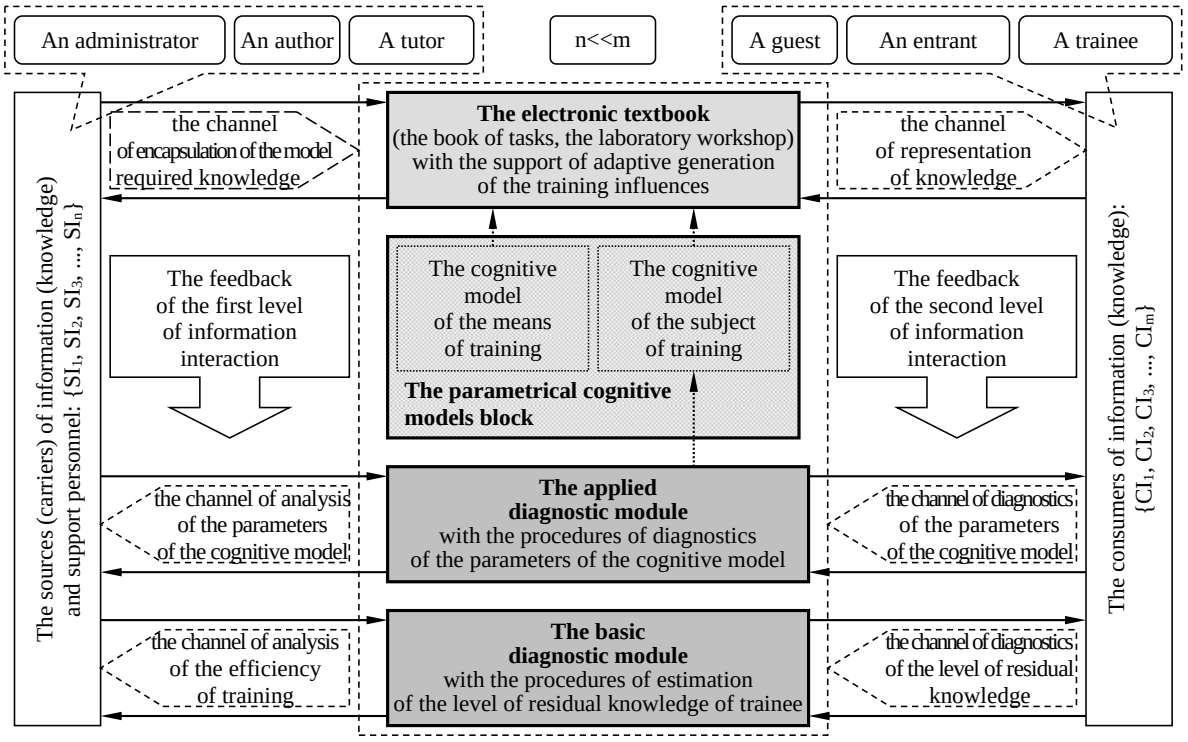
The developed innovative CMT includes the technique of its use for the system analysis of the information-educational environment, the algorithm of formation of the structure of the cognitive models based on two ways of representation [12,13].

The realization of the contour of adaptation based on the parametrical cognitive models block causes a row of modifications in the organization and technology of training (at distance) (pic. 1), and also involves the development of a new algorithms of functioning of the components of ART system, taking into account the diverse individual features of personality of the trainee (PCT) [12].



Pic. 1

The general structure of ART system with the elements of adaptation based on the parametrical cognitive models block (pic. 2) represents the closed contour (with feedbacks), including the two levels of information interaction and the several channels of information exchange between the subjects and means of training.



Pic. 2

The information interaction between the various categories of the subjects of training (the sources of information, the carriers of knowledge and the consumers of information and educational services) in the automated information-educational environment occurs by means of the means of training (pic. 2), therefore it directly has the significant organizational drawback – the limitation of communicative duplexity of the virtual dialogue, which need be researched from the point of view of the diverse scientific approaches: physiology of sensory systems, cognitive psychology and applied linguistics, and then the technologically eliminated using the modern achievements in the field of the new information and communication technologies.

The parametrical cognitive model (CM) acts as the repertoire of parameters, echeloned on a row of diverse portraits with a certain scientific justification, each of which is directly stratified on a set of mathematical sets of the kinds of properties; the elementary properties, the vectors of parameters and elementary parameters, the nominal values of which serve as a basis for the carrying out of the system analysis of the efficiency of the controlled technological process of the formation of knowledge of the trainee and the realization of the individually-oriented generation of the diverse educational influences by the means of training in the automated IEE.

The parametrical CM of the subject of training characterizes a row of the individual features: the anomalies of sensory perception of the structured diverse information by the visual and auditory analyzers (the physiological portrait), the convergent and divergent intellectual abilities, the learning-ability and the cognitive styles (the psychological portrait) and the level of proficiency in the language of statement of the material and elements of interface of the means of training and the level of understanding of the key terms and definitions (the linguistic portrait).

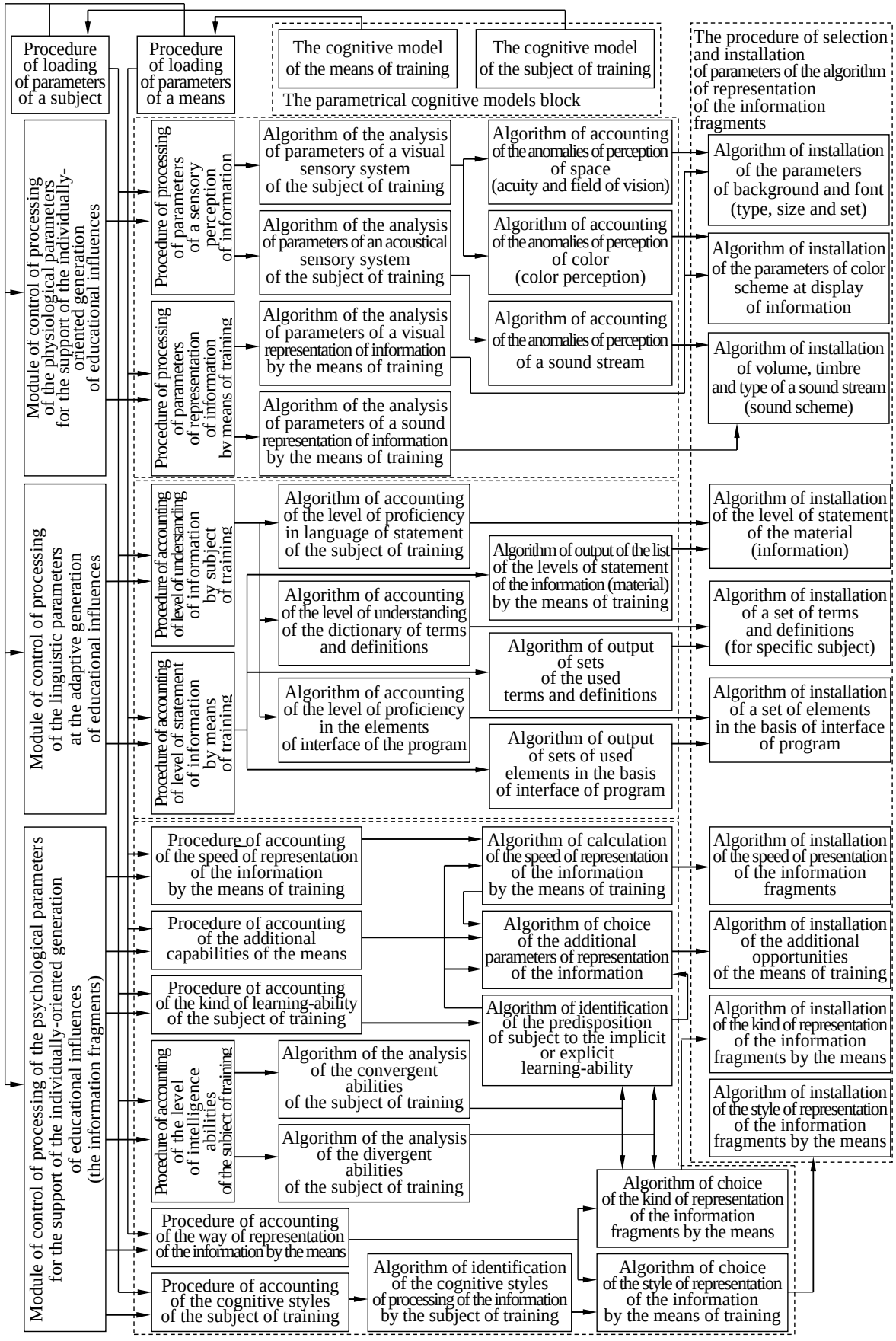
The parametrical CM of the means of training characterizes a row of technical capabilities: the features of visual and sound representation of the information influences – the parameters of background, font and color schemes of displaying of the structured information, volume, timbre, the type of audio stream and sound scheme (the physiological portrait), the way of representation of the educational influences – the kind of displayed information, the style and speed of presentation of the information fragments (the psychological portrait) and the level of statement of the material, the set of used keywords and definitions and the set of elements of the interface of the adaptive means of training (the linguistic portrait).

The principle of functioning of the adaptive means of training (the electronic textbook) with the support of the individually-oriented generation of training influences based on the innovative parametrical cognitive models block provides the semantic model for the saving of structured information in a certain way in the studied disciplines (the subjects of studying) and the adaptive representation of a sequence of information fragments processor (pic. 3).

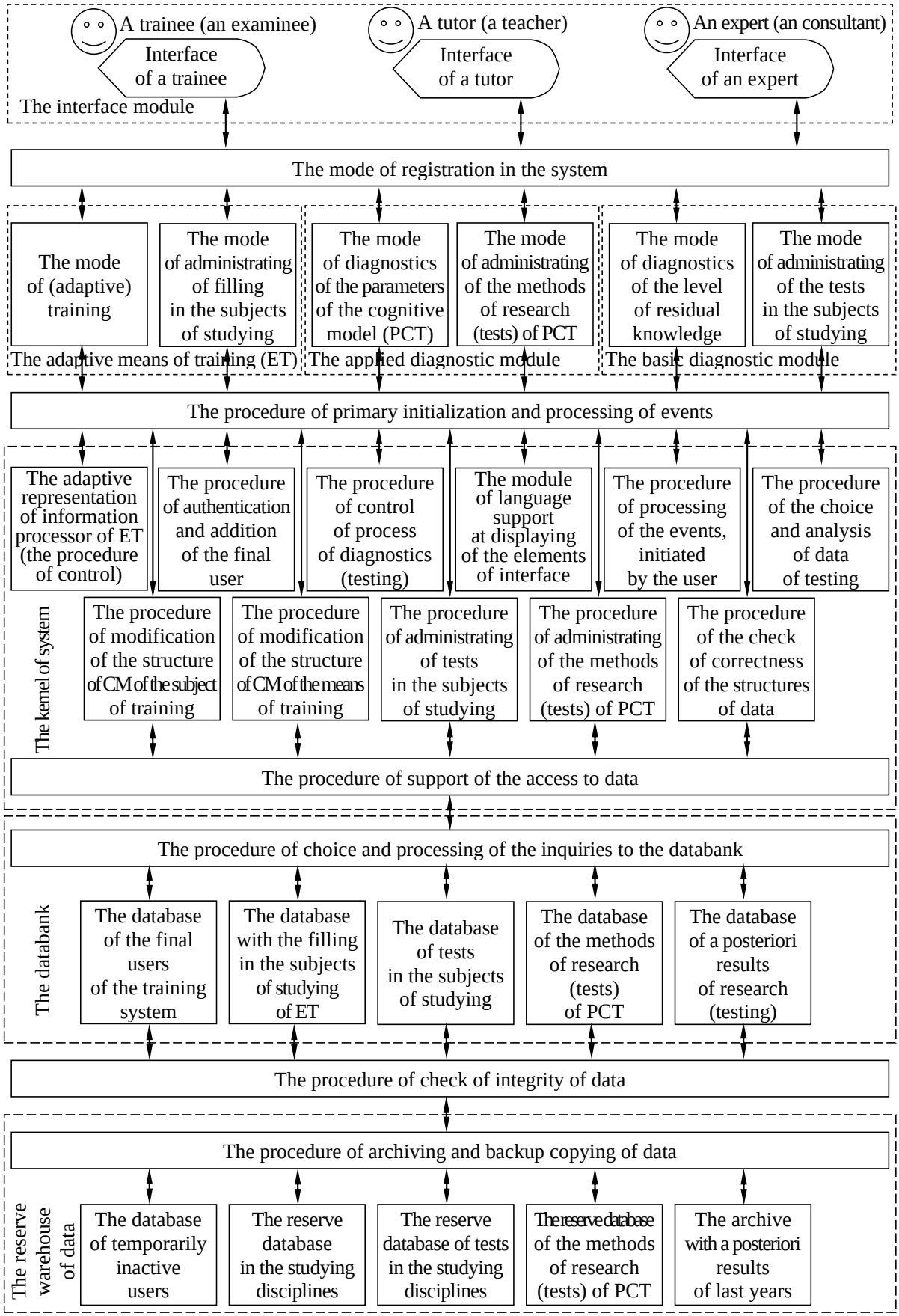
The semantic model of saving, extracting and searching of the information provides the storage and extracting of a set of information fragments (the pieces of information), reflecting the content of the chapter, section, subsection, module and page of the studied discipline, and also directly containing the blocks of control questions for the realization of the intermediate and final testing using the diagnostic module.

The modern ART systems are realized by the block-modular principle in the basis of a technologically expanded complex of programs (the educational portal), allowing to provide the quick modernization of their structure (at the level of components) and the expansion of a set of the provided educational services for the final consumers.

The developed complex of programs (pic. 4) provides the automation of the main tasks of training (the filling and presentation to the trainee in the certain way of the structured information, characterizing the model of required knowledge and the subsequent diagnostics of the level of residual knowledge), allows to research the nominal values of parameters of CM and includes: the adaptive electronic textbook – provides the individually-oriented generation of the diverse educational influences based on the parametrical CM block, the basic diagnostic module – realizes the automated estimation of the level of residual knowledge of the trainee in the studied disciplines (the subjects of studying) using a rough and exact point scale based on the weight coefficients, the applied diagnostic module – provides the automated research of the parameters of CM of the subject of training, characterizing the individual features of the trainee.


Procedure of loading of parameters of a subject
Procedure of loading of parameters of a means
The cognitive model of the means of training
The cognitive model of the subject of training
The parametrical cognitive models block
The procedure of selection and installation of parameters of the algorithm of representation of the information fragments
Module of control of processing of the physiological parameters for the support of the individually-oriented generation of educational influences
Procedure of processing of parameters of a sensory perception of information
Procedure of processing of parameters of representation of information by means of training
Algorithm of the analysis of parameters of a visual sensory system of the subject of training
Algorithm of the analysis of parameters of an acoustical sensory system of the subject of training
Algorithm of the analysis of parameters of a visual representation of information by the means of training
Algorithm of the analysis of parameters of a sound representation of information by the means of training
Algorithm of accounting of the anomalies of perception of space (acuity and field of vision)
Algorithm of accounting of the anomalies of perception of color (color perception)
Algorithm of accounting of the anomalies of perception of a sound stream
Algorithm of installation of the parameters of background and font (type, size and set)
Algorithm of installation of the parameters of color scheme at display of information
Algorithm of installation of volume, timbre and type of a sound stream (sound scheme)
Module of control of processing of the linguistic parameters at the adaptive generation of educational influences
Procedure of accounting of level of understanding of information by subject of training
Procedure of accounting of level of statement of information by means of training
Algorithm of accounting of the level of proficiency in language of statement of the subject of training
Algorithm of accounting of the level of understanding of the dictionary of terms and definitions
Algorithm of accounting of the level of proficiency in the elements of interface of the program
Algorithm of output of the list of the levels of statement of the information (material) by the means of training
Algorithm of output of sets of the used terms and definitions
Algorithm of output of sets of used elements in the basis of interface of program
Algorithm of installation of the level of statement of the material (information)
Algorithm of installation of a set of terms and definitions (for specific subject)
Algorithm of installation of a set of elements in the basis of interface of program
Module of control of processing of the psychological parameters for the support of the individually-oriented generation of educational influences (the information fragments)
Procedure of accounting of the speed of representation of the information by the means of training
Procedure of accounting of the additional capabilities of the means
Procedure of accounting of the kind of learning-ability of the subject of training
Procedure of accounting of the level of intelligence abilities of the subject of training
Procedure of accounting of the way of representation of the information by the means
Procedure of accounting of the cognitive styles of the subject of training
Algorithm of the analysis of the convergent abilities of the subject of training
Algorithm of the analysis of the divergent abilities of the subject of training
Algorithm of calculation of the speed of representation of the information by the means of training
Algorithm of choice of the additional parameters of representation of the information
Algorithm of identification of the predisposition of subject to the implicit or explicit learning-ability
Algorithm of identification of the cognitive styles of processing of the information by the subject of training
Algorithm of choice of the kind of representation of the information fragments by the means
Algorithm of choice of the style of representation of the information by the means of training
Algorithm of installation of the speed of presentation of the information fragments
Algorithm of installation of the additional opportunities of the means of training
Algorithm of installation of the kind of representation of the information fragments by the means
Algorithm of installation of the style of representation of the information fragments by the means

Pic. 3


A trainee (an examinee)
Interface of a trainee
A tutor (a teacher)
Interface of a tutor
An expert (an consultant)
Interface of an expert
The interface module
The mode of registration in the system
The mode of (adaptive) training
The mode of administrating of filling in the subjects of studying
The adaptive means of training (ET)
The mode of diagnostics of the parameters of the cognitive model (PCT)
The mode of administrating of the methods of research (tests) of PCT
The applied diagnostic module
The mode of diagnostics of the level of residual knowledge
The mode of administrating of the tests in the subjects of studying
The basic diagnostic module
The procedure of primary initialization and processing of events
The adaptive representation of information processor of ET (the procedure of control)
The procedure of authentication and addition of the final user
The procedure of control of process of diagnostics (testing)
The module of language support at displaying of the elements of interface
The procedure of processing of the events, initiated by the user
The procedure of the choice and analysis of data of testing
The kernel of system
The procedure of modification of the structure of CM of the subject of training
The procedure of modification of the structure of CM of the means of training
The procedure of administrating of tests in the subjects of studying
The procedure of administrating of the methods of research (tests) of PCT
The procedure of the check of correctness of the structures of data
The procedure of support of the access to data
The procedure of choice and processing of the inquiries to the databank
The databank
The database of the final users of the training system
The database with the filling in the subjects of studying of ET
The database of tests in the subjects of studying
The database of the methods of research (tests) of PCT
The database of a posteriori results of research (testing)
The procedure of check of integrity of data
The procedure of archiving and backup copying of data
The reserve warehouse of data
The database of temporarily inactive users
The reserve database in the studying disciplines
The reserve database of tests in the studying disciplines
The reserve database of the methods of research (tests) of PCT
The archive with a posteriori results of last years

Pic. 4

The scientific-methodical research and experimental check of the efficiency of functioning of IEE of ART system based on CM using CMT allows [13]:

- to reveal the anomalies of sensory perception (the physiological portrait), understanding (the linguistic portrait) and subsequent processing (the psychological portrait) of the various kinds of structured information expressed in the data, presented to the contingent of trainees by means of the use of the electronic (computer) (adaptive) educational means;
- to develop and integrate into the learning process of the adaptive means of training and the electronic learning-methodological complexes of a new generation, providing the individually-oriented generation of educational influences;
- the degree of influence of the parameters of CM on the efficiency of training (at distance) depends on the contingent of trainees and has the individual character, that initiates the carrying out of a series of the additional experimental researches;
- the system analysis of the efficiency of training (at distance) based on CM using CMT is determined by the potential capabilities of the means of IEE, the content of the information fragments of the electronic textbook and the purposes of training, varied according to the program of studying of the discipline (the subject of studying).

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А.Н. Ветров

РЕАЛИЗАЦИЯ АДАПТИВНОГО ОБУЧЕНИЯ В АВТОМАТИЗИРОВАННОЙ ОБРАЗОВАТЕЛЬНОЙ СРЕДЕ НА ОСНОВЕ КОГНИТИВНЫХ МОДЕЛЕЙ

Для реализации адаптивного обучения в автоматизированной образовательной среде на основе блока параметрических когнитивных моделей предлагаются технология когнитивного моделирования, методика ее использования, алгоритм формирования структуры когнитивной модели и комплекс программ

Информационно-образовательная среда, система автоматизированного (дистанционного) обучения, когнитивная модель, блок параметрических когнитивных моделей, технология когнитивного моделирования, алгоритм формирования структуры когнитивной модели