

**The response
of the scientific consultant,
the head of the chair “Modeling of social-economic systems” (“MSES”)
of the faculty “Applied mathematics – control processes” (“AM – CP”)
of “The Saint-Petersburg state university” (“SPbSU”),
doctor of physical-mathematical sciences, professor
Malafeyev Oleg Alekseyevich
on the dissertation (in the form of manuscript) on the rights of manuscript
of Vetrov Anatoly Nikolaevich
on the theme “The cognitive modeling technology
for the system analysis of the information-educational environments”
on the competition of scientific degree of the doctor of technical sciences
in the specialty 2.3.1. “The system analysis, control
and information processing”
(05.13.01 – “The system analysis, control and information processing”)
(technical sciences)**

In the process of training in the intramural post-graduate-study and working as a teacher in “The Saint-Petersburg state electrotechnical university "LETI" named after V.I. Ulyanov (Lenin)” (“SPbSETU "LETI"”) the dissertation researches are conducted by Vetrov A.N., directed on the solving of the actual scientific problem of the development of the environment of automated (remote) training (ART) with the properties of adaptation based on the innovative cognitive models.

The actuality of the theme of dissertation is caused by the significant necessity of the increasing in the quality of functioning of the information-educational environment (IEE) with the using of adaptation based on the parametrical cognitive models block (PCMB).

The new important scientific results are developed by Vetrov A.N. self-independently:

1. The generalized distributed structure of the adaptive IEE of ART system of the educational establishment (EE) based on the innovative PCMB:
 - the generalized topological structure of the territorially distributed IEE: on the example of the geographically distributed countries, regions and areas;
 - the typical scheme of information interaction of the information centre (IC) of EE and the automated workplaces (AWP) of the subjects of training (at distance);
 - the typical scheme of remote information interaction of the different AWP of the diverse subjects of training of IEE of ART system of (the various) EE;
 - the classification of the diverse subjects of training of IEE of ART system;
 - the transformation of information in the technological process of the formation of knowledge;
 - the classification of the practical methods of extraction and transmission of information (as the aggregate of knowledge) in the various subjects of studying (disciplines);

- the modifications in the organization of IEE of ART system of (the modern) EE for the providing of taking into account of the various individual features of personality of the subjects of training (IFPST) directly;
- the modifications in the technological process of the controlled formation of knowledge at the realization of the automated personally-oriented training;
- the generalized scheme of comparing of the modifications in the organization of IEE and the technology of ART for the realization of the contour of adaptation based on the innovative PCMB;
- the structure of the information-educational portal of the scientific (educational) centre: on the example of the information resources of "The scientific-educational consortium "System and financial analysis based on cognitive modeling technology" ";
- the structure of the information-educational portal of the teacher (the scientist): on the example of the information resource – the scientific-educational portal of "the author of the unique technology" of cognitive modeling for the system, financial and complex analysis" ("AUT CMT SFA") Vetrov A.N.;
- (the recommended formal description – the scheme of calculation of) the structure of ART system with the properties (elements) of adaptation based on the innovative PCMB (by means of the apparatus of the classical theory of automatic control);
- the information scheme, reflecting the algorithm (principle) of functioning of the main and applied diagnostic module (DM) in IEE of ART system;
- the information scheme, reflecting the algorithm (principle) of functioning of the innovative adaptive means of training (the electronic textbook – ET and the laboratory workshop – LW) in IEE of ART system;
- the architecture of the adaptive means of training (ET and LW) based on PCMB;
- the branched information structure of the subject of studying (discipline), displayed at the level of presentation of data by the means of use of the innovative adaptive means of training (ET and LW) based on PCMB;
- the recommended schemes of the realization of branching for the linear and branched model of controlled process of the formation of knowledge of the contingent of trainees;
- the algorithm of processing of the events, initiated by the user (the subject of training) in the innovative adaptive means of training (ET and LW) based on PCMB;
- the semantic (structural) model of representation of the diverse information (a sequences of diverse information fragments by the different way) in the innovative adaptive means of training (ET and LW) based on PCMB;
- the structural-functional scheme of the adaptive representation of a sequence of information fragments processor in the subject of studying.

2. The innovative cognitive modeling technology (CMT) for the system analysis and increasing in the efficiency of functioning of IEE:
- the generalized iterative cycle of CMT for the system analysis of IEE of ART system;
 - the technique of use of CMT for the tasks of the system analysis of IEE of ART system;
 - the recommended bases (the meta-structures) for the building of the structure of the cognitive model (CM) of the zero generation;
 - the formal models for the presentation of procedural data (the algorithms and procedures);
 - the representation of the structure of CM by means of the logical model;
 - the representation of the structure of CM by means of the production model;
 - the representation of the structure of CM by the means of use of the (difficult) calculus of the theory of sets and the corteges on domains;
 - the nonformal models for the representation of declarative data (knowledge);
 - the representation of the structure of CM in the view of the frame model;
 - the representation of the structure of CM in the view of the semantic network;
 - the representation of the structure of CM in the view of ontology (the field of knowledge);
 - the representation of the structure of CM in the view of the multi-level structural scheme;
 - the infological scheme of database (DB) for the representation of the structure of CM;
 - the hybrid models for the representation of data in the poorly formalized areas;
 - the representation of the structure of CM by the means of use of the (difficult) classical calculus of the theory of sets and the theory of graphs;
 - the representation of the structure of CM by the means of use of the multilevel encapsulated pyramids, combining the theory of graphs and the theory of sets;
 - the recommended bases for the building of the structure of CM of the first generation;
 - the hybrid models for the representation of data in the poorly formalized areas;
 - the representation of the structure of CM in the view of the cognitive ring;
 - the representation of the structure of CM in the view of the cognitive disc;
 - the representation of the structure of CM in the view of the cognitive cylinder;
 - the representation of the structure of CM in the view of the cognitive cone;
 - the representation of the structure of CM in the view of the cognitive sphere;
 - the recommended bases for the building of the structure of CM of the second and third generations;
 - the hybrid models for the representation of data in the poorly formalized areas;
 - the representation of the structure of CM by the means of use of the one-, two-, three-, four-, five- and more-cognitive ring, cognitive disc, cognitive cylinder, cognitive cone and cognitive sphere;
 - the algorithm of formation of the structure of CM for the system analysis of IEE of ART system;
 - the technique of research of the parameters of the innovative CM of the subject of training;
 - the technique of research of the parameters of the innovative CM of the means of training;
 - the algorithm of processing of a posteriori data of testing of the contingent of trainees.

3. The innovative PCMB for the system analysis of IEE of ART system
[* – the scientific result of increased difficulty was obtained in the dissertation]:
- the innovative structure of the parametrical CM of the subject of training (the multilevel structural scheme, combining the theory of mathematical sets) [the theoretical structure of CM with the wide scientific justification: cognitive informatics, psychophysiology of perception, cognitive psychology and applied (mathematical) linguistics];
 - the innovative structure of the parametrical CM of the means of training (the multilevel structural scheme, combining the theory of mathematical sets) [the theoretical structure of CM with the wide scientific justification: cognitive informatics, psychophysiology of perception, cognitive psychology and applied (mathematical) linguistics];
 - the structure of the modified model of the reduced eye of human (CM of the optical and biological construct of the reduced eye of human) [the theoretical and experimental structure of CM with the wide scientific justification: cognitive informatics, psychophysiology of perception, ophthalmology and micro-surgery of eye (the visual sensory system)];
 - the structure of the modified model of the reduced ear of human (CM of the optical and biological construct of the reduced ear of human) [the theoretical and experimental structure of CM with the wide scientific justification: cognitive informatics, psychophysiology of perception, otology and micro-surgery of ear (the acoustic sensory system)];
 - * the structure of CM of the difficult chemical element (the nuclear polymer) with the one, two, three, four, five or more nucleuses (the plasmatic formations) in the view of the one-, two-, three-, four-, five- and more-cognitive sphere [the experimental structure of CM with the narrow scientific justification: cognitive informatics, physics of atomic nucleus, physics of plasma and physical chemistry; it was developed by the means of use of the modeling and scientific visualization before the official decision about the recognition of fact of the synthesis of nuclear polymers with the one, two, three, four, five or more nucleuses (or the areas of plasma) of “The international association of theoretical and applied chemistry”:
at-first,- for the purposes of the potential possibility of realization of the complex analysis of the structure of the difficult chemical elements (the nuclear polymers) as the plasmatic formations with the clearly (not explicitly) expressed one, two, three, four, five or more nucleuses (the areas of plasma);
at-second,- for the providing of the potential possibility of studying (modeling) of the difficult physical phenomena of the nuclear convergence and divergence (at the micro-level)].

4. The complex of programs for the automation of the tasks of research of IEE of ART system, which includes the innovative adaptive means of training (ET and LW), the basic and applied DM, and also the innovative electronic dean's office (ED) and electronic library (EL):
- the generalized structural-functional scheme of the complex of programs for the automation of the tasks of research of IEE of ART system;
 - the algorithm of the primary initialization of DB and switching of the modes of functioning of the complex of programs for the automation of tasks of the system analysis of IEE of ART;
 - the algorithm of authentication of the user in the automated training system;
 - the interface of the complex of programs in the mode of main button form: the basic DM;
 - the structural-functional scheme of the adaptive means of training (ET and LW);
 - the infological scheme of DB of the adaptive means of training (ET and LW);
 - the algorithm of filling of the content of the adaptive means of training (ET and LW) based on the information (semantic) model of the subject of studying;
 - the algorithm of extraction of a sequence of information fragments of the adaptive means of training (ET and LW) based on the adaptive representation of a sequence of information fragments processor;
 - the algorithm of functioning of the adaptive ET together with DM (the refinement of the level of statement of the material of the subject studying was realized);
 - the interface of the adaptive ET (LW) in the mode of administrating: the viewing and modifying of parameters of the subjects of studying (disciplines);
 - the interface of the adaptive ET (LW) in the mode of administrating: the viewing and modifying of parameters of the sections of the subject of studying;
 - the interface of the adaptive ET (LW) in the mode of administrating: the viewing and modifying of parameters of the modules of section of the subject of studying;
 - the interface of the adaptive ET (LW) in the mode of administrating: the viewing and modifying of parameters of the page of module of the section of the subject of studying;
 - the administrating of DB with the values of parameters of PCMB: the viewing and modifying of parameters of CM of the subject of training;
 - the administrating of DB with the values of parameters of PCMB: the viewing and modifying of parameters of CM of the means of training;
 - the interface of the adaptive ET (LW) in the mode of adaptive training: the textual representation of information fragment (text);
 - the interface of the adaptive ET (LW) in the mode of adaptive training: the graphical representation of information fragment (the flat scheme);

- the structural-functional scheme of the basic DM in IEE of ART system;
- the infological scheme of DB of the basic DM in IEE of ART system;
- the algorithm of functioning of the mode of administrating of the basic DM;
- the algorithm of functioning of the mode of diagnostics in the form of testing of the basic DM;
- the interface of the basic DM in the mode of administrating;
- the interface of the basic DM in the mode of diagnostics (the version for the carrying out of express diagnostics without the using of images);
- the structural-functional scheme of the applied DM in IEE of ART system;
- the infological scheme of DB of the applied DM in IEE of ART system;
- the algorithm of functioning of the applied DM in the mode of administrating of the question-answers structures of the methods of research (tests) of the individual features of personality of the contingent of examinees;
- the algorithm of functioning of the applied DM in the mode of diagnostics of the individual features of personality of the contingent of examinees;
- the interface of the applied DM in the mode of administrating of the question-answers structures of the method of research of the color-perception of Rabkin E.B.;
- the interface of the applied DM in the mode of diagnostics of the color-perception by means of the method of research of Rabkin E.B.;
- the interface of the applied DM in the mode of administrating of the typical question-answers structures of different subtests of the verbal reasoning, verbal abstraction, verbal combinatorics, conceptual judgment, arithmetic counting, arithmetic inductive reference, the concentration of attention and mnemonics, planar imagination and volumetric thinking by the means of use of the various blocks of questions “The logical selection, the addition of sentences”, “The searching of common signs, the exclusion of word”, “The search of verbal analogies”, “The classification of concepts, generalization”, “The arithmetic tasks”, “The numerical rows”, “The attention and memory (mnemonics)”, “The flat figures” and “The cubes” of the method of research of Amthauer R.;
- the interface of the applied DM in the mode of diagnostics by the means of use of the different blocks of questions of the method of research (test) of Amthauer R.;

- the interface of the applied DM in the mode of administrating of the question-answers structures of the subtest of verbal creativity and figurative creativity by the means of use of the method of research of Mednik S.A. and Torrance E.P.;
- the interface of the applied DM in the mode of diagnostics of the verbal and figurative creativity by the means of use of the method of research (test) of Mednik S.A. and Torrance E.P.;
- the mathematical model of the spherical perimeter of Forster K.F.R., and also the features of representation of a posteriori data of research of the achromatic and chromatic field of vision of the examinee;
- the interface of the applied DM in the mode of administrating of the question-answers structures of the method of research of the achromatic and chromatic field of vision of the examinee by means of the computer perimetry: the parameters of the method of research;
- the interface of the applied DM in the mode of administrating of the question-answers structures of the method of research of the achromatic and chromatic field of vision of the examinee by means of the computer perimetry: the parameters of displaying;
- the interface of the applied DM in the mode of administrating of the question-answers structures of the method of research of the achromatic and chromatic field of vision of the examinee by the means of use of the computer perimetry: the parameters of DB;
- the interface of the applied DM in the mode of diagnostics of the achromatic and chromatic field of vision of the examinee by the means of use of the computer perimetry;
- the structural-functional scheme of the innovative ED based on PCMB;
- the infological scheme of DB of ED of ART system with the properties of adaptation based on CM;
- the interface form of the innovative ED in the mode of administrating of DB: the basic parameters of account and the estimation of knowledge of the trainee (the examinee);
- the interface form of the innovative ED in the mode of administrating of DB: the nominal values of parameters of CM of the subject of training and CM of the means of training;
- the interface form of the innovative ED in the mode of viewing of the content of DB: the main parameters of account and the estimation of the trainee (the examinee);
- the interface form of the innovative ED in the mode of viewing of the content of DB: the nominal values of parameters of CM of the subject of training and CM of the means of training;
- the semantic model of saving, extracting and searching of the information for the innovative adaptive EL based on the innovative PCMB;
- the structure of the information model of information resource of the adaptive EL;
- the structure and linkage of information elements of the adaptive ET in the adaptive EL.

5. The statistical justification of practical use of the obtained results by means of the preliminary (primary) processing of a posteriori data, the secondary mathematical processing of samples of a posteriori data: some results of the dispersion, regression, discriminant and cluster analysis, multivariate scaling and the factor analysis (*):
- the scheme, reflecting a sequence of actions (stages) for the support of researches of the cycle of adaptive ART;
 - the summary results of mathematical processing of a posteriori data;
 - the results of regression analysis: the equations of multiple regression;
 - the results of discriminant analysis: the eigenvalues for the formed canonical discriminant functions and the position of the centroids of classes in the space of two discriminant functions;
 - the results of multidimensional scaling of a posteriori data;
 - the results of factor analysis of the formed a posteriori data;
 - the dynamics of the indicators of efficiency (resultativity) of the technological process of the controlled formation of knowledge of the contingent of trainees (examinees).
6. The structure of “The scientific-educational consortium "System and financial analysis based on cognitive modeling technology ” (“SEC "SFA CMT"”), including the scientific organizations:
- the structure of “The state international organization "Academy of cognitive natural sciences” (“SIO "ACNS"”);
 - the structure of “The scientific-research institute "System and financial analysis based on cognitive modeling technology ” of “The Russian academy of (natural) sciences" named after Veniaminov V.N.” (“SRI "SFA CMT" of "RA(N)S" n. a. Veniaminov V.N.”);
 - the structure of “The scientific fund "System and financial analysis based on cognitive modeling technology ” named after Prokopenko N.A.” (“SF "SFA CMT" n. a. Prokopenko N.A.”);
 - the structure of “"Saint-Petersburg exhibition centre named after Brezhnev L.I." at "Exhibition of achievements of science and technology named after Sobchak A.A.”” (“"SPbEC n. a. Brezhnev L.I." at "EAST n. a. Sobchak A.A.””);
 - the structure of “The scientific-educational centre "System and financial analysis based on cognitive modeling technology ” of "The Russian academy of (medical) sciences" named after academician Burdenko N.N.” (“SEC "SFA CMT" of "RA(M)S" n. a. acad. Burdenko N.N.”).

Thus, the presented dissertation contains the principally new theoretical and practical fundamental and applied scientific results, the using of which allows to carry out the system analysis of the automated information-educational environment of the educational establishment (organization) and to increase the efficiency of the process of the formation of knowledge of the contingent of trainees.

The structure and volume of the doctoral dissertation (in the form of manuscript) of Vetrov A.N.:

- volume 1 (2006 y.) – the introduction, four chapters (sections), conclusion, the bibliographic chapter, including 499 names, stated on 240 p. of typewritten text, including 44 pictures and 2 tables (with appendices) are presented;
- volume 2 (2006 y.) – contains 14 appendices on 252 p. of typewritten text, including 89 pictures (the difficult structural schemes) and 154 tables;
- volume 3 (it was created in 2008 y., it was submitted in 2010 y.) – contains 1 appendix on 418 p. of typewritten text, including 177 pictures and 171 tables.

The interest to the scientific work was shown by Vetrov A.N. even in the period of training in “SPbSETU “LETI””, which he graduated *with honors* on the 11th of February 2003 year. In 2003 year he was awarded by the diploma of the IInd degree of the open concourse of “SPbSETU “LETI”” on the best scientific-research work of students.

On the theme of the specified dissertation (in the form of manuscript) of Vetrov A.N. was published 44 on 2006 y., 52 on 2007 y. (314 on 2023 y.) scientific works: 01 textbook and 03 methodical manuals to the laboratory works in the discipline “Informatics”, 01 textbook (10 volumes) in the discipline “Finance, monetary circulation and credit”, 02 sections in 01 collective scientific monography of “The international Higher education academy of sciences” (“IHEAS”) (with the formal co-authors-teachers), 04 (10) learning manuals and scientific monographies (with the co-authors-diploma-students), 12 (29) [54] learning manuals and scientific monographies (without co-authors), 01 (02) report(s) on the individual initiative SRW (2003-2005 y. and 2006-2008 y.), 01 appendix to the report on the individual initiative SRW (2003-2005 y.), 05 (09) [14] scientific articles in the scientific journals, recommended by “The higher attestation commission of The Russian Federation” (“HAC of RF”), from which 00 (05) scientific articles were deposited in ““The All-Russian institute of scientific and technical information” of “The Russian academy of sciences”” (“VINITI” of “RAS””), 22 (48) [226] scientific reports in the materials of 11 (24) [46] international scientific conferences, and also 04 copyright certificates about the deposition and registration of works – the objects of intellectual property in “The Russian author’s society” (“RAS”) (RF, Moscow city) were received.

In the time of working under the dissertation (in the form of manuscript) Vetrov A.N. proved himself to be the highly-qualified scientific worker (4 diplomas with honors), knowing to set and solve the difficult scientific-technical problems (tasks). In the process of training in the intramural (day-time) post-graduate-study on the concourse basis, he was left on the chair “ACP” of “SPbSETU “LETI”” in the post of teacher, as he was performed successfully all kinds of learning and scientific-methodical load.

The results of researches were used in the learning process (from 2003 y. to 2010 y.) on the disciplines “Artificial intelligence” (from 2003 y. to 2007 y.) and “Informatics (computer science)” (from 2004 y. to 2010 y.) on the chair “Automatics and control processes” (“ACP”) of the faculty “Computer technologies and informatics” (“CTI”) of “SPbSETU “LETI””, and also on the disciplines “Banking”, “Accounting”, “Taxes and taxation”, “The general theory of audit”, “Insurance”, “Management accounting”, “Financial management” and others on the faculty “Professional retraining and improvement of professional-skill” (“PR and IPS”) of “The international banking institute” (“IBI”), that is confirmed by the sheets (lists) and the personal cards of the examinees (trainees) for the registration of a posteriori data and by the corresponding acts about the practical use (introduction) of scientific results into the learning process.

The considered nodal aspects can be the subject of separate researches, therefore each from them has its own specifics and causes the emergence of various traditional and innovative approaches, methods and technologies.

In connection with the described above I believe, that the presented dissertation on the theme “The cognitive modeling technology for the system analysis of the information-educational environments” on the competition of scientific degree of the doctor of technical sciences in the specialty 2.3.1. “The system analysis, control and information processing” (05.13.01 – “The system analysis, control and information processing”) meets to all requirements, presented to the doctoral dissertations, and its author Vetrov Anatoly Nikolaevich deserves to be awarded to him the scientific degree of the doctor of technical sciences in the scientific specialty 2.3.1. “The system analysis, control and information processing” (05.13.01 – “The system analysis, control and information processing”).

The scientific consultant,
the head of the chair “Modeling of social-economic systems” (“MSES”) of the faculty “Applied mathematics – control processes” (“AM – CP”) of “SPbSU”, doctor of physical-mathematical sciences, professor Malafeyev Oleg Alekseyevich [the scientific specialty 01.01.09 – “Discrete mathematics and mathematical cybernetics”]
(the address: RF, The North-Western federal district, 198504, Saint-Petersburg city, Peterhof city, Universitetsky pr., h. 35, room 335, Phone: +7(812)428-4247 (work), Fax: +7(812)428-4247 (work), WWW: www.spbu.ru, www.apmath.spbu.ru, Email: o.malafeev@spbu.ru, malafeyeva@mail.ru)

The “ th” of December 2023 year.