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THE FUNDAMENTAL DEVELOPMENTS BRANCH  
“COGNITIVE MODELING IN THE MATHEMATICAL SCIENCES” (“OMN”)  
OF “SRI "SFA CMT" OF "RA(N)S" N. A. VENIAMINOV V.N.”

The developed “The fundamental developments branch  
"Cognitive modeling in the mathematical sciences"” (“OMN”)  
treats to the fundamental developments divisions  
of “The scientific-research institute "System and financial analysis based on  
cognitive modeling technology" of "RA(N)S" named after Veniaminov V.N.”  
 (“SRI "SFA CMT" of "RA(N)S" n. a. Veniaminov V.N.” – SRI) as the first SRI  
in the structure of “SIO "Academy of cognitive natural sciences"” (“SIO "ACNS"”)  
and the add. component of the system of science and education of the modern country  
for the creation, distribution and use of the main and derivative  
scientific results of the cognitive modeling technology (CMT) (www.vetrovan.(spb.)ru)  
[see the fundamental developments branches and departments of SRI]:  
1) it is executed by the principle of “administrative-economy submission”;  
2) works in the several main directions, which allow to provide  
the development of the fundamental main and derivative scientific results  
(my second report on SRW from 2006-2008(9) y. was submitted  
to “SPbSETU "LETI”” and “The Government of RF”  
for the translation, carrying out of int. action and receiving of “The Nobel prize”);  
3) includes the several various main divisions:  
I. “The fundamental developments department  
"Theory of mathematics and the complex system analysis  
based on the cognitive modeling technology”” (“SM”) (\*)  
*[the fundamental developments in the area  
“Theoretical mathematics” (\*)* –  
theory of mathematical logic, theoretical bases of mathematics,  
theory of numbers, theory of algebra, theory of topology, theory of geometry,  
theory of the mathematical analysis, theory of the functions of valid variables,  
theory of the functions of complex variables,  
theory of the ordinary differential equations,  
theory of the differential equations with private derivatives,  
theory of the integrated equations,  
theoretical mathematical models  
of the objects, processes and phenomena of the natural and technical sciences,  
theory of the equations of mathematical physics, theory of variational calculus,  
mathematical theory of optimum control,  
theory of the functional analysis, theory of calculation mathematics,  
theory of probability and mathematical statistics, theory of the combinatory analysis,  
theory of graphs, theoretical mathematical cybernetics,  
theory of the ways of representation of the structure of the cognitive models and problem environments,  
theoretical basis of the parametrical cognitive models block,  
theory of the cognitive modeling technology  
in the theoretical mathematics;

*the fundamental developments in the area “The theoretical complex system analysis” (\*)* – theory of the general questions of the complex system analysis, theory of tendencies, dependences and laws of the complex system analysis of the difficult objects, processes and phenomena, theory of the cognitive modeling technology with dynamic cloning, verification and subverification, theory of the iterative cycle and the technique of use of the cognitive modeling technology for the complex system analysis of the difficult objects, processes and phenomena, theory of the parametrical cognitive models block for the complex system analysis and the increase of efficiency of functioning of the difficult objects, processes and phenomena, theory of the structure of the parametrical cognitive models of the 0<sup>th</sup>, 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> generations, theory of the ways of representation of the structure of the cognitive models and problem environments: the formal classical of the 0<sup>th</sup> generation (the logical and production models), the nonformal classical of the 0<sup>th</sup> generation (the semantic network, the frame network and ontology), the formal new of the 0<sup>th</sup> generation (the calculus of theory of sets and corteges on domains and the innovative calculus of theory of sets and graphs), the nonformal new of the 0<sup>th</sup> generation (the multi-level structural scheme and the multi-level encapsulated pyramids combining theory of graphs and theory of sets), the flat of the 1<sup>st</sup> generation (the cognitive circle and the cognitive disc), the volumetric of the 1<sup>st</sup> generation (the cognitive cylinder, the cognitive cone and the cognitive sphere), the flat and volumetric of the 2<sup>nd</sup> generation (the one-, two-, three-, four-, five- and more cognitive circle, cognitive disc, cognitive cylinder, cognitive cone and cognitive sphere), the hybrid of the 3<sup>rd</sup> generation (the combinations of the existing cognitive models), theory of the algorithms of formation of the structure of the difficult cognitive models of the 0<sup>th</sup>, 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> generations, theory of the techniques of research of parameters of the difficult cognitive models of the 0<sup>th</sup>, 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> generations, theory of the algorithms of processing of a posteriori data of the complex system analysis of the difficult problem spheres, theory of software for the automation of research tasks, theory of the statistical substantiation of practical use of the received results, theory of the factors influencing to the efficiency of functioning of the difficult objects, processes and phenomena, theory of organization and plan of carrying out of the experiment, theory of research of the cognitive models parameters, theory of preliminary processing of a posteriori results of diagnostics, theory of choice of the statistical analysis methods of the generated data sets, theory of the analysis of the dynamics of resultativity of the difficult object, process and phenomena of research, theory of the dispersion, regression, discriminant, cluster analysis, multidimensional scaling, factor analysis and bibliographic lists, the theoretical complex system analysis of the basic rocket engine, the first, the second, the third and the fourth rocket engine of the launch vehicle, the theoretical complex system analysis of the multivariate code device, the theoretical complex system analysis of the modified model of reduced eye for the research of acuity of vision, field of vision, color perception and other parameters in the Descartes space of the 2 and 3 coordinates, the theoretical complex system analysis of the modified model of reduced ear for the research of absolute sensitivity and thresholds of sensitivity in the Descartes space of the 2 and 3 coordinates, the theoretical complex system analysis of the chemical element with 1, 2, 3, 4, 5 and more nucleus, the theoretical complex system analysis of the difficult multidimensional hurricane and other difficult objects, processes and phenomena].

II. “The fundamental developments department “Theory of cybernetics and (cognitive) informatics”” (“SPMI”) (\*)  
[*the fundamental developments in the area “Theoretical cybernetics”* –  
 theory of the automatic control systems, theory of modeling, theory of the cybernetic control systems, theory of information, theory of artificial intelligence, theory of the discrete (final) automatic devices and formal languages, theory of reliability, theory of the system analysis, theory of the cognitive modeling technology in the theoretical cybernetics;  
*the fundamental developments in the area “Theoretical informatics”* –  
 theory of informatics, theory of the organization of information work, theory of the documentary information sources, theory of the analytical-synthetical processing of documentary information sources, theory of information search, theory of information service, theory of the technical means of support of the information processes, theory of the cognitive modeling technology in the theoretical informatics;  
*the fundamental developments in the area “Theoretical cognitive informatics” (\*)* –  
 theory of the modified stratified-step model of perception (psycho-physiology of perception), processing (cognitive psychology) and understanding (cognitive linguistics) of the content of information fragments, theoretical bases of cognitive informatics and the cognitive modeling technology in the technical, economic, physical-mathematical and other sciences, theoretical bases of formation of the parametrical cognitive models block for the system analysis of the information-educational environments (the cognitive models of the subject of training and the means of training), theoretical bases of formation of the parametrical cognitive models block for the financial analysis of the (credit) organizations (the cognitive models for the vertical, horizontal and trend financial analysis), theoretical bases of formation of the parametrical cognitive models block for the complex analysis of the objects, processes and phenomena in cognitive informatics, theory of the ways of representation of the structure of the cognitive models and problem environments (the formal and nonformal classical and new of the 0<sup>th</sup> generation, the flat and volumetric of the 1<sup>st</sup> generation and 2<sup>nd</sup> generation and the hybrid of the 3<sup>rd</sup> generation), theory of the adaptive automation means of the information-educational environment (the basic and applied diagnostic module, the electronic textbook, the laboratory practical work, the electronic dean, the electronic library and others), theory of the technical means of support of the adaptive information interaction (the adaptive representation of sequence of information fragments processor, the question-answers structures sequence processing processor, the linguistic processor and other processors), theory of the technical means of support of the financial analysis (the automation means of formation of the working plan of accounts based on the normative-regulated plan of accounts of the accounting; the automation means of formation of the accounting balance and the report about profits and losses of the (credit) organization and enterprise, the automation means of the vertical, horizontal and trend financial analysis of the (credit) organization and enterprise based on the diverse analytical coefficients system), theory of the technical means of support of the complex analysis (the automation means of formation and research of the cognitive circle, cognitive disc, cognitive cylinder, cognitive cone, cognitive sphere, one-, two-, three-, fore-, five- and more cognitive sphere and others)].

The fundamental developments branches and departments of SRI allow to develop the main and derivative scientific results of CMT.