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**THE COGNITIVE MODELING TECHNOLOGY
FOR THE SYSTEM ANALYSIS
OF THE INFORMATION-EDUCATIONAL ENVIRONMENTS**

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Appendix 1 (information).

The essence of the fundamental theories of remote training

The first mention about the education without interruption from the main activity is related with the development of a method of using of the postal communications for the sending of various instructions, information, control works, training materials to the trainees and the receiving of a certain questions and completed tasks from them. The authors of the innovation, appeared more than 130 years ago, were Tusen Ch. – the teacher (lecturer) of the French language of “The Berlin university” and Langenscheidt G. – the member of “The Berlin society of modern languages”.

This form of education in the higher school is acquired the official status in USA, where in 1891 y. the extramural (remote) department was created at “The university of Chicago”. Somewhat later it spread and on the other American universities, and in the XXth century it spread to USSR and the countries of The Central and Eastern Europe. In last decades it has become popular in the developing countries, especially in the different countries of Australia and Oceania, and also in PRC and others. As it develops and uses of the achievements of communication technologies, the educational establishments of a new type is appeared and the terminology is expanded. Along with the term “the extramural training” such concepts, as “the training at home”, “the open (remote) training”, “the training at distance”, “the independent (autonomous) training” and other synonymous scientific concepts began to be used. In USA the term “the independent training” has become the most wide dissemination, and in Europe – the term “the education at distance” (“the distance education”). In RF the scientific term “the extramural education” was used, and in last years the concept of “the distance education” has been introduced as a special form of education.

In Western and Eastern Europe the scientific problems of distance education (DE) were discussed by the different scientists quite widely from the different scientific positions.

Gleason G.T. defines DE as a system of training, which provides to trainees the possibility to comprehend the disciplines, that are important to them independently, without any restrictions relative to time and place, regulations, acting at the ordinary training.

Holmberg B. refers it to the various forms of training at all levels, when there is no constant and direct control from the side of the mentor (tutor). Trainees receive the materials (assistance) from a certain educational centre, which plans and manages by the learning process and conducts the mentoring.

Keegan D. believes, that “the training at distance” necessarily assumes:

- the lack of direct personal contact between the subjects of training, which are located in the different places, that is a distinctive feature of the training at distance from the traditional (classical) training;
- the influence of various means of training in the automated (virtual) information-educational environment on the trainee (the subject of training), that distinguishes the training at distance from the independent training;
- the use of different modern achievements in the area of information and communication technologies for the support of the cycle of remote training;
- the existence of bilateral communication between the means and subjects of training (the teacher and trainee), taking into account the possibility to initiate a dialogue;
- the possibility of carrying out of the targeted meetings between the different subjects of training.

There is a row of problems in DE, on which there is no consensus between the scientists and specialists, so the various scientific discussions arise very often, in particular: whether DE should be considered a full-fledged independent form of education or should be considered only as a way of exchanging of the information at distance.

Apparently, those, who believe, that the remote training is significantly justified at the qualified leadership, when the trainees are involved into the independent creative activity, in the process of which their attention and efforts concentrate on the intellectual and emotional development of their personality.

DE can directly be as effective and high-quality, as and education, which is carried out in the walls of classical educational establishments. This is confirmed by the practical experience of work of such learning establishments as “The open university of Great Britain” and other similar universities, in which the standards of preparation at all levels (the educational programs of preparation of the diploma specialists, bachelors, magisters and doctors of sciences) are not inferior to the existing standards of preparation in the best British universities, performing the (automated) training by the traditional methods.

Another important question is the motivation of organization and realization of DE (the government bodies, the educational establishments and the private organizations), and also the subsequent involvement and selection of the contingent of trainees for the training at distance (the subjects of training, which on one or other reasons cannot complete the educational program with using the traditional technologies of training).

The organizers of DE are oriented on the scientific principles of openness and importance of the given form of activity of the educational establishment for the society, since it allows to expand the potential possibilities of preparation of the qualified specialists without interruption from of their main activity.

To the most strongest stimuli, that providing the motivation of the subject of training at the choosing of the remote form of (automated) training, today include: the increasing of social status and the perspective of career growth of the specialists, the emancipation of persons with the various physical disabilities and restrictions, the expanding of outlook (worldview), the studying of cultural heritage and others.

The expansion of the sphere of use of the remote form of (automated) training in many countries of the world underlines the necessity of carrying out of the theoretical and practical actual researches of a row of scientific problems, related with the organizational, methodical, technical and didactic support. These include: the organization of remote exchange of the information of the subjects of training (teachers and trainees), the development of methodical materials (of a new generation), the estimation of resultativity of the (automated) training, the control of the learning process, the social and economic justification of resultativity and efficiency of DE and other.

The modern bibliography on the main scientific problems of DE includes more than 2 thousand selected scientific works only in the English and German languages. From these more than 240 scientific works are devoted to the development of (traditional) learning courses, their structure and the means of automation of the transfer of material to the subjects of training (trainees). In last years the output flow of scientific literature in RF is increased significantly, the dissertations on the problems of DE, its development is defended and foreign experience is generalized. The main theoretical provisions, containing in the works of Western-European scientists, relate to the theories of autonomy and independence of the (automated) training (at distance), appeared in late 60^s – early 70^s years, the theory of “industrialization”, the theories of interaction and communication and the theory of integrated models.

A1.1. The theory of autonomy and independence of training

The idea of autonomy of the (automated) training (at distance) is most clearly traced at Delling R.M. (The university of Tübingen, Germany). He defines the training at distance as the scheduled systematic activity of the subjects of training (teachers and trainees), including the formation and selection of an educational program, the preparation and studying of information resources, and also the control and provision of assistance to the trainees in the course of studying of the material by means of the means of communication, allowing to take into account the territorial distance of the subjects of training.

The central place in the scientific theory of Delling R.M. is assigned directly to the scientific principles of feedback and two-way (duplex) communication.

He notes a significant difference between the potential possibilities of the controlled technological process of (automated) training (at distance) in the mode of monologue (the simplex transmission of information by means of use of the information resources and the carriers of information – books, methodical manuals, newspapers, journals, audio- and video-cassettes, radio-broadcastings and cases in disciplines, providing the independent studying of the learning courses and other materials) and the potential possibilities of (automated) training (at distance) in the mode of dialogue (the duplex transmission of information, acting as the analogue of traditional training – conferences, seminars, forums, dialogues, correspondence and remote access to the courses of DE of the information centre of the educational establishment). Obviously, the training in the mode of monologue is based on one-sided communication, and the training in the mode of dialogue is based on two-sided communication. The educational potential of technologies of the (automated) training (at distance), providing the exchange of information in the duplex mode is significantly higher, than with the information interaction of the subjects of training in the mode of monologue.

In the opinion of Delling R.M., the information-educational environment of DE has the characteristics of traditional training and the participation of the teacher is minimized, and its functions on the providing of assistance (support) to the trainee in the course of the learning process are realized by the channels of communication with using the various means of training, located in the information centre of a certain educational establishment. The main idea in the theory of Delling R.M. is in autonomy and independence of the subject of training (trainee) in the information-educational environment of DE, he proposes to move “the training at distance” beyond the frameworks of the traditional forms of training.

Conceptually the scientific position of Wedemeer A. – doctor of sciences and professor of pedagogics of “The university of state Wisconsin” (USA) is significantly close to this. He defines DE as “the independent training”, carried out as a result of activity of the diverse subjects of training (the trainees and teachers) in the specific information-educational environment, different from the traditional one. Although the technological process of the (automated) training (at distance) is supervised by the teacher, the trainees act as the independent subjects of training, since they have a certain degree of freedom and social responsibility.

At “the independent training” the subjects of training (the teachers and trainees) perform their various functions and tasks separately from each other, supporting the communication between themselves by the various ways (the means of training).

In the opinion of Wedemeer A., the purposes of “the independent training” are: firstly,- to reduce the quantity of classroom hours in the educational establishment; secondly,- to provide the possibility of studying of the material by means of technologies of DE in a convenient and comfortable information-educational environment for the trainee (at the place of permanent or temporary residence, work, study and etc).

In accordance with the scientific conception of Wedemeer A. DE system must:

- to carry out the (automated) training (at distance) of any trainee in any place regardless of the presence of teachers at this location;
- to assign more responsibility on the trainee himself at the training;
- to free the teachers from the routine operations and constant control of activity of the trainee with the purpose of free up of time for the performance of scientific work, allowing to improve the methodical support;
- to provide to the diverse trainees and applicants, wishing to complete the training, a more wider set of different learning courses, forms and methods of their studying;
- to approve and estimate the efficiency of innovative technologies and methods of training, and also the algorithms of functioning of the different means of training in practice;
- to provide the possibility to the trainee to independently select the different parameters of educational trajectory, in particular: the speed and convenient time for him to study the sequence of information fragments in the discipline.

A. Wedemeer believes, that the only way for the overcoming of “the space-time” barrier at the (automated) training (at distance) – the use of the means of communication, allowing to the remote trainee to study the material and to perform the reporting actions in the controlled technological process of training.

For this requires the separate special planning of different actions, which are in the basis of the controlled technological process of training (at distance) and the consideration of each from them as the independent kinds of activity of the diverse subjects of training (a certain teacher and trainee).

This implies the main features of the information-educational environment of DE:

- the subjects of training (the trainee and teacher) are territorially separated;
- the training at distance is carried out based on the communication technologies: the mail correspondence, the electronic mail and the access to the information resources by means of use of the various means of communication and computer networks;
- the individually-oriented character of the (automated) training;
- the training (at distance) is oriented on the independent activity of the trainee;
- the most convenient place of training is the automated workplace of trainee (on a certain place of residence, location and etc.);
- the trainee is socially responsible for his or her creative achievements and is free in the choose of certain terms and rates of work at the cycle DE;
- the possibility of introducing and using of a new methods of training (at distance);
- the planning of actions, accompanying the cycle of (automated) training is carried out by the information center of the educational establishment in relation to the diverse contingent of trainees (the subjects of training).

Moore G.M. made a significant scientific contribution into the development of the theory of DE. His conception is also based on the two concepts – “autonomy” and “distance”. Moore G.M. allocates the three elements: the trainee, the teacher, the means of training and communication, which on their characteristics differ significantly from the analogous elements at the other forms of the controlled technological process of (automated) training. According to him, the learning programs are related to the programs of DE, if they provide epy two-way communication between the teacher and the trainee, and also meet their requests.

In dependence from the subject of training, which defines the various purposes and technologies of training and the methods of estimation of the achievements of each trainee, Moore G.M. classifies the learning programs by the degree of autonomy of the trainee. Thus, he refers any learning program to the independent training, in which the trainee has, at least, the same possibility to influence on the definition of the purposes and technologies of training and the methods of estimation of results.

Analyzing the theory of Moore G.M., the former chairman of “The research committee” of “The international council of training at distance” Keegan D. notes, that one pole of the theoretical position of Moore G.M., namely “the distance”, is justified quite well, but as for the second pole, i.e. “the autonomy”, then here he directly needs the further scientific evidences, as not all trainees are able to take advantage of autonomy to the same extent. The learning program with the high degree of autonomy can directly cause the same damage to the trainee, as and the program with the insufficient autonomy. Therefore the scientific task (problem) consists in that, then to provide the individualization of the diverse learning programs to the individual features of each trainee. Then they will use the maximum of autonomy and advance in the studying of material.

A1.2. The theory of industrialization

It was developed by the founder of “The university of distance training” Peters O. He considers DE as a new form of “the industrialized and technologized education”, and the ordinary, the traditional education – as “the pre-industrial” form. The rector of “The university of distance training” Peter O. considers the historical regularity of emergence of the various forms of DE in the course of the informatization of society.

The theory of DE of Peters O. begins with the didactic analysis of methods and technologies of DE.

In his research DE is considered not as a definite scientific method, and as a definite area of application of the educational efforts of the subjects of training. In his analysis of the didactic structure of DE Peters O. follows the scientific conception of the two classical German tutors (teachers) – Heyman P. and Schulz V., the founders of “The Berlin didactic school”, which argued, that all processes of training (the studying of material) can be analyzed in the context of the six structural elements: the purposes, the content, the methods, the means, and also the humanistic prerequisites and the social-cultural prerequisites. He comes to the scientific conclusion, that on all these information elements the ordinary (classical) training and DE are significantly different from each other.

Peters O. argues, that at the analysis of the distance form of education the traditional pedagogical conceptions can only be partially used, and therefore the new approaches and principles should be sought for the analysis of this form of training.

For example, at a large number of trainees in the system of DE, the teachers, which develop the training courses, are exempted from the other routine functions, such as the testing of the level of residual knowledge, consulting, tutoring and others. There is a division of labor between the subjects of training (the teachers), thereby achieving a high efficiency of the developed educational programs. The objective requirements to the entire structure of the learning course in the subject of studying dominate under the personal (subjective) preferences of the teacher.

The theory of Peters O. was developed directly in 1960^s years. Nowadays it is criticized by a row of famous teachers (Eyman S., Rebel K.H., Hamman M. and other specialists and experts in pedagogics), which believe, that the scientific conceptions of Peters O. are applicable in our time due to the significant changes, that have occurred in the society for the last decades.

A1.3. The theory of interaction and communication

In the 70^s years a well-known scientist-teacher Boat J. was a clear consistent supporter of the scientific conception of double-sided communication in DE. He made an important theoretical and practical contribution into the formation of this scientific conception as a defining sign of the modern systems of DE. He investigated the potential applicability of the models of training of the famous didacts (Skinner B.F., Rothkopf E., Keegan D., Bruner J.S, Roger S., Gagne R.M. and others).

Boat J. came to the conclusion, that the models with the tighter control of the process of training, directed on the achieving of the set purposes, at DE have a tendency to the concentration of attention more on the learning materials, than on the two-sided communication between the trainee and the educational institution (the teacher and tutor). The models with the less stringent control of the process of training, leading to the achievement of the set purposes, require the simultaneous communication between the trainee and the teacher (tutor) in the form of personal contacts or telephone conversations.

The personal experience, the theoretical and empirical researches led Boat J. to the conclusion about the central place of double-sided communication in the technological process of DE and the central role of extramural tutoring directly in this scientific conception. He wrote about the presence of scientific evidences, confirming directly, that, starting to the (automated) training (at distance), the trainees first need in the special help, especially at the consolidating of their motivation. In his opinion, the tutor should perform the important pedagogical functions, and not only to correct the errors and to estimate the written works of the trainees. He can play a significant role in the process of linking of the learning material with the previous preparation of each subject of training (the trainee), accumulated earlier knowledge through the establishment of good personal relations with the trainee.

Holmberg B., the professor of “The extramural university” in Hagen city (Germany), developed the theory of controlled didactic conversation between a tutor and a trainee.

DE in the scientific vision of Holmberg B. – is a complex didactic dialogue, directed on the studying of material in the subject of studying (discipline). The constant interaction between the subjects of training (the trainee and the tutor) is presented in the form of dialogue in the writing view or by the telephone in the oral view. Except to the real didactic conversation (the informational interaction), Holmberg B. defends the idea of imitated dialogue (the virtual dialogue), possible due to the studying by the subject of training (the trainee) of the learning material, prepared in a certain form (according to the algorithm and the structure of data).

The typical at the organization of didactic conversation is than, that its process gives advice, how to approach to the studying of the problem, which should be paid more attention, how to combine the certain parts of knowledge, contained in the various learning materials and information resources.

The learning material, prepared for DE in accordance with the recommendations of Holmberg B. should differ in the following significant characteristics (properties):

- be easily available for the perception by the visual sensory system (text should be easily readable and moderately reached by the information);
- to contain the clear advice and recommendations of specialist on, what to do and avoid, what to pay a special attention to and why;
- to motivate the interest of trainee to the subject of studying and its problems;
- the tips and recommendations to the trainee should be presented in the form of personal appeal.

The researcher Daniel J., who has extensive practical experience in the organization of DE, uses the activity approach to DE: in his view the trainee can work alone, autonomically, and can come into the contact with others in the technological process of training.

In the first case the “independent” activity of the trainee is realized, in the second – the interactive. The training in the systems of DE is achieved by the balance between the learning activity of the trainee, which is carried out independently (completely autonomously), and the activity, which is determined by the interaction with the different other subjects of training. To find this reasonable balance – the main task of organization and control of the systems of DE.

A special place in the theoretical works on DE is occupied the studying of the directly integrated models of DE, according to which the traditional work of many educational institutions of the university profile or the Russian HEIs is being built today, offering to the trainees both the intramural and the distance forms of education.

One from the consistent proponents of these models is Smith P.K. In contrast from Peters O. directly with his theory of “industrialization”, Smith P.K. insists on a reasonable distribution of the working hours of university teachers between the trainees, studying in the extramural and DE departments. The development of courses, the checking of tasks, the conducting examinations and the estimation of knowledge, the consulting assistance and other – are the traditional functions, the completion of which is required from any teacher regardless from the audience, on which his activity is oriented: extramural or distance. All trainees receive the same scientific degrees on the completion of training. Smith P.K. compiled the typology of existing learning institutions of DE and concluded to conclusion, that:

- DE should be carried out directly by the university teachers, and not by the tutors and assistants, which work jointly;
- the providing of integration of DE as the component of the information-educational environment of a certain traditional educational establishment (the scientific centre);
- the trainees at DE need to support the contacts with a small group of leading university teachers in the various subjects of studying;
- the trainees should become the members of the community of scientists and teachers of the university and systematically visit (the information center of) the educational establishment.

Appendix 2 (mandatory).
**The technical description of program toolkit
for the realization of the automated individually-
oriented training of the contingent of trainees
in the studied disciplines,
the standard blanks of the electronic record book
for the registration of academic-performance of trainee
and the semantic models of storage and extraction of the information**

In the given description describes the use of the adaptive means of training of the first generation (the electronic textbook), developed for the realization of the individually-oriented model of training based on the parametrical cognitive models block and providing the automation of adaptive representation of a sequence of information fragments by the cycle of the subjects of studying to the contingent of trainees.

The developed parametrical cognitive models (CM) block contains:

- CM of the subject of training – the parameters, characterizing directly the various individual features of personality of the subjects of training;
- CM of the means of training – the parameters, reflecting the potentially possible kinds and types of training influences, generated by the means of training.

The adaptive representation processor of a sequence of information fragments processor of the developed means of training of the first-generation (the electronic textbook) provides the individually-oriented generation of information fragments based on the nominal values of parameters of CM of the subject of training and CM of the means of training.

In the process of functioning the program module operates by the database with the filling in the subjects of studying and the database of users of the system of training.

The presented database with the filling in the subjects of studying (disciplines) is based on the structural (semantic) model of the subject of studying (discipline), which directly provides the saving and extracting of previously structured information by means of a row of special procedures and algorithms.

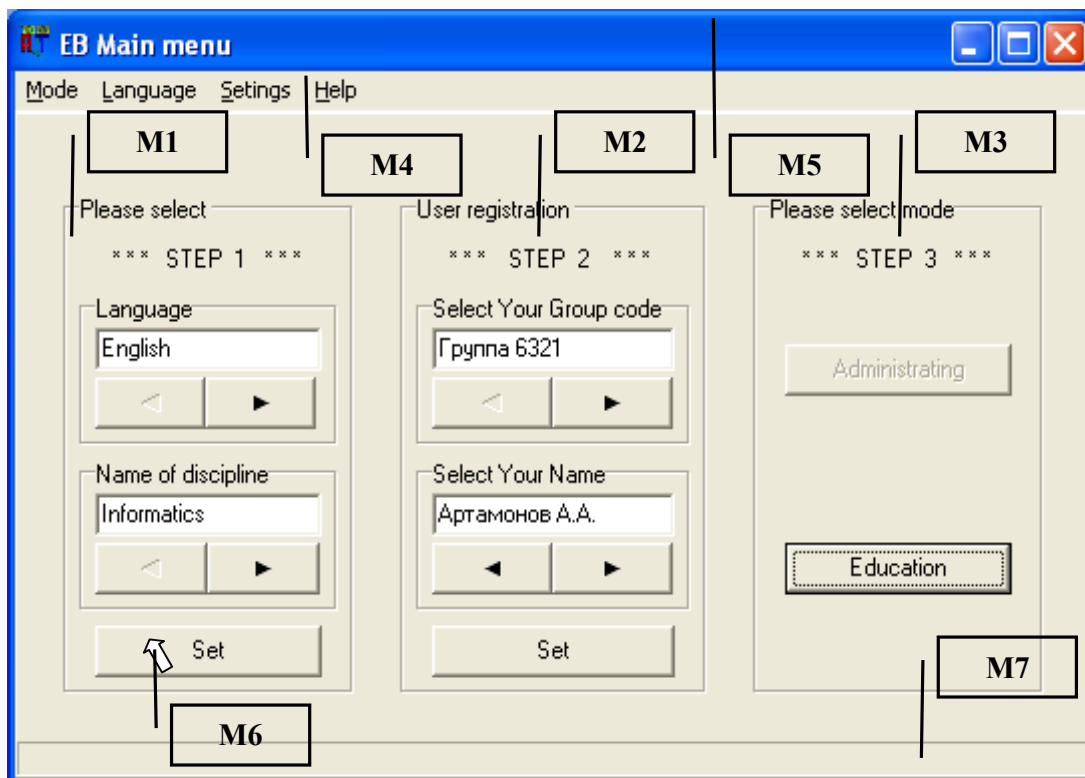
The database of users of the system of training contains the different accounts of diverse users of various categories (are formed at the registration), including the registration (personal) data and the values of parameters of CM.

In the pictures of the forms of interface, accompanying the description of the program product are used the alphabetic-numeric identifiers (codifiers) of the certain structure ([letter][digit].[digit]), which directly unambiguously determine the purpose:

- the first part of the identifier (letter) – the belonging of the form of interface of the program product (module) to the certain mode of functioning (the registration of user, the administrating and the adaptive training);
- the second part of the identifier (digit) – the number of the group of the elements of interface on the form in the certain mode of functioning of the program product;
- the third part (digit) – the number of the element of interface in the composition of the group of elements of interface.

A2.1. The main button form

The main button form of the interface of program realization (application) of the adaptive means of training of the first generation (the electronic textbook) contains a set of groups of the elements of interface of the different kind and appointment, which perform the various functions in the process of functioning (pic. A.2.1).



Picture A2.1. The main button form of interface of the program realization of the adaptive means of training of the first generation (the electronic textbook) and its groups of elements of interface

Pic. A2.1 contains the callouts with the alphabetic-numeric identifiers (“M1” – “M7”), corresponding to the various groups of elements of interface of the program product.

Note

The considered groups of elements of interface realize the certain functions in the various modes of functioning of the program product (application):

- the administration – allows to view and modify the content of the database with the filling (content) in the subjects of studying (disciplines) and the database with the accounts (parameters) of users (the subjects of training);
- the adaptive training – allows to provide the individually-oriented generation of a sequence of information fragments taking into account the individual features of personality of the subject of training (CM of the subject of training) and the potential technical capabilities of the means of training (CM of the means of training).

The appointment of the elements of interface of the main button form is shown in tabl. A2.1.

Table A2.1

The appointment of the groups of elements of interface of the main form of application

The identifier of group	The name	The appointment
“M1”	The selector of discipline	Allows to select the language of statement of the material of discipline and its name
“M2”	The selector at the registration of user	Provides the registration of user, at the same time a certain user must specify his group and L.F.P.
“M3”	The selector of mode	Allows to choose the mode of work of the program: the administration and the (adaptive) training
“M4”	The menu bar	Intended for the selection of the mode of work, the language of interface of the program, parameters, and also the output of reference information
“M5”	The title of window	Displays the icon and name of application, identifies the current mode of work, contains the buttons of control of the window
“M6”	The cursor of manipulator	Identifies the position of the cursor of manipulator (mouse, trackball and touchpad)
“M7”	The status line	Contains the additional information about the current status of training system (including displays the appointment of elements)

The main button form of the interface of application functions in the step-by-step mode (each step is accompanied by the flashing banners with the tooltip balloons):

- at the first step (“M1”) – the user (the subject of training) makes the selection of the language of statement of the information fragments and the name of discipline;
- at the second step (“M2”) – the authentication of user (the subject of training) in the training system is performed (at the necessity the procedure of registration is realized);
- in the third step (“M3”) – the mode of functioning of the program is selected.

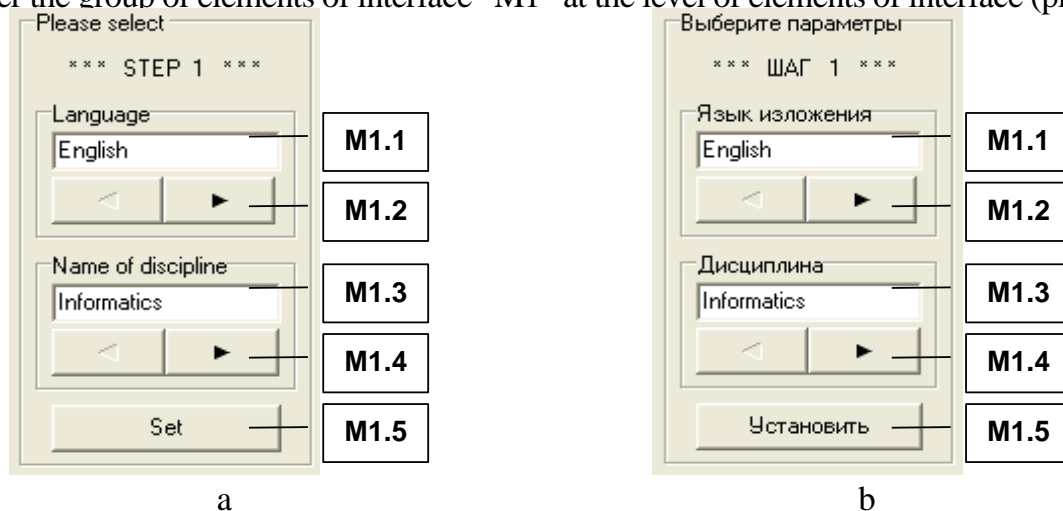
In pic. A2.1 shows simultaneously all the steps for the completing of the subject of training, but in fact they are displayed to the final user one by one (consistently).

A2.1.1. The selection of subject area (knowledge base)

The adaptive means of training of the first-generation (the adaptive electronic textbook) based on the parametrical CM provides the individually-oriented generation of a sequence of information fragments in the various subjects of studying.

The adaptive means of training allows to modify the list of disciplines and the content of the structural (semantic) model of the subject of studying (discipline).

The switching of a certain language of statement of the material and the name of discipline is provided by the group of elements of interface of the application (the program product), indicated directly by the alphabetic-numeric identifier “M1” in pic. A2.1. Consider the group of elements of interface “M1” at the level of elements of interface (pic. A2.2).



Picture A2.2. The group of elements of interface of the program “M1”, providing the selection of a certain language of statement of the material and the names of discipline (the subject of studying)

In pic. A2.2 presents directly: a – the variant in the English language; b – the variant of identifiers of the elements of interface of the program in the Russian language, and tabl. A2.2 reveals the appointment of the presented elements of interface of the program.

Table A2.2

The appointment of the elements of interface of the program at the selecting of a certain language of statement of the material and the name of discipline (the subject of studying)

The identifier of element	The name	The appointment
“M1.1”	The field of indication	Displays the name of the selected language of statement of the material of discipline
“M1.2”	The navigator	Pressing provides the switching of the language of statement of the material of discipline
“M1.3”	The field of indication	Displays the name of the selected subject of studying from the general list
“M1.4”	The navigator	Pressing provides the switching in the limits of the list of available disciplines
“M1.5”	The button	Press to confirm the selection of a certain language of statement of the material and the name of the subject of studying, and then the transition to the next step is carried out (the authentication)

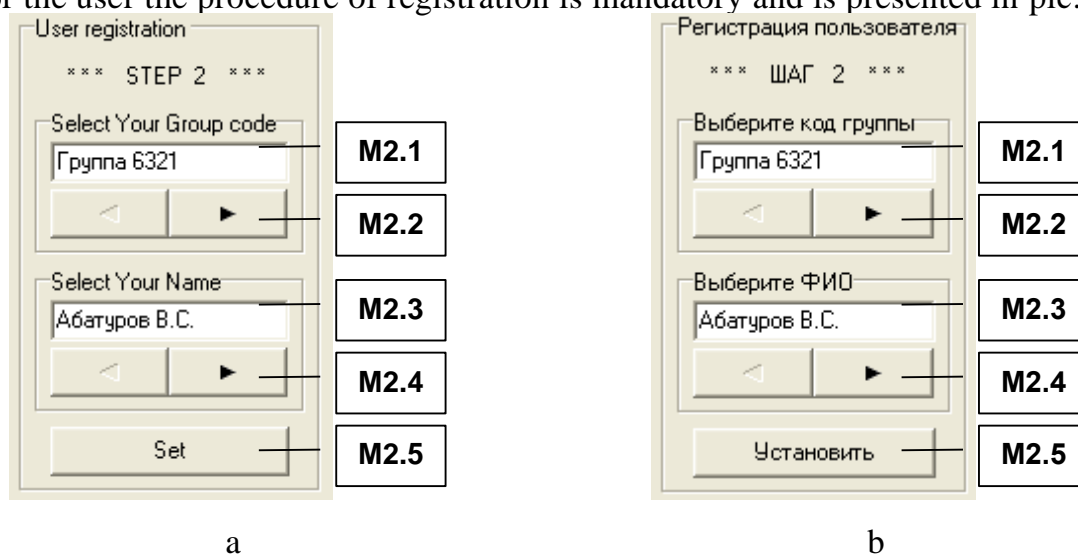
The structured information in the subject of studying (discipline) is loaded from the database with the filling (content) in the subjects of studying (disciplines) immediately after the choosing of the language of statement of the material and the name of discipline.

Pressing the button “M1.5” directly initiates the transition to the second step – the authentication of user (the subject of training) (is the mandatory procedure).

A2.1.2. The procedure of authentication of the user

After confirming the selection of a certain language of statement of the material and the name of the subject of studying (discipline) at the previous step (pressing the button “M1.5”), the user (the subject of training) needs to pass the procedure of authentication (if a certain user was not previously registered in the database, then needs to pass the procedure of registration of the user in the adaptive training system). The procedure of registration of the user (the subject of training) consists in the fact, that the final user needs to specify the identifier of the group and L.F.P. The procedure of registration of the user is necessary for the distinguish of the rights of access to the certain information resources and databases of the adaptive training system, and also the loading of parameters of CM of the subject of training (the individual features personality), necessary for the support of functioning of the mode of adaptive training.

For the user the procedure of registration is mandatory and is presented in pic. A2.3.



Picture A2.3. The group of elements of interface of the program “M2”, providing the registration of final user

In pic. A2.3 presents the group of elements of interface of the program “M2”, at the same time the inscriptions (labels) made in two languages: English (a) and Russian (b).

For the registration in the training system the user must specify the group and L.F.P., at the same time needs to use the elements of interface, presented in tabl. A2.3.

Table A2.3

The appointment of the elements of interface of the program at the registration of user

The identifier of element	The name	The appointment
“M2.1”	The field of indication	Displays the identifier (codifier) of the group of users (the subjects of training)
“M2.2”	The navigator	Pressing provides the selection of group, the name of which is displayed directly in the field of indication “M2.1”
“M2.3”	The field of indication	Displays L.F.P. of user
“M2.4”	The navigator	Pressing provides the selection of L.F.P. of the user, the displaying is provided in the field of indication “M2.3”
“M2.5”	The button	Pressing completes the procedure of authentication of the user and proceeds the transition to the next step (the selection of mode)

A2.1.3. The selection of the mode of working of the adaptive training system

The adaptive training system has the ability to work in the several modes:

- the administrating – the modification of the databases of users and content;
- the adaptive training – the studying of content taking into account the individual features.

For each category of final users (the subjects of training) the certain mode of working in the process of operation of the means of training is directly intended.

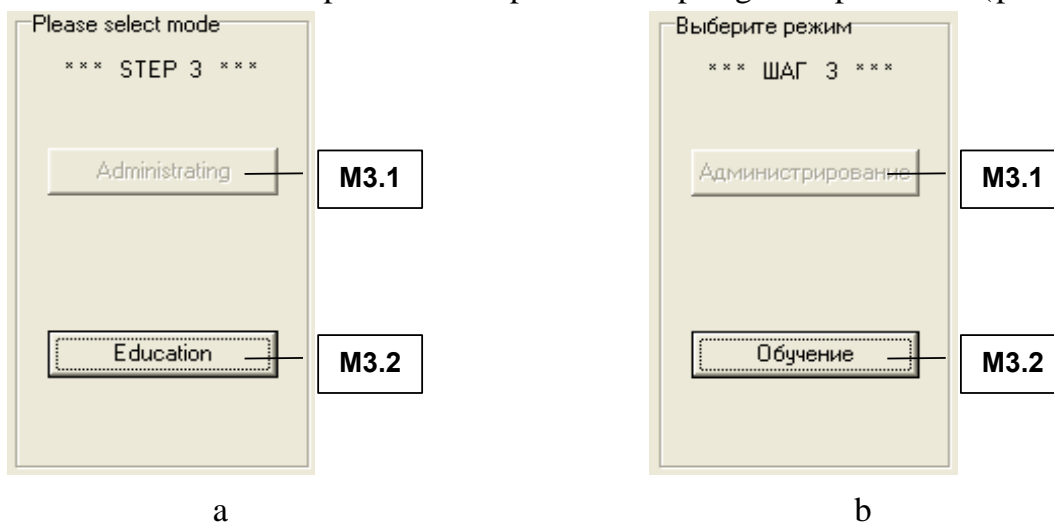
In dependence from the user belonging to the certain category it is possible to determine the operating mode of working of the program product based on tabl. A2.4.

Table A2.4

The categories of users and the modes of working of the program

The name of category of the users	The mode of working of the program
An expert	The administrating and analysis of data
An analyst	
An examinee	The diagnostics (testing)

The user must specify the mode (in dependence from his category in tabl. A2.4), in which he intends to operate the provided program product (pic. A2.4).



Picture A2.4. The selection of the mode of working of the program

The selection of the mode of working of the adaptive training system of the first generation (the electronic textbook) is carried out with the help of the group of elements of the interface “M3”, the functional appointment of which is presented directly in tabl. A2.5.

Table A2.5

The appointment of the elements of interface at the selecting of the mode of working of the program

The identifier of element	The name	The appointment
“M3.1”	The button	Pressing provides the transition in the mode of administrating
“M3.2”	The button	Pressing puts the program into the mode of adaptive training

A2.1.4. The modes of working of the adaptive training system

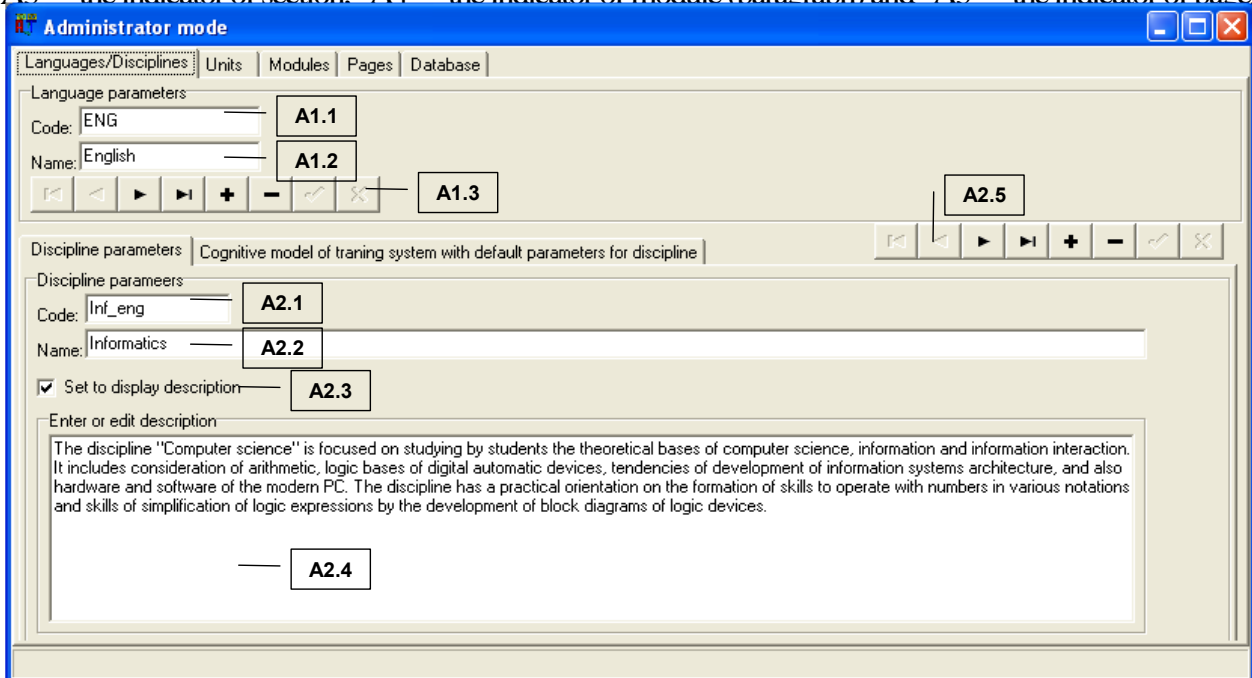
In the process of operation of the program product the various tasks are solved in the different modes of functioning of the adaptive means of training (the electronic textbook). Each mode has the certain features in the process of functioning of the program.

The forms of interface of the program in the different modes of functioning have the significant differences and each mode of functioning of the program is intended for the certain category of final users (see tabl. A2.4).

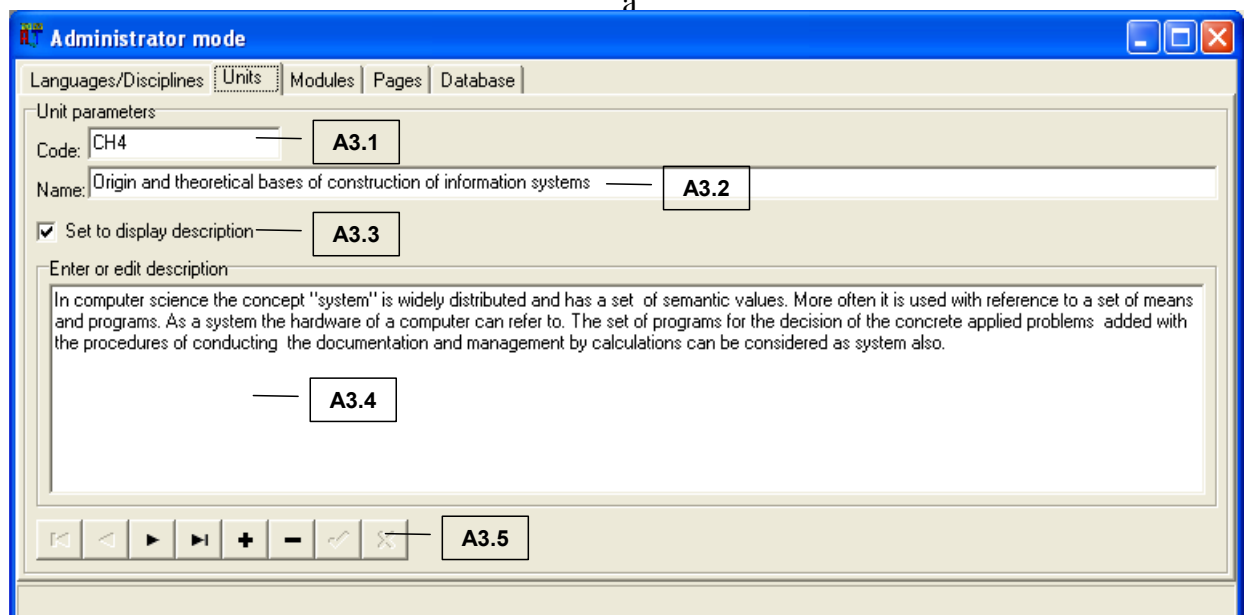
A2.1.4.1. The mode of administrating

The form of interface of the program directly in the mode of administrating is saturated by the different elements of interface of the various functional appointment, which provide the filling of the database by the information in row of disciplines, and also the setting of the values of parameters of CM of the subject of training and CM of the means of training for the providing of subsequent work of user in the mode of adaptive training.

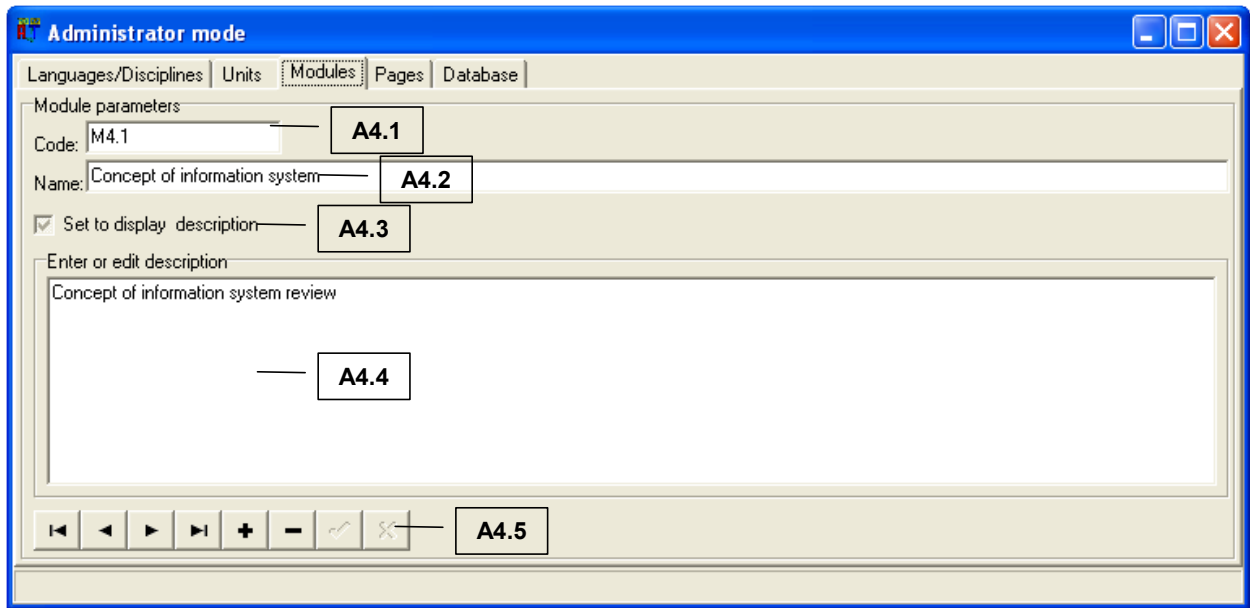
In pic. A2.5 shows the interface of the means of training in the mode of administrating of the content of discipline “Informatics”, including a set of groups of elements of the interface: “A1” – the indicator of language, “A2” – the indicator of the subject of studying (discipline), “A3” – the indicator of section. “A4” – the indicator of module (paragraph) and “A5” – the indicator of page.



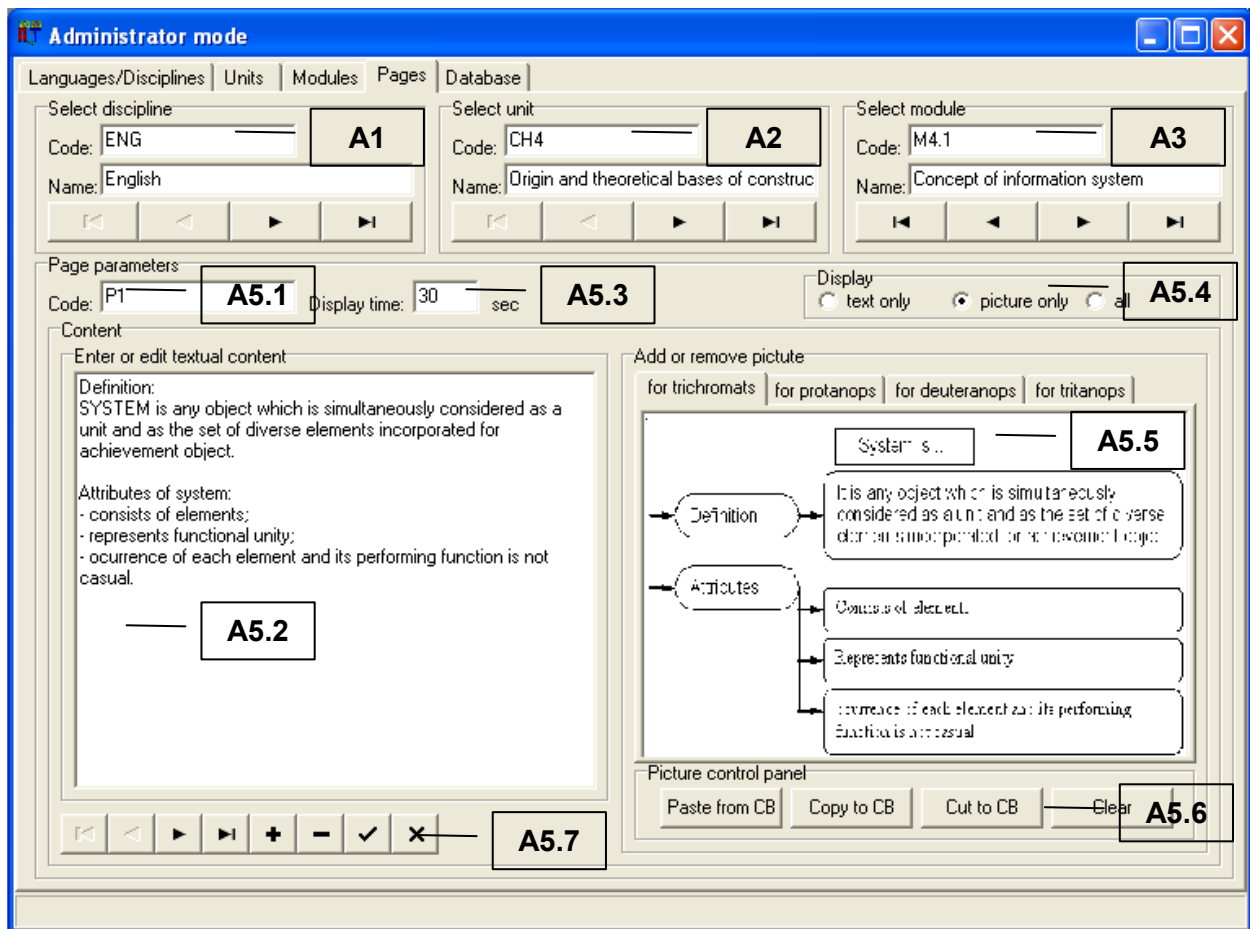
a



b



c



d

Picture A2.5. The setting of parameters in the mode of administrating

In the context of the accepted sequence of statement tabl. A2.6 reflects the appointment of the main groups of elements of the interface of program “A1” – “A5” in the mode of administrating.

Table A2.6

The appointment of the groups of elements of the interface of program in the mode of administrating

The identifier of element	The name	The appointment
“A1”	The indicator of language	Provides the displaying and inputting of the codifier and name of the language of statement of the material
“A2”	The indicator of discipline	Provides the displaying and recording of the codifier and name of discipline, and also its description
“A3”	The indicator of section	Provides the displaying and recording of the codifier and name of section, and also its description
“A4”	The indicator of module	Provides the displaying and recording the codifier and name of module (paragraph), and also its description for the user
“A5”	The indicator of page	Provides the displaying and modification of the parameters of page of the module of section of the discipline

The information, reflecting the content of each subject of studying (discipline) is structured on a set of sections, modules (paragraphs) and pages.

The filling of the database by the information fragments of the discipline is carried out sequentially: the list of the necessary languages of statement of the material is formed (“A1”), the parameters of new discipline are added or the existing discipline is selected for modification (“A2”), the sections of discipline and their parameters are added or the section to be changed is selected (“A3”), the parameters of modules (paragraphs) of each section of discipline are entered or changed (“A4”) and the new are created or the existing pages in each paragraph are modified (“A5”).

Let's consider a closer at the groups of elements of the interface, presented in pic. A2.5.

Tabl. A2.7-A2.11 reflect the name and appointment of the corresponding elements of interface of the program in the composition of the groups of elements of the interface “A1”–“A5”.

In the case of necessity of the statement of material of the discipline in the several languages it is necessary to use the group of elements of the interface of program “A1” (tabl. A2.7).

Table A2.7

The appointment of the elements of the indicator of language (“A1”)

The identifier of element	The name	The appointment
“A1.1”	The field of indication	Intended for the displaying and entering of the codifier of certain language
“A1.2”	The field of indication	Provides the displaying and modifying of the name of the language of statement of the material
“A1.3”	The navigator (the control panel)	Allows to carry out the navigation in the limits of the list of the possible languages of statement of the material, and also to add, delete, save and restore the values, entered by the final user

The addition of new, the deletion or modifying of the values of parameters of the existing discipline is carried out by means of the group of elements of the interface “A2” (tabl. A2.8).

Table A2.8

The appointment of the elements of the indicator of discipline (“A2”)

The identifier of element	The name	The appointment
“A2.1”	The field of indication	Provides directly the displaying and inputting of the codifier of the subject of studying (discipline)
“A2.2”	The field of indication	Intended for the displaying and inputting of the certain name of discipline
“A2.3”	The selector	Allows to activate the displaying of the certain description of discipline (for the displaying in the mode of adaptive training)
“A2.4”	The field of indication	Provides the displaying and modifying the text, containing the description of discipline

The adding of new, the deleting or modifying of the values of parameters of the existing section of discipline is realized by means of the group of elements of the interface “A3” (tabl. A2.9).

Table A2.9

The appointment of the elements of the indicator of the section of discipline (“A3”)

The identifier of element	The name	The appointment
“A3.1”	The field of indication	Intended for the displaying and inputting of the codifier of the section of the subject of studying
“A3.2”	The field of indication	Provides directly the displaying and inputting of the certain name of the section of discipline
“A3.3”	The selector	Intended for the activation of displaying of the certain description of the section of discipline (displayed in the mode of adaptive training)
“A3.4”	The field of indication	Provides the displaying and inputting of the text, containing the description of the section of discipline (for the mode of adaptive training)

In the case of necessity of the adding of new, the deleting or changing of the values of parameters of the existing module (paragraph) of the subject of studying (discipline) it is necessary to use the group of elements of the interface “A4” (tabl. A2.10).

Table A2.10

The appointment of the elements of the indicator of the module (paragraph) of discipline (“A4”)

The identifier of element	The name	The appointment
“A4.1”	The field of indication	Provides directly the displaying and inputting of the codifier of the module (paragraph) of discipline
“A4.2”	The field of indication	Intended for the displaying and inputting the name of the module (paragraph) of discipline
“A4.3”	The selector	Provides the activation of displaying of the description of the module (paragraph) of discipline
“A4.4”	The field of indication	Intended for the display and inputting of the text, containing the certain description of the module (paragraph) of the subject of studying
“A4.5”	The control panel (the navigator)	Allows to carry out the navigation in the limits of the list of the modules (paragraphs) of discipline, and also to add, delete, save and restore the values, entered by the final user

Directly for the addition of new pages, the deletion or changing of the values of parameters of the existing pages in the limits of the paragraphs and sections of discipline it is necessary to use the group of elements of the interface of program “A5” (tabl. A2.11).

Table A2.11

The appointment of the elements of the indicator of pages (“A5”)

The identifier of element	The name	The appointment
“A5.1”	The field of indication	Intended for the displaying and inputting the codifier of page at the editing
“A5.2”	The field of indication	Provides the displaying and modifying of the verbal content (text) of page
“A5.3”	The field of indication	Intended for the displaying and inputting of the nominal value of the interval of time, limiting the time of studying of the page
“A5.4”	The selector	Allows the user to forcibly select of the certain type of displayed content (text, graphics or all), ignoring the adaptive representation of a sequence of information fragments processor in the basis of the adaptive means of training of the first generation (the electronic textbook)
“A5.5”	The field of indication of the graphical image	Provides the displaying and saving of the certain graphical image for the normal trichromats and dichromats (protanopes, deuteranopes and tritanopes)
“A5.6”	The button	Provides the insertion from the clipboard, the cutting and copying into the clipboard, and also the clearing of the field with the graphical object
“A5.7”	The control panel (the navigator)	Allows to carry out the navigation in the limits of the list of pages with the content of discipline, and also to add, delete, save and restore the values, entered by the final user

The adaptive representation of a sequence of information fragments processor of the adaptive means of training of the first generation (the adaptive electronic textbook) forms the different individually-oriented educational influences based on the certain nominal values of parameters of CM of the subject of training (previously diagnosed by means of the applied diagnostic module) and CM of the means of training (added and modified in the course of the life cycle of program realization of the adaptive means of training of the first generation).

The parameters of the two CM are contained in the database with a posteriori results of research, their values are loaded automatically and allow to realize the adaptive training.

In the mode of administrating all fields of indication have the possibility of editing. In the process of functioning of the procedure of diagnostics in the form of testing at the examinee does not have the possibility to make changes into the information fields of the form of interface.

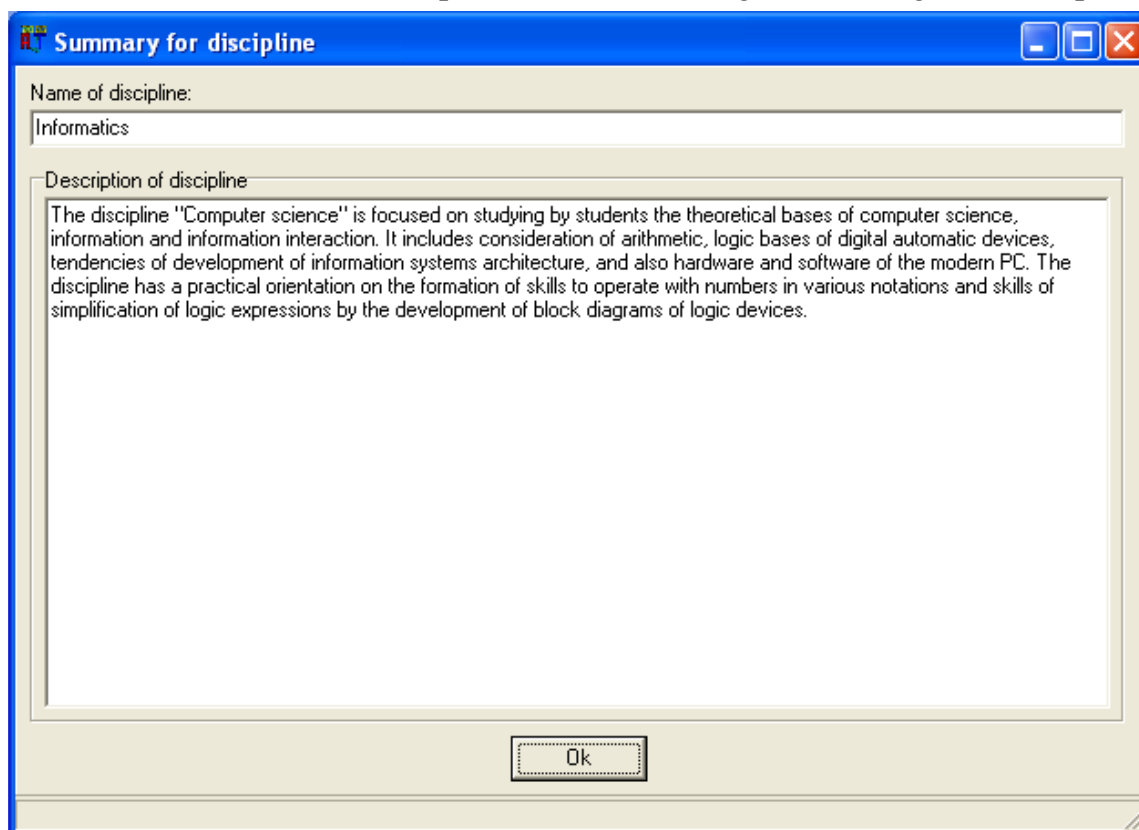
A2.1.4.2. The mode of adaptive training

It is intended for the providing of the automated formation of knowledge of the trainee due to the individually-oriented generation of educational influences with the elements of adaptation based on the innovative parametrical CM block.

Before the starting of the mode of adaptive training in the mode of administrating it is necessary to record previously the various information fragments, reflecting the contents (content) of a certain subject of studying (discipline), and also to make sure in presence of the values of parameters of the formed parametrical CM.

The final user enters into the mode of adaptive training from the main button form (the main window) of the program, presented in pic. A2.1. At the same time the procedure of registration of the final user is mandatory (pic. A2.3).

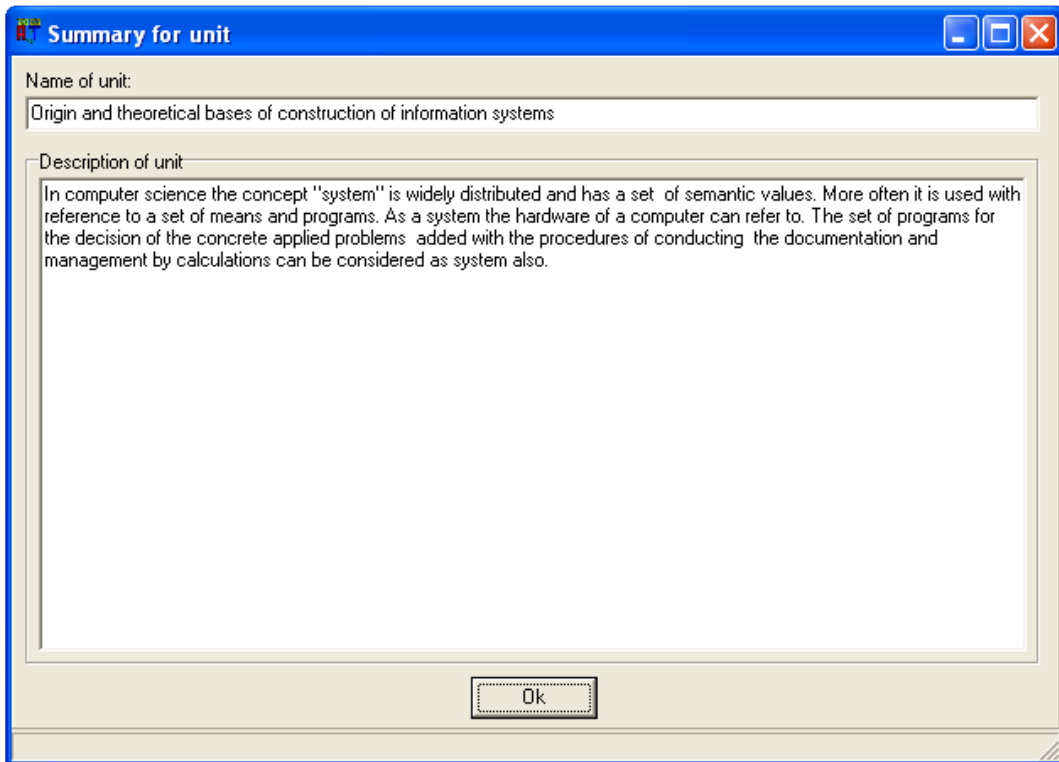
Immediately after the start of the mode of adaptive training to the final user is provided the displaying of the name and description of the subject of studying (discipline) in the window of interface of the adaptive means of training of the first generation (pic. A2.6).



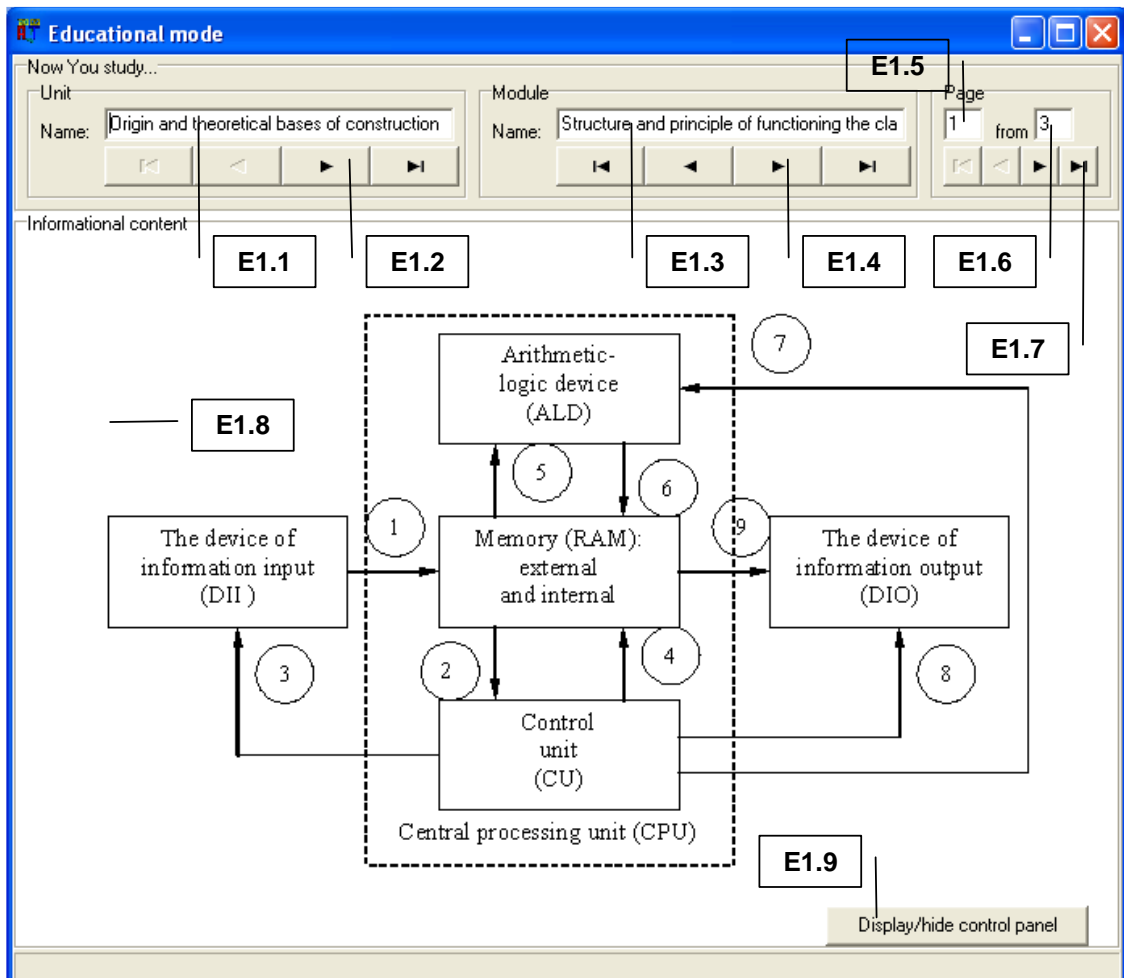
Picture A2.6. The window of interface with the name and description of discipline in the mode of adaptive training

After the final user familiarizes himself with the name and description of discipline the next window of interface of the program with the name and description of the section of the subject of studying (discipline) is directly displayed (pic. A2.7).

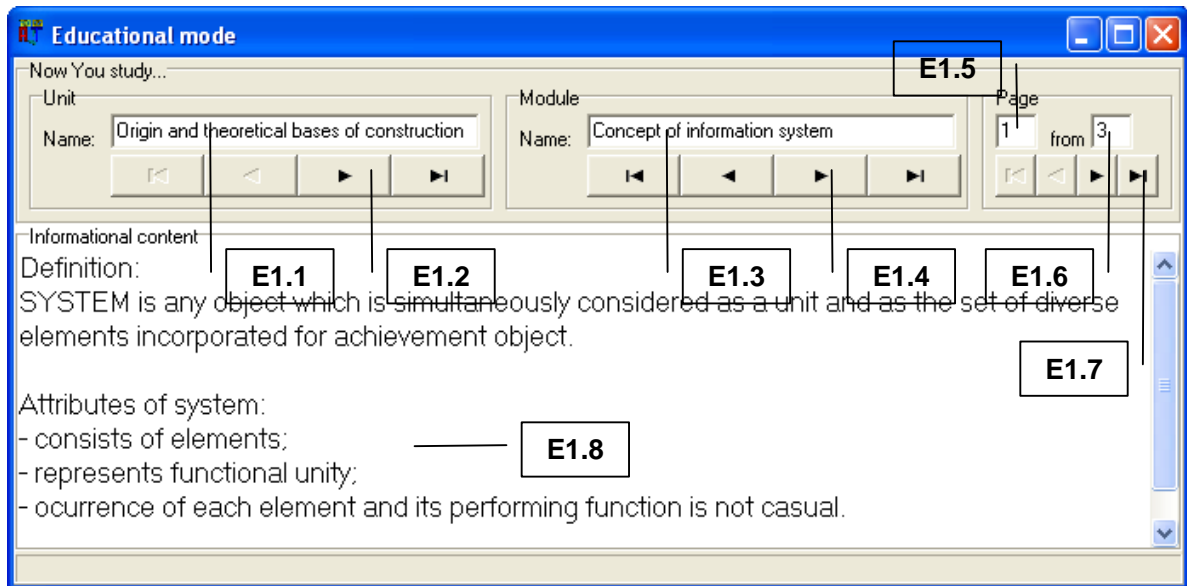
Figure P2.8 presents the window of interface in the mode of adaptive training with the demonstration of material a – in the view of flat scheme and b – in the verbal view (text).



Picture A2.7. The window of interface of the program with the description of the section of discipline in the mode of adaptive training



a



b

Picture A2.8. The window of interface of the program in the mode of adaptive training

Let directly consider the main groups of elements of the interface of program (“E1” – “E9”) and their functional appointment in the mode of adaptive training (tbl. A2.22).

Table A2.22

The appointment of the groups of elements of the interface of program in the mode of adaptive training

The identifier of element	The name	The appointment
“E1.1”	The field of indication	Provides directly the displaying of the name of section of the discipline
“E1.2”	The control panel (the navigator)	Provides directly the switching between the sections of the subject of studying (discipline)
“E1.3”	The field of indication	Displays the name of module (paragraph) in the structure of content of the discipline
“E1.4”	The control panel (the navigator)	Provides directly the switching between the modules (paragraphs) of discipline
“E1.5”	The field of indication	Displays the number of current page in the module (paragraph) of material of the discipline to the user
“E1.6”	The field of indication	Displays the total quantity of pages in the module (paragraph) of material of the discipline to the user
“E1.7”	The control panel (the navigator)	Provides the switching of pages in the limits of the module (paragraph) of discipline
“E1.8”	The field of indication (the graphical image or text)	Provides the displaying of graphical image (flat or volumetric scheme) or text, reflecting the content of information fragment of the discipline
“E1.9”	The button	Pressing directly initiates the hiding / displaying of control panels, providing the navigation on the structure of the subject of studying (discipline) to the user

The parameters of displaying of the information are controlled automatically by the program, and for the exiting from the mode of adaptive training it is necessary to close the window of interface.

**The standard forms of the electronic record book
for the registration of the academic-performance of the trainee
and the semantic models of saving and extracting of the information in the cycle of disciplines**

The registration of the academic-performance of trainee on the list of planned learning actions is carried out by means of using of the electronic record book (ERB), represents directly a set of linked tables, reflecting the nominal values of various indicators, some of which are presented further.

Tabl. A2.23 allows to chronologically register the academic-performance in the discipline, reflects the achieved results of the trainee on all stages of the process of training: the mastering of information of the various kind, the developing of understanding, abilities and skills.

Table A2.23

The structure of the electronic record book (the academic-performance in discipline)

The results of work with CC and LMM by the chapters: "The name of discipline"																
The number of module	The acquisition of information			The development of understanding						The development of abilities and skills						
	The date of work	The expenses of time	The results		The date of work	The expenses of time	The results				The date of work	The date of work	The results			
			The estimation	The consultations and recommendations			The self-control	The preliminary control	The request for clarifications	The solution of exercises			The final control	The estimation of understanding	The quantity of iterations	The parameters of method
	The date of work	The expenses of time	The estimation	The consultations and recommendations	The date of work	The expenses of time	The self-control	The preliminary control	The request for clarifications	The solution of exercises	The final control	The estimation of understanding	The date of work	The date of work	The quantity of iterations	The parameters of method

The tables of ERB act directly as the elementary information pages for the storing and presenting of the actual information of the technological process of training. Tabl. A2.24 allows to register directly the results of performance of the additional tasks (AT) and the boundary control (BC) testings.

Table A2.24

The page of the electronic record book (the results of performance of AT and BC)

The performance of AT and BC: "The name of discipline"													
The number of module	The date of work	The expenses of time	The results of theoretical works				The number of module	The date of work	The expenses of time	The results of practical works			
			The existence of errors	The address for consultations	The address to CC	The estimation				The existence of errors	The address for consultations	The address to CC	The estimation

The final indicators for the semester include directly the results of testing the physiological (TPH), psychological (TP), linguistic (TL) and other individual features personality of the subjects of training (the contingent of trainees), and also reflect the resultativity of work with the learning-methodical manual (LMM) by means of use of the means of training (for example, the electronic textbook – ET) and the obtained estimations in the course of performance BC, AT, the practical (laboratory) and course works. The page of ERB, reflecting directly the nominal values of the final indicators on the different learning and methodical actions per semester is presented in tabl. A2.25.

Table A2.25

The page of electronic record book (the totals for semester)

L.F.P.		The time of performance of the scheduled works (BC, AT and CW)		The time of presentation of the reached results (report)		The consultation		The estimation by the kinds of works (the control test)	The final estimation by the kinds of work
		The date of start of the work	The date of end of end	The date by the plan	The actual date	The date of carrying out	The date by the schedule		
The name of discipline									
The research of the individual features of personality of the trainee	TPH №1								
	TP №2								
	TL №3								
	...								
	T№H								
The learning of LMM by means of the means of training (ET)	The section №1								
	The section №2								
	The section №3								
	...								
	The section №I								
The additional task (AT)	AT №1								
	...								
	AT №J								
The boundary control in the form of testing (BC)	BC №1								
	...								
	BC №L								
The practical task (the laboratory workshop)	PT №1								
	...								
	PT №M								
The course work (CW)									

In tabl. A2.26 presents the description of the structural (semantic) model of the subject of studying (discipline) – the frames of information fragments, allowing to provide the saving and extracting of the previously structured material, reflecting the contents (content) of a certain subject of studying (discipline).

Table A.2.26

The description of the structural (semantic) model of the subject of studying (discipline) – the frames of information fragments

The code (ID)	<The identifier of information fragment>
The identifier of affiliation of the type of frame and the presence of terminal text in it: <the index of type>: <the description, exposing the essence and content> <a> – is the nested frame instance, then <the identifier of proto-frame> – the sign of the main or auxiliary information fragment, then <the identifier of affiliation to the type>	
The description of components of information fragment	A <The component №1>: <the description> B <The component №2>: <the description>...
...	
<c> – reflects the purpose appointment, then <the description of the purpose appointment>	
The description of the purpose appointment	A <The purpose appointment №G>: <the description> B <The applied purpose №S>: <the description>...
...	
<d> – reflects the complex of tasks, then <the description of the tasks of training>	
The description of the tasks of training	A <The main task №T>: <the description> B <The applied task №V>: <the description>...
...	
<e> – contains the basic concepts and key definitions, then <the description>	
The description of basic concepts	A <The concept №1>: <the description> B <The concept №2>: <the description>...
...	
<f> – contains the classifications of key concepts	
The description of the classification of concepts	A <The classification №1>: <the description> B <The classification №2>: <the description>...
...	
<g> – contains the properties of basic concepts and key definitions	
The description of the properties of key concepts and definitions	A <The property №1>: <the description> B <The property №2>: <the description>...
...	
<h> – contains the axioms and theorems or the links to it	
The description of axioms and theorems	A <The theorem №1>: <the description> B <The theorem №2>: <the description>...
...	
<i> – contains the links on the information from the earlier discussed fragments	
The description of the links with the previous fragments	A <The fragment №1>: <the description> B <The fragment № 2>: <the description>...
...	
<j> – contains the links on the information, located in the external sources	
The description of links on the information from the external sources and reference-books	A <The source №1>: <the description> B <The source №2>: <the description>...
...	

In particular, tabl. A2.27 contains the description of the structural (semantic) model of the subject of studying (discipline) – the frames of the purposes of adaptive training, providing the saving and modifying of the trees of the purposes of adaptive training, previously developed directly on the basis of the requirements of LMC.

Table A2.27

The description of the structural (semantic) model of the subject of studying (discipline) – the frames of the purposes of adaptive training

ID <the code>	<The identifier of the purpose frame>	
The identifier of affiliation and the description of purpose appointment: <a> – is the nested frame instance, then <the identifier of proto-frame> – contains the tree of the main purposes of adaptive training, then <the description of priority purposes>		
The description of set of the main purposes of adaptive training	A	<The purpose appointment №1>: <the description> <The purpose appointment №2>: <the description>
...		
<c> – contains the group of the applied purposes of adaptive training, then <the description of the applied purposes>		
The description of set of the applied purposes of adaptive training	A	<The applied purpose №1>: <the description> <The applied purpose №2>: <the description>

Tabl. A2II2.28 contains directly the description of the structural (semantic) model of the subject of studying (discipline) – the frames of the tasks of adaptive training, providing the searching and extracting of the tasks of adaptive training (at distance), realizing the achievement of the main and applied purposes of adaptive training.

Table A2.28

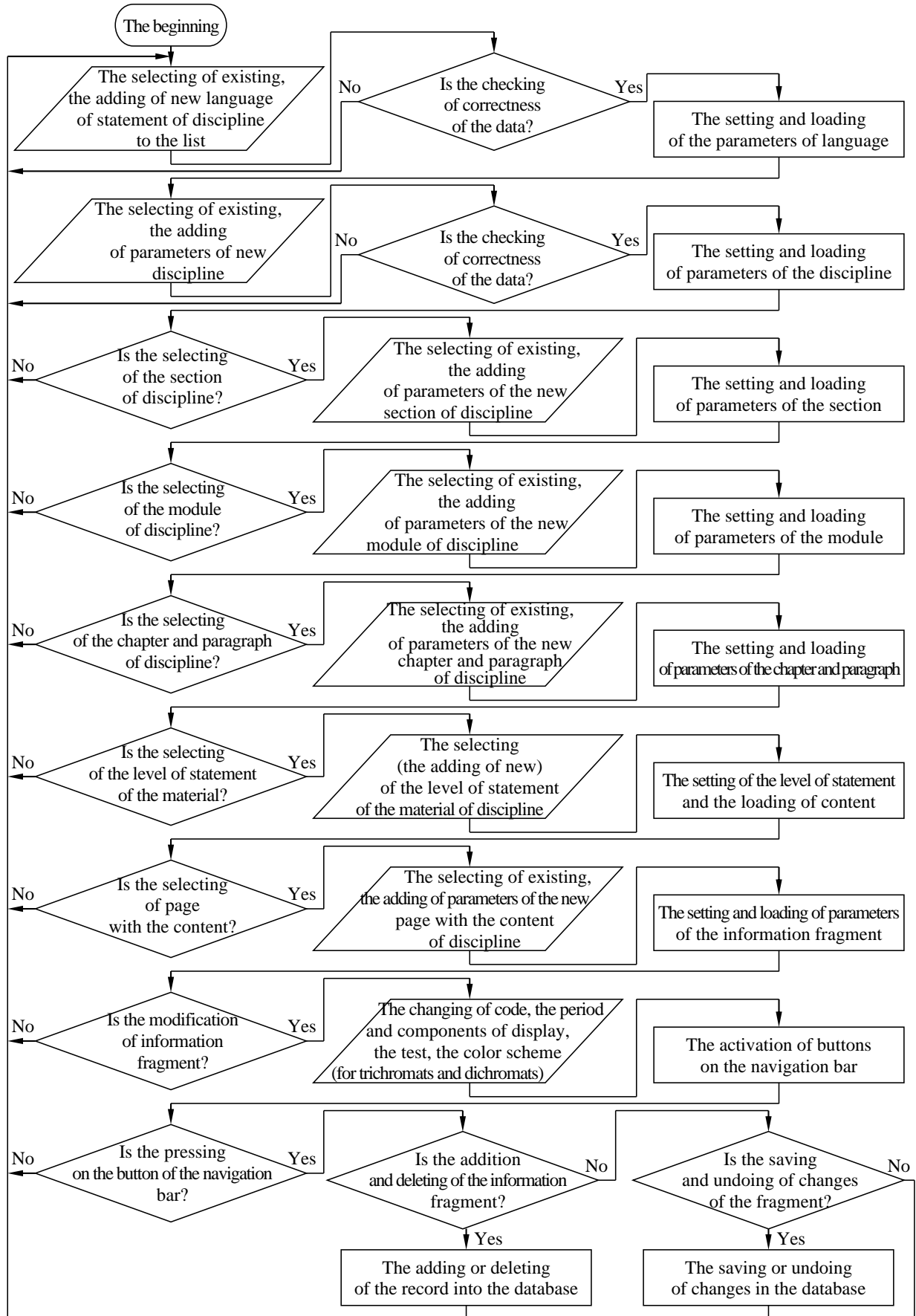
The description of the structural (semantic) model of the subject of studying (discipline) – the frames of the tasks of adaptive training

ID <the code>	<The identifier of the frame of tasks>	
The identifier of affiliation and the description of the tasks of adaptive training: <a> – is the nested frame instance, then <the identifier of proto-frame> – contains the classification of the main tasks of adaptive training (at distance)		
The description of the main tasks of adaptive training	A	<The main task №1>: <the description> <The main task №2>: <the description>
<c> – contains the classification of the applied tasks of training		
The description of the applied tasks of adaptive training	A	<The applied task №1>: <the description> <The applied task №2>: <the description>
...		

It should be noted, that at the developing of the structure and content of the considered frames it is necessary to take into account the features of the structural (semantic) model of discipline, realized in the basis of the adaptive means of training (for example, the electronic textbook), and also the specifics of use of the various components of the (automated) (adaptive) information-educational environment by the final users:

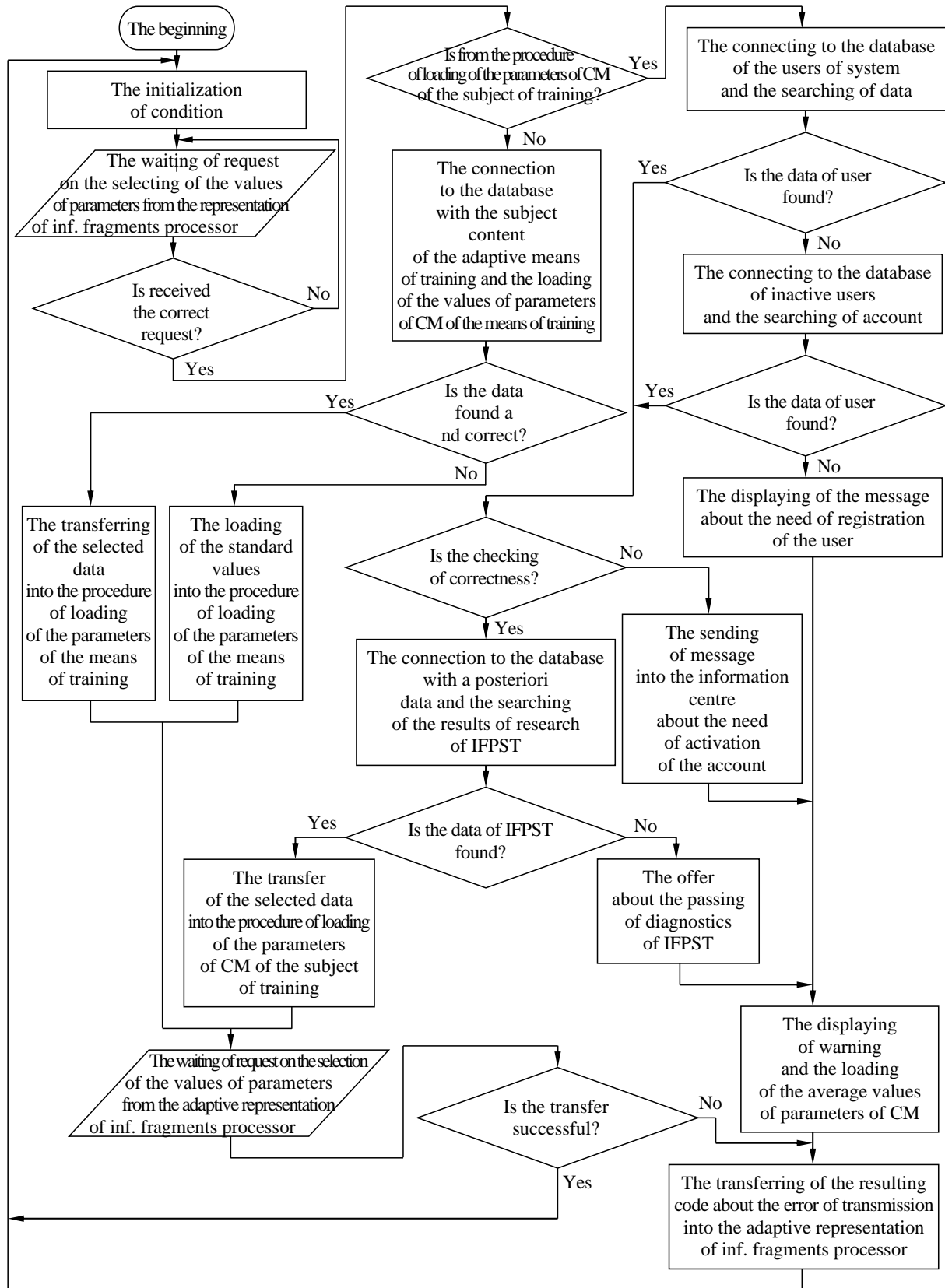
- the alphabetical-subject index of the adaptive means of training – the systematic catalogue of the basic and additional information resources in the subjects of studying (disciplines), the libraries of the purposes and tasks of adaptive training, the reference materials and descriptions to the use of the adaptive means of training in the traditional or innovative automated educational environment;
- the information structure of the adaptive means of training (in particular, the electronic textbook) – the table of contents (with links), the links between the information fragments, the libraries of texts, graphic images and multimedia (the audio-streams and the video-streams), and also the features of generation of the training influences (the information fragments).

The algorithm of formation of the database with the content in the discipline follows in pic. A2.9.



Picture A2.9. The algorithm of formation of the database (the knowledge base) with the content in the discipline of the adaptive means of training (the electronic textbook)

The algorithm of extracting information fragments (pic. A2.10) provides the support of functioning of the innovative adaptive representation of a sequence of information fragments processor of the adaptive means of training.



Picture A2.10. The algorithm of extracting of information fragments of the adaptive means of training (the electronic textbook)

Appendix 3 (information).

The main parameters (criteria) of estimation of the means of training (the electronic textbook, the laboratory workshop and the book of tasks)

The modern theoretical and practical experience of using of the means of training (the electronic textbook – ET, the laboratory workshop – LW and the book of tasks) in the information-educational environments allows to distinguish a row of parameters of estimation:

- the features of architecture and the technology of hardware and program realization;
- the various functional capabilities and the different consumer properties;
- the costs on the introduction and the increasing of efficiency from the practical use.

The features of the architecture of the means of training are caused by the presence of components (ET, LW and the book of tasks), realizing the different related functions at the program level:

1. The means of automation of the support of work of the teacher, which include:
 - the means of development and filling of contents (content), in the composition of which include the knowledge extraction and presentation system, the textual and graphic editors;
 - the means of creation of the learning tasks and the development of the scenarios of training (at distance);
 - the means of formation and reconstruction of the algorithms of training (at distance);
 - the means of diagnostics of the individual features of personality of the subject of training;
 - the means of estimation of the level of residual knowledge of the contingent of trainees in the disciplines;
 - the means of collecting and presenting of the various information about the work of the subject of training in the certain information-educational environment for a given period of time;
 - the means of analysis of the results of testing of the level of residual knowledge of the trainees.
2. The means of automation of the support of independent work of the trainee, which include:
 - the means of displaying of the information and the presentation of content of the subject of studying;
 - the means of stimulation of the technological process of training (at distance) and the development of understanding of the information in the subjects of studying (disciplines) with the possibility of presentation of the explanations (clarifications) and the suggestive questions, the application of which allows to increase the level of perception of the information;
 - the means of development of the skills of solving of the different typical tasks in the discipline (the theoretical-reference module, the laboratory workshop and the book of tasks);
 - the means of development of the ability to solve the different applied tasks in the discipline (the means of access to the scientific information, the means of the system analysis and modeling, the means of constructing, the analytical and calculation-logical systems);
 - the means of generation of tasks in dependence from the individual features of the subjects of training and the achieved results in the course of training (at distance);
 - the means of development of the recommendations on the resultativity of training (at distance);
 - the means of estimation of the level of residual knowledge of the trainee in the subjects of studying.

The estimation of architecture of the means of training is carried out directly in accordance with the presence (YES) or absence (NO) in it of the hardware-program components, realizing the certain functions independence from the needs of the subjects of training.

The consumer usefulness is characterized directly by the list of technical and the learning-methodical capabilities, provided to the teacher and the trainee as the potential users (the subjects) of this means of teaching (at distance).

The consumer properties of the means of training for the teacher are manifested in the support of the following technical and methodical capabilities by the means of training:

- the textual and graphical editors for the evident (visual) presentation of the various information on the screen of display (monitor) of the personal computer;
- the automated building of the structural (semantic) models of discipline;
- the construction of the various strategies and algorithms of training (at distance);
- the formation of tasks for the conducting of classes in the automatic mode (directly under the program control of a certain means of training based on the given model of presenting of the content of the subject of studying) and the automated mode (under the systematic guidance of the teacher), which provide the independent work of the contingent of trainees;
- the diagnostics of the individual features of personality of the subjects of training;
- the adaptive presentation of information in the subject of studying (discipline) according to the individual features of perception, processing and understanding of the subject;
- the systematic estimation of the level of residual knowledge of the contingent of trainees;
- the statistical analysis (the mathematical processing) of data, characterizing the resultativity of training of the contingent of trainees for a certain period of time;
- the obtaining of the results of testing of the level of residual knowledge in the disciplines.

The consumer properties of the means of training for the subject of training are shown in the support of the following technical and methodical capabilities by the means of training:

- the preliminary preparation of a certain subject of training to the work with the various automated means of training (ET, LW and the book of tasks), functioning on the basis of the content of the learning-methodical manual (complex) in the subjects of studying (disciplines) in the information-educational environment;
 - the familiarization with the potential technical capabilities of the means of training, used by the educational establishment or the learning centre;
 - the providing of possibility of the choosing of educational program (trajectory);
 - the differentiation of the diverse subjects of training by the level of proficiency of the basic disciplines and the automated means of training;
- the work on the discipline under the control of the means of training (in the automatic mode) and under the guidance of the teacher or tutor (in the automated mode);
 - the possibility of choosing of a certain technique and technology of studying of the material of discipline in relation to the diverse contingent of trainees;
 - taking into account the individual features of personality of the subjects of training for the realization of the adaptive (individually-oriented) training;

- the standard possibilities of the independent study of a certain discipline;
 - in the mode of the obtaining of information, when the various means of training perform the following functions for the subject of training (the final user): the providing of the structural (semantic) model of the subject of studying (discipline), the searching of certain information (by the entered concept or keyword, by the table of contents, by the alphabetical index or the subject index), the generating of information fragments by means of HTML and XML code, the intermediate automated control of the level of assimilation of the information and the providing of the list of the sources of literature from the bibliographic section;
 - in the mode of developing of the understanding of information, when the functions of the means of training include: the revealing of “bottlenecks” in the understanding of the content of the theory by the trainee based on the analysis of the level of proficiency of the material by the fragments of the subject of studying (discipline), the displaying of the various explanations (clarifications) in the case of necessary, the providing of recommendations on the mastering of information fragments (the viewing of the structural (semantic) models of the subjects of studying (disciplines), the specifying of the possible causes of difficulties, the viewing of the list of questions, on which the trainee gave incorrect answers and the revealing of sections, which need in the additional working out as the repeated studying);
 - in the mode of developing of the ability to solve the typical tasks of the subject of studying, when the functions of certain means of training directly include: the providing of different statements of the typical tasks in the subject area, the training in the recording of the formal description of typical tasks with the control of correctness, the demonstration to the diverse contingent of trainees of a set of algorithms and procedures of their application for the practical solution of tasks of the various type, the training (at distance) of solving of the typical tasks in the step-by-step mode with the control of actions of the trainee and the specifying of the causes of possible errors, the estimation of skills of the solving of typical task, the preparation of task for the solution on ECM, the providing of possibility of the dialogue input of task in the internal language of ECM, the supporting of analysis of the process of performing of the task in the step-by-step mode on ECM, the displaying of the formed protocol of execution of the task in ECM, the automated analysis of the resulting data in the dialogue mode and the analysis of the obtained results of performance of the typical task by the trainee;
 - in the mode of developing of the ability to solve the applied tasks in the subject of studying, when the certain means of training support a row of different functions: the providing of possibilities of the formation of mathematical statements of tasks, the access to the information resources from the adjacent subject areas, the displaying of different links on the special and reference literature, the possibility of visualization of the procedure of formation of the algorithm of solving of the task, the providing of the necessary instrumental means of modeling and the mathematical processing of a posteriori data by the statistical methods;
 - in the mode of estimation of the level of residual knowledge, abilities and skills of the trainee, formed directly at the studying of a certain discipline, when the certain means of training realize a set of different functions: the control of progress of each trainee by the educational trajectory and the level of understanding of the subject of studying (discipline) achieved by him, the automated estimation of the level of residual knowledge of each trainee and the formation of the electronic record book based on the achieved results;

- the functions of the modern means of training in the course of independent work of the trainee;
 - in the mode of adaptation of the process of automated training (at distance) to the current level of residual knowledge of the trainee as the subject of training, when the various means of training perform a row of significant functions: the analysis of the current level of residual knowledge of the trainee by the stages of training, the comparison (comparing) of the current level of residual knowledge with the required, the changing of the algorithm or program of training on the results of comparison (the selection of the level of difficulty of the tasks in a certain subject of studying, the changing of a sequence of performance of the tasks and the character of recommendations), the possibility of formation and the differentiation of tasks by the level of complexity (with the given or arbitrary configuration of question and the variants of answer, with the typical and heuristic procedures of solving of the certain tasks), the correlating of the solution of task with the reference set of possible solutions, the providing of step-by-step control at the solving of certain tasks (tests) and the generation of content of a sequence of information fragments in dependence from the current level of residual knowledge of each trainee;
 - in the mode of adaptation of the process of automated training (at distance) to the individual features of personality of the subjects of training (trainees): the changing of the speed, style and kind of presentation of the information fragments in the context of the automated training (at distance) taking into account the physiological, psychological and linguistic parameters of the subject of training, the conducting of diverse automated trainings and testing, the stimulating of independent work of the trainees in the subject area.

The set of consumer properties of the means of training characterizes their quality from the point of view of the teacher and the trainee as subjects of the process of training (at distance). The estimation of quality of the means of training (ET, LW and the book of tasks) is performed in accordance with the presence (YES) or absence (NO) of the certain consumer property.

The efficiency of application of the certain means of training (ET, LW and the book of tasks) is estimated from the positions of achievement of the final purpose of the (adaptive) training (at distance) – the resultativity of the acquisition of knowledge by the certain trainee (the contingent of trainees). The knowledge is called the active information (the structured data) on a carrier, formed in the course of training and capable to generate the new information (data).

The estimation of the level of residual knowledge of the trainee in the subjects of studying (disciplines) is carried out on the basis of revealing of the certain required levels of residual knowledge, achieved in the course of the automated training (at distance), and includes:

- the estimation of the level of proficiency of the declarative information (formulations);
- the estimation of the level of understanding, when the ability to answer to the questions and to aggregate the information, to form the algorithms of solving of the typical tasks, the ability to combine the various methods of solving of the tasks in practice are estimated;
- the estimation of the abilities to solve the theoretical tasks in the given subject area by the results of studying of the content of the means of training (ET, LW and the book of tasks);
- the estimation of the skills of using of the different theoretical positions in practice by the results of performance of LW (a sequence of laboratory works);
- the estimation of the ability to solve the applied tasks in the given subject area by the results of carrying out of the course, additional and practical works;
- the current (intermediate) and final (examination) estimation of the current level of residual knowledge of the trainee by the results of the studying of discipline.

The modern techniques of analysis and estimation of the indicators of the resultativity of training are based on the various criteria (factors), allowing to significantly improve the accuracy and to reduce the randomness of estimations, at the same time they can be oriented on the accounting:

- the features of the chosen educational trajectory, involving the specialization, the content of the program of training, the scheduled plan of studying of the material and other;
- the results of testing, which can be estimated both on the level scale, on the point scale based on the given system of weight coefficients;
- the results of diagnostics of the individual features of personality of the trainee (at the realization of the individually-oriented and adaptive training), characterizing the various parameters of perception, processing and understanding of a sequence of information fragments (educational influences).

The considered approach reflects the modern tendencies at the development of the means of training.

Appendix 4 (information).

The features of use of the means of multimedia at the creation of the electronic textbooks in the basis of the information-educational environment

The intensification of the rates of scientific-technical progress and the globalization of information environment are the systematic character and imposes the principally new requirements and restrictions to the level of preparation of a modern specialist, and also cause the emergence of the new information and communication technologies of creation, distribution and use of the information resources, products and services.

The multimedia-product can contain no less (even more) the information, than the existing rather the large and distributed museums or libraries. As one from the criteria of realization of the multimedia-products is the accessibility, then for the studying of their content does not require the special (profile) education. For the facilitate of navigation on the content of the various information fragments the system of menus and cross-references is created, which significantly simplifies the work. The dynamically updated table of contents of the information resource reflects the content and allows to estimate the structure of the actual material, and also quickly to find the desired section and to receive the different reference information about the appointment of any element. The modern multimedia- and hypermedia-resources, products and services are realized on the basis of the advanced technology of active pages of server (“Active server pages”) and the innovative language of hypertext markup (“Hyper-text markup language”), assuming the developed system of processing of the requests of user and cross-references, which allows the possibility to receive the necessary information as the need arises. At the working with the active content the navigation is significantly facilitated due to the visualization of the interface of interaction of the user with the hypermedia system. For example, at the using of the technologies of hypermedia the entering into the building of museum or the displaying of graphical image, the name and author of a certain picture is carried out by the hovering, highlighting and pressing of the key of manipulator (the type “mouse”). The additional information, which relates to the appointment of any object, may be displayed in the view of text, picture, video-stream and (or) audio-stream. The systems of similar class allow to study the different objects, processes and phenomena in the scale of space and time convenient for the final user (trainee), besides, they allow to realize the maximally friendly interface of interaction, does not require the specific knowledge, skills and approaches at the working (training), and also the preparation in the area of information and communication technologies.

The multimedia- and hypermedia-technologies allow to realize the interfaces of information-search, information-educational and other information systems, oriented on the needs of a wide range of consumers of the different levels of preparation.

The intensification of growth of the diverse sources (flows) and the increasing of volumes of the processed information in the various spheres of activity of the information society cause the emergence of innovative principles, methods, technologies and algorithms, providing the increasing in the level of organization of the information interaction of the subjects. The requirements to the information-educational environments of educational establishments cause the necessity of adequate reaction on the needs of information society and the changing of the aggregative aggregate of scientific, technical, medical and other information at the preparation of qualified specialists in the system of education and science.

As in any science a row of established directions (“the core”) and a set of (innovative) advanced directions (“the front edge”) can be distinguished, the development of which causes the formation of fundamental and applied provisions, then in the sphere of education there is a significant necessity of formation of the adequate organizational, methodical, hardware and software, taking into account the dynamics and tendencies of theoretical and practical scientific knowledge. The improvement of technologies and methods of the carrying out of researches in the various areas allows to minimize the level of consideration of the object, process or phenomenon of research, and also initiates the increasing in the difficulty of studied objects, processes and phenomena. Taking into account, that the various possibilities and abilities of a person (as a biological species) at the studying of the content of new actual information (the subject of studying) are limited, then said leads to the potential increasing in the period of time of preparation of the narrowly specialized qualified specialists in the subject area and initiates the improvement of the existing methods and technologies of training.

Bearing in mind the modern achievements in the experimental psychology at the researching of the convergent and divergent intellectual abilities, the type of nervous system and temperament, the requirements and needs of trainees and others, there is a need to select the adequate structure of methodical support (the diverse information resources and products) for each discipline. These scientific problems are solved by means of use of the multimedia- and hypermedia-technologies at the realization of the automated means of training (the electronic textbooks, the laboratory workshops, the books of tasks and others).

The use of new information and communication technologies in combination with the multimedia- and hypermedia-technologies allows to develop and realize the means of training of a new generation at the software level and to fill them by the large volumes of information in a wide range of disciplines, reflecting the last achievements of the fundamental and applied spheres of scientific knowledge, and also to apply the individually-oriented model of automated training, allowing to take into account the various individual features of personality of the trainees.

Not every multimedia-product is necessarily the educational product, but and, conversely, not every educational product is created based on the multimedia-product. The multimedia-technologies invade in the area of education and science not simply in the quality of tool or learning manual, its effect on the very structure of this problem sphere, and at the same time on the attitude of the subjects of training to the means of training and the methods of access to the data.

In the present time the multimedia-systems are successfully practically used in the sphere of education and science, and also in the professional (re)training, in the publishing activity (the publishing systems), for the automation of business (the advertising and service of customers), in the cultural centres (the libraries and museums) and others.

The electronic textbooks (books) are divided on the several main kinds: the scientific, encyclopedic, educational, information and others.

The scientific electronic books contain the information about the achievements in the area of science: the modern technologies, methods and principles of scientific research and creativity (“The British royal scientific committee journal” and other information resources).

The encyclopedic electronic books contain a huge volume of information on the certain subject or heading in the context of the given subject area (“Britanica encyclopedia”, “Grolier encyclopedia”, “Compton’s multimedia encyclopedia”, “Microsoft bookshelf” and other information resources and information products).

The learning electronic books are most widely distributed in practice and successfully practically used both in the kindergartens (“Broderbimd’s living book”) or HEIs (“HEI’s living book”) for the automation of the process of training (at distance), and in the various courses of skills development of the diverse specialists. These books refer to the works of educational and fiction literature (“Herman Melville’s Moby Dick”, “Gustave Flaubert’s Madame Bovary” and others).

The information electronic books are similar to the encyclopedic, but the information in the form of data, stored in them, has purposeful character (“Oxford textbook of medicine on compact disk” and other information resources).

The above classification of electronic books is not the only one. It is possible the classification by the kind of information, contained in the electronic books: the books with the textual information, the books with the static graphical images, the books with the dynamic graphical images (with video-streams), the “talking” books (with audio-streams), the hypermedia-books and the intellectual books. The most interesting and perspective are the last two from the specified kinds of electronic books.

The hypermedia-books function on the basis of the various WWW-technologies, provide for the operational updating of content and the access to the information by means of use of the global computer network “Internet” (“WWW”), and also can be used in the educational and scientific centres in the composition of the distributed interactive system of automated (remote) training.

The intelligent electronic books contain the mechanism of production output, allowing to set the nominal values of parameters of the displaying of information, to take into account the events, initiated by the user in the process of navigation on the content, providing the friendliness of the interface of interaction and the comfort of working of the user.

The training (at distance) as a technological process of the formation of knowledge allows to distinguish the several stages (the technological gaps) of the processing of information: the displaying of a sequence of information fragments in the subject of studying, the developing of understanding and the formation of abilities and skills of the contingent of trainees and others.

The multimedia-technology is directed on the increasing of the efficiency of training due to the visualization of the structure and content of the studied objects, processes and phenomena.

The elements of multimedia-technology should be present at all stages of training, especially on the key: the mastering of diverse information, the development of understanding, the formation of ability to solve the typical and applied tasks in the subject area.

The multimedia-technologies allow to present in the visual form (to visualize) the process of proving of theorems, video-inserts, fragments of lecture, background music, and also include the elements of animation in the productions to the typical and applied tasks.

Due to the associative basis of functioning of memory at the perception and processing of the flows of information by the psychophysiological construct of the head brain of human and the potential predisposition of a person to the perception of visual stimuli (up to 90% of actual information is perceived by the visual sensory system), presented in the view of the static and dynamic graphical images (schemes), the use of multimedia-technologies in combination with the means of animation, the vector and raster graphics is the most preferred variant. Therefore the given way of presentation of the diverse information and its combinations allow to significantly increase the efficiency of training (at distance) and to reduce the cognitive burden on the trainee at the studying of material in the discipline. From the other side, the development of the active graphical schemes, diagrams and video-streams initiates the complex of additional researches, directed on the providing of comfort and efficiency of the perception of the information contained in them. The audio accompanying (audio-stream) of the process of playback of the elements of multimedia allows to involve the acoustical analyzer of human and thus to provide the additional improvement of efficiency of the formation of knowledge of the trainee.

At the preparation of the learning manual, containing the audio-visual materials, emphasizes the essential need of careful selection of the source material, the selection of the methods of its structuring and the models of representation of the structured data, and also the ways of reproduction taking into account the potential possibilities of the means of training.

Appendix 5 (information).

The influence of the means of the information-educational environment on the health of consumers

The providing of the comfort of working and the taking into account of influence of the personal computer on the health of user is studied by ergonomics, the provisions of which allow to say, that the illiterate development of the interface of user of the software and the incorrect organization of the automated workplace of the final user cause the different negative influence on the biological construct of the organism of the organic individual and the rapid physiological fatigue of the final user.

The main problems are caused by the inconsistency of the means of automation of the process of training to GOST, used by the subjects of training in the educational establishments.

The secondary set of problems is caused by the violations of the safety regulation by the final users at the using of the means of training in the information-educational environment, as 91% of the subjects of training (even teachers) do not know elementary the sanitary rules and standards for the safe use of the personal computer.

It should be understood, that the video-display terminals in the computer classrooms of the educational establishments have the violations of the color gamut of the polychromatic spectrum at the displaying of diverse information, leading to the intensification of fatigue of the visual sensory system of the subjects of training and the negative influence on the psyche.

The scientific-research organizations around the world are constantly improving the approaches, methods and technologies, allowing to exclude and (or) to compensate the negative influence on the health of the subjects of training, in particular (for example) at the organization of training (at distance) in the automated (virtual) information-educational environment, the functioning of which is realized on the basis of the different innovative information and communication technologies.

The specialists in the area of medicine (ophthalmology) emphasizes the significant increasing of load on the visual sensory system at the working of person behind the video-display terminal, causes the syndrome of visual fatigue.

From the point of view of the fundamental and applied bases of psychophysiology of perception, the conducted experiments allow to talk about the increasing of fatigue of the nervous system of the subject of training (trainee) in the course of classes with using of the traditional (the total fatigue in 19% and the fatigue of eyes in 8.6% of trainees) and the information (computer) technologies of training (in 24.2% and 38.3%), so many specialists attention is emphasized on this scientific problem (Andrianov Yu.N., Arshinov V.I., Bruner J., Vekker L.M., Krol V.M., Lomov B.F., Neisser U.G., Rakitov A.I., Sukhobskaya G.S., Haymen I. and others).

The main reason lies in the imperfection of the technologies of production of the devices of information display – the displays (especially at the stage of their appearance), that allows to talk about the low quality of manufactured production by the manufacturers. In particular, the presence of the certificates of conformity, complying to the acting sanitary rules and regulations, guarantees the safety of practical use of the video-display terminals at the visual displaying of information to the user. To the main normalized parameters the different expert organizations are included: the level of electromagnetic and ionizing radiation, the frequency of regeneration of the frames of image on the screen at the various indicators of resolution and color depth, the unevenness of distribution of brightness and contrast over the surface of display and others.

The rational organization of workplace has the essential value.

The location of monitor (display) should provide directly the drop of flux of the photon radiation of lighting on the right on the surface of screen, and the level of illumination of the room should provide the permissible ratio of brightness and contrast at the displaying of image on the surface of screen. It is impossible to work in a dark room, and the lighting in the room should be mixed: the natural (without ripple) – the incandescent lamp, the light-emitting-diode lamp and others; the artificial (pulsating) – the luminescent lamp, the halogen lamp and others. The presence of a window in the room creates the optimal conditions for the normal (correct) functioning of the mechanism of accommodation of the visual sensory system, as it allows the possibility to the user to periodically move the point of view on a significantly distant object in relation to the image, displayed on the screen. The distance from the eyes to the surface of screen of the monitor should be at least 50-60 cm. The geometrical dimensions of the table and chair should correspond to the height of the user.

The important problem is the providing of electromagnetic compatibility of information interaction of the subject of training and the means of displaying of information. Each automated workplace in the computer class of the organization creates the characteristic physical electromagnetic field with the radius of 1,5 m or more, and the dangerous electromagnetic radiation comes not only from a monitor (display), but and from the various peripheral equipment of a personal computer.

The problems of occurrence of the harmful ionizing radiation of various wavelengths directly caused by the imperfection of the technology of manufacturing, the errors of assembly and the principle of functioning of the electron gun in the basis of the electron-beam monitor. The level of radiation is registered by the special devices and must correspond to the permissible doses for a person, specified in the sanitary rules and norms.

The complete list of recommendations can be found in “The sanitary rules and regulations...” 2.2.2.542-96 “The hygienic requirements to the video-display terminals, the personal computers and the organization of work” and their subsequent changes (additions).

Appendix 6 (information).

The psychological aspects of individual readiness of trainees to the independent work in the information-educational environment of the automated (remote) training system

The problematics of the synthesis of the effective information-educational environments (IEE) of the automated (remote) training (ART) is a covariant to the consideration of the different subject areas of artificial intelligence and cognitive informatics. The learning-ability is associated with the potential ability of the subject of training (trainee) to sensorially perceive, process (remember and reproduce) and understand the information that is caused by the difficult technological process of the higher nervous activity of the psychophysiological construct of the head brain of an organic individual (person).

In the psychological literature the scientific concept “the independent work” (IW) is considered by the various scientists (specialists) from the various scientific views: the method, means and organizational form of training, the way of involving of the trainees into the training, for which is characterized the presence of a clearly formulated task of training (at distance), the means of organization and performance by the trainees of a certain learning activity (Basova N.V., Buryak V.K., Wexler S.I., Dalinger VA, Dyachenko V.K., Pidkasisty P.I., Podlasy I.P., Portnov M.I., Skatkin M.N., Uvarov A.Y., Unt I.E., Usova A.V. and others). The studying of literature on the researched problematics allows to make conclusion, that the interpretation of the concept “IW” is not limited to one definition in the present time.

The essence of IW of the trainees in IEE of ART system is reduced to the consideration of directly psychological and logical methods of organization of the learning-cognitive activity (LCA) of trainees, aimed on the solving of certain educational tasks.

In the modern theory of training the three main directions of IW of trainees are considered:

- the organizational-technical independence – the choice of educational trajectory, the means of training, and also the information resources, products and services;
- the independence in the theoretical activity – the ability to find the various information resources, products and services in the subject of studying;
- the independence in the practical activity – the ability to find the solutions of typical applied tasks in the subject of studying (discipline);
- the independence in the process of LCA – the conscious choice of the volume, speed and the additional parameters of studying of the material in the subject area.

IW – is an important component of the technological process of training (at distance), involving the individual activity of each subject of training (trainee) at the consolidating of acquired knowledge, abilities and skills, at the preparation to the classes, at the performance of learning projects, course works studies and diploma projecting, and also the participation in the different planned actions of an educational or scientific establishment.

In the present time in the educational establishments (EE) there has been scheduled the tendency to the increasing of the quantity of hours (the learning load), allocated on IW of trainees with the learning materials of various type (the traditional, electronic and combined), the studying of which provides directly the formation of knowledge of the trainee.

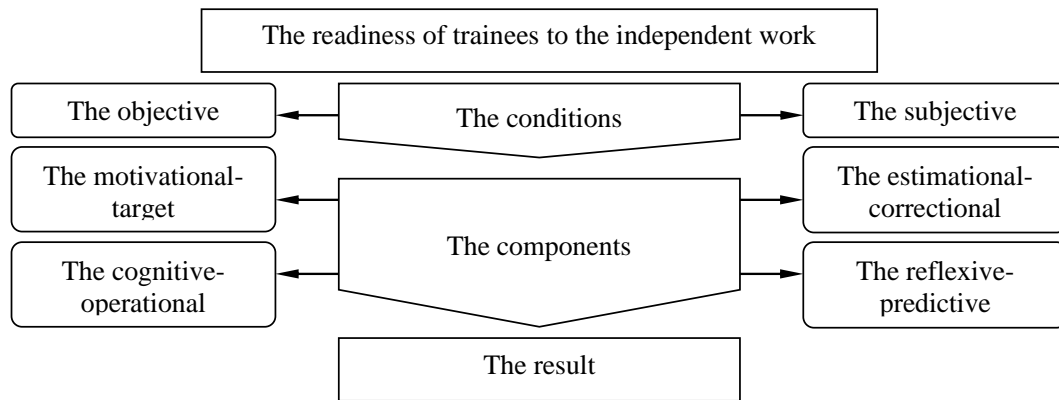
The scientific researches show, that for the successful carrying out of IW it is necessary to form the readiness at the subjects of training to this kind of activity. This scientific problem is especially actual for ART systems, having their own specifics and associated with the various features of the emotional-intellectual condition and the information interaction of the involved subjects of training in the process of ART. IW of trainees in the conditions of ART is determined by their readiness to purposefully solve the certain educational tasks in the isolation from EE with using of the model of training (teaching, studying and the model taking into account the intellectual-emotional condition) at the saving of their health (the physiological, psychological and linguistic components). This allows to the subjects of training (teachers and trainees) directly to realize the active and passive controlled LCA of various structure and difficulty. At the trainees in ART system shown a certain given purpose setting – the readiness to the achievement of the set purpose (result) of training (at distance) – the increasing of theoretical and practical level of qualification in the given area of knowledge.

The readiness of the trainee to IW is understood as a potential condition of the personality, based on a motivated attitude to the process of training (at distance), in a certain extent of mastering of a specially organized part of social experience, and also on the awareness of own abilities to use the formed knowledge and experience in own life-activity (in the fundamental and applied problem spheres).

According to researches the readiness of trainees to IW includes a row of components: the motivational-targeted, the cognitive-operational, the estimation-corrective and the reflexive-prognostic, and also the other structurally similar components.

In the basis of IW of the subjects of training (trainees) is lied the solution of the educational task. It is the core of IW and comprises the need of searching and applying of the new knowledge by the already known ways, or the revealing of new techniques and IT of the obtaining of knowledge in the considered subject area or problem sphere.

In the course of IW in the conditions of ART the emotional-intellectual interaction occurs between the subject of training (trainee) and the (adaptive) means of training. It involves the mutual support, the provision of methodological assistance, the assistance in the solving of various difficult educational tasks and control. The interaction can be direct (contact) and indirect (remote). It is considered as an integrated factor, contributing to the development of the personality of the trainee. The main signs of information interaction in IEE are the following: concreteness, situativity, motivational preference and others (pic. A6.1).



Picture A6.1. The model of readiness of the subject to the independent work in IEE of ART

The results of scientific researches of many scientists and specialists show, that the subjects of IEE of ART system should have a certain qualities and properties.

For a tutor-teacher: the creative approach to the process, the initiative, the perseverance, the ability to develop the information-educational resources for the realization of ART, the accuracy, the ability to control the process of (adaptive) training, the responsibility, the knowledge, abilities and skills of working with the means of training (the computing technics), the knowledge of possibilities of the (adaptive) means of training, the ability to quickly adapt to the new conditions of the (adaptive) training with using of the modern achievements in the area of the new information and communication technologies (the means of automation).

For students: the motivation, the purposefulness, the value attitude to the knowledge and the process of their acquisition, flexibility, industriousness, high self-discipline, self-organization, perseverance, accuracy, responsibility, a certain initial level of residual knowledge of the previous education, the knowledge, ability and the skills of working with the means of automation and the ability to adapt to the innovations.

The studying of psychological literature showed, that there are the two scientific approaches: the personal and the functional, which allow to consider the readiness to IW as a certain property of personality and an emotional-functional condition. IW – is a potential condition of personality of the certain subject of training (trainee), which reflects the upcoming activity and the attitude to it in the subject area.

The three various components in the structure of readiness to IW of the trainee are distinguished:

1. The psychological component: the quality of personality of the trainee – the independence, initiative, the awareness of the importance of IW by the trainees and the presence of motivation.
2. The theoretical component: the knowledge of the essence, kinds, ways and techniques of IW.
3. The practical component: the mastery of abilities, skills, ways and techniques of performance of the different kinds of IW and the desire to realize them by the subjects of training.

For the formation of readiness to IW of trainees the process of (adaptive) training should contain such a system of specially organized actions (events), which are directed on the formation of the three specified above important components.

In the process of formation of the readiness of trainees to IW the following stages are distinguished:

- the diagnostic – the revealing and fixation directly of the presence or absence of the necessary skills of IW, and also the proficiency of knowledge on its control (the preparation, organization, planning, realization, control and others);
- the search – the revealing of technical conditions, contributing to the activation of IW, the organization of search of the causes of emergence of the difficulties at the subjects of training;
- the active – the taking over of responsibility for the results of IW by the trainees, and also the establishment and development of readiness of the subjects of trainees (trainees) to it;
- the reflexive – the awareness of the different causes of emergence of the various difficulties (the conditions of information interaction in a certain IEE of ART system, the organizational, technical and methodical support of the process of training and other) and the successes at the previous stages of the controlled technological process of training.

The motive encourages the trainee to the showing of activity and self-improvement at the performing of actions directed on the achievement of the purpose of (adaptive) training, providing the conditions of satisfying of his various information needs directly in the process of professional and personal self-development, increasing the probability of success of the training and providing the efficiency of IW.

On the efficiency of IW in IEE of ART system have influence directly the various individual features (parameters) of human (as an organic individual). The formed set of motives forms the motivation (as a complex system), which acts as a dynamic component of the psychological readiness of the trainees to IW.

Thus, the motivation as a system acts as a set of stable motives, determining the directionality of trainees on the mastering of knowledge, abilities and skills.

At the performance of IW the trainee has the possibility to realize himself maximally as the subject of activity (the subject of training), remaining the object of influence. The content of IW in ART system is planned in advance by means of the training program.

The various components of IEE of ART system realize the certain functions in the controlled technological process of (adaptive) training (at distance):

- the (adaptive) electronic textbook – the (adaptive) presentation of a sequence of the diverse information fragments to the contingent of trainees (the subjects of training);
- the (adaptive) electronic laboratory workshop and the book of tasks – the development of the various skills of solving of the typical fundamental and applied tasks;
- the basic diagnostic module – the testing of the level of residual knowledge of trainees;
- the applied diagnostic module – the diagnostics of the various individual features and abilities of personality, the professional skills and the revealing of compliance to the established qualification requirements and limitations;
- the (adaptive) electronic library – the providing of the (open or closed) access to the information resources in a set of disciplines (the subjects of studying);
- the electronic deanery – the storage of various parameters of the (adaptive) means of training, the electronic record books and the individual features of trainees.

The teacher, operating with the components of IEE, has a potential possibility of informational interaction with the diverse contingent of trainees (the subjects of training) and the control of IW in the course of studying of the material in the discipline (the subject of studying).

The trainee has a potential possibility to choose independently: the specialization, the time and place of studying, the techniques and ways of performing of the proposed tasks.

The model of formation of the readiness to IW in IEE of ART system includes the components:

- the purposes (basic and alternative) – the social, psychological, methodical, professional, technical (hardware and software) and others;
- the principles (primary and secondary) – the self-control, purposefulness, consciousness, rationality, effectiveness, skill, advisability and others;
- the functions – the assistance to the optimal way of assimilating of the learning material, the development of intellectual abilities at the subjects of training (trainees), the acquisition of various methods and methodologies of the modern LCA, the development of the needs at the trainees as the subjects of training in the self-education, self-development and the providing of continuity of the technological process of training;
- the forms – the classroom (“the training with a teacher”), the out-of-classroom (“the training without a teacher”), the combined (“the mixed training”), in the presence of a tutor or without him;
- the individual features of the subject of learning-cognitive activity – the physiological, psychological and linguistic characteristics (parameters);
- the means – the complex of different information technologies of the support of the cycle of ART;
- the functions of the subjects of training in the technological process of training in the conditions of DE – the tutor or teacher (the subject of training) provide directly: the preliminary preparation, analysis, stimulation, forecasting, organization, control and the coordination of the technological process of training, and the trainee (the subject of training) at the same time carries out directly: the independent preliminary preparation, self-analysis, self-stimulation, self-prediction, self-organization, self-control, self-regulation and other.

Appendix 7 (mandatory).

The technical description of program toolkit for the automation of research of the parameters of the physiological portrait of the cognitive model

In this description describes the process of practical use of the applied diagnostic module, developed directly on the basis of the architecture of the expert system for the automation of research (diagnostics) of the nominal values of parameters of the cognitive model (CM) of the subject of training with using of a set of the specialized methods of research in the form of testing.

The structure of the physiological portrait of CM of the subject of training directly (proposed in the third part of the manuscript of dissertation) includes a row of the vectors of parameters, characterizing the individual features of the visual and auditory sensory systems.

The applied diagnostic module is part of the developed complex of programs and allows to provide the diagnostics of the values of parameters of the visual sensory system with using of a set of the various methods of research in the form of testing from the area of physiology of analyzers, located in the basis of the existing database.

In particular, for the realization of diagnostics of the color-sensation (color perception) (the revealing of anomalies of the color vision) of the examinee the database contains directly the structured method of research (test) – the polychromatic tables of Rabkin E.B.

The loading and modifying of a sequence of tasks (questions), included into the test, and also the automated diagnostics (testing) of individual features of the color vision of the examinees (the trainees as the subjects of training) is realized in the various modes of functioning of the applied diagnostic module.

In the pictures of the forms of interface, accompanying the description of the program product are used directly the alphabetic-numeric identifiers of the certain structure ([letter][digit].[digit]), which mutually-unambiguously define the appointment:

- the first part of the identifier (letter) – the belonging of the group of elements of the form of interface to the certain mode of functioning of the program;
 - “M” – at the describing of the functional appointment of the main button form;
 - “A” – at the describing of the appointment of the form in the mode of administrating of KB and DB;
 - “D” – at the describing of the form in the mode of diagnostics of the contingent of examinees;
- the second part of the identifier (digit) – the number of the group of elements of the interface on the form of interface in the certain mode of functioning of the product;
- the third part of the identifier (digit) – the number of the element of the interface in the composition of group.

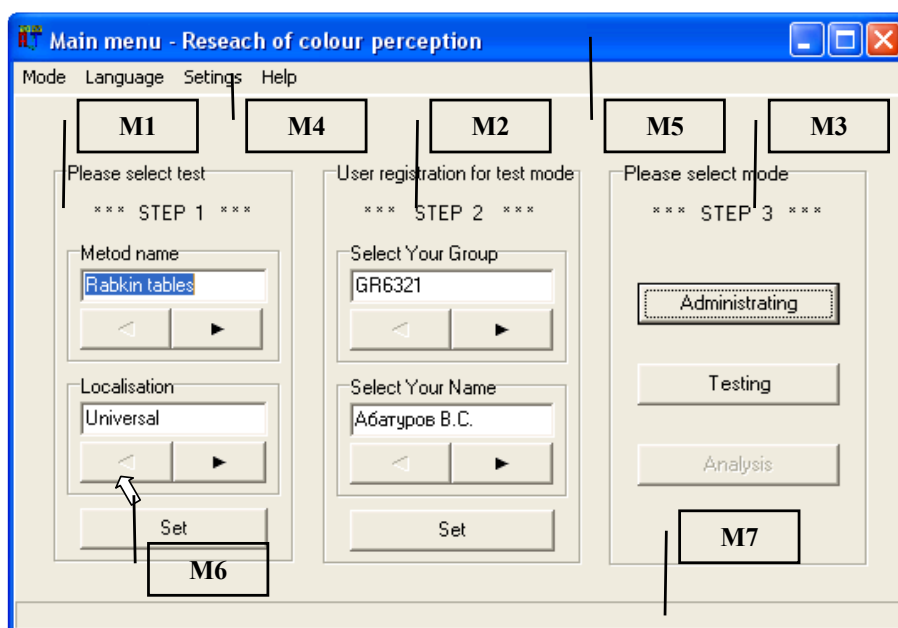
A7.1. The main button form of the application

The main button form presents many different elements of interface, performing the various functions in the process of functioning of the program (pic. A7.1).

The main button form of the considered application operates in the step-by-step mode, each step is indicated by the flashing identifiers (“STEP 1”, “STEP 2” and “STEP 3”):

- at the first step (the group of elements of the interface “M1” is used) – the final user carries out the selection of the method of research (test);
- at the second step (the group of elements of the interface “M2” is used) – the authentication of the final user in the program system is carried out (if necessary the procedure of registration of the final user is realized);
- at the third step (the group of elements of the interface “M3” is used) – the mode of functioning of the program product is selected by the user.

In pic. A7.1 presents all steps directly simultaneously (for clarity), but factually they are displayed sequentially to the final user.



Picture A7.1. The main button form of the application and the groups of its elements

In pic. A7.1 the callouts with the alphabetic-numeric identifiers (“M1” – “M7”) are presented, which indicate directly the groups of elements of the interface of the program product, realizing (for the various final users) the certain different functions of the applied diagnostic module, presented (the name and appointment) in tabl. A7.1.

**The appointment of the groups of elements of the interface
of the main button form of the application**

The identifier of group	The name	The appointment
“M1”	The selector of the method of research	Allows to select the method of research (test) and its localization, located in the knowledge base
“M2”	The selector at the registration of user	Provides the registration of user in the system, at the same time the final user directly needs to specify his group and L.F.P.
“M3”	The selector of the mode of working	Allows to select the mode of working of the program: administrating, diagnostics and analysis
“M4”	The menu bar	Intended for the selection (setting up) of the mode of working, the language (localization) of interface, the values of parameters of setting of the program and the display of help information to the user
“M5”	The title of window	Displays the icon and name of the application, identifies the current mode of working, contains the control elements of the interface of window – buttons: collapse, expand (restore) and close
“M6”	The cursor of manipulator	Displays the current position of cursor of the manipulator (mouse, trackball, touchpad and others)
“M7”	The status line	Contains the various information about the current condition of the program system and displays the appointment of the elements of interface to the user

The elements of interface (the groups of elements of the interface) of the program are divided on the active elements of interface and the passive elements of interface of the program.

The active elements of interface of the program are available to the user for the selection.

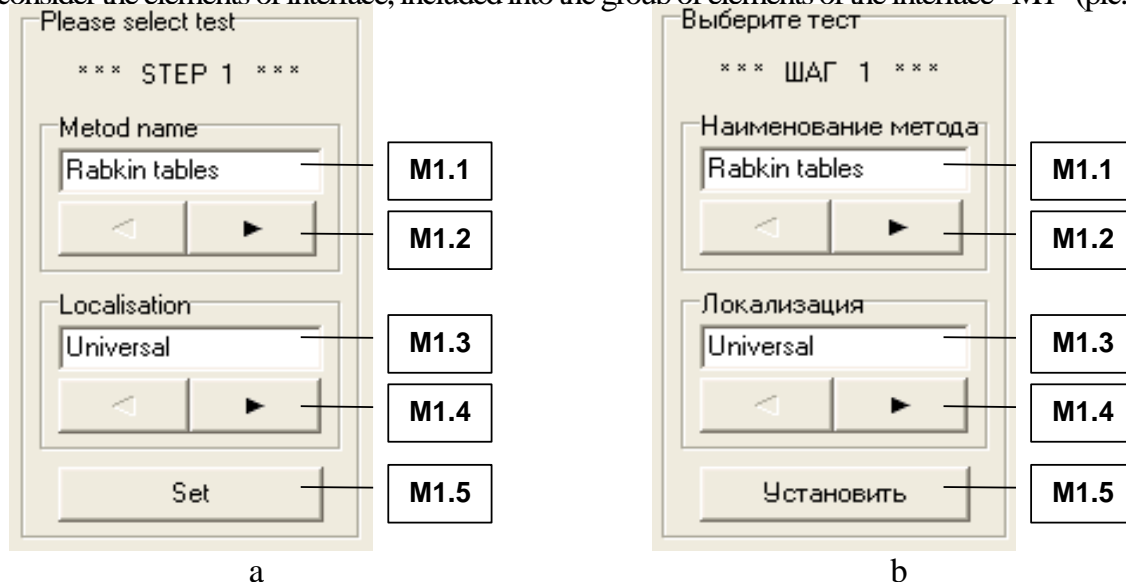
The inactive (unavailable) elements of interface are displayed by the grey color.

A7.1.1. The selection of the method of research and its localization

The programs, included into the applied diagnostic module, allow to research the nominal values of different parameters of the cognitive model of the subject of training.

The list of available methods of research (tests) is not limited, since for the user there is a potential possibility at the program level (without the additional modification of program code) to connect the additional database, and then to fill it by the knowledge (the structured data of the method of research).

The switching of the method of research (test) is provided by the group of elements of the interface, indicated directly by the alphabetic-numeric identifier “M1” in pic. A7.1. Let's consider the elements of interface, included into the group of elements of the interface “M1” (pic. A7.2).



Picture A7.2. The group of elements of the interface “M1”, providing the selection of the method of research (test)

In pic. A7.2 presents the two variants of the names of elements of the interface of program: a – the localization of interface in the English language, b – the localization of interface in the Russian language.

In tabl. A7.2. presents the appointment of each from these elements of interface of the program. Table A7.2

The appointment of the elements of interface of the program at the selecting of the method of research (test)

The identifier of element	The name	The appointment
“M1.1”	The field of indication	Displays the name of the method of research (test), which selected by the user
“M1.2”	The navigation	Provides the switching of the method of research, at the same time its name is displayed directly in the field of indication “M1.1”
“M1.3”	The field of indication	Displays the name of localization of the method of research, selected by the user
“M1.4”	The navigation	Provides to the user the switching of the localization of the method of research (test), at the same time its name is displayed directly in the field of indication “M1.3”
“M1.5”	The button	Press to set (selected by the user) the method of research (test) and its localization, and then the transition to the step 2 is carried out

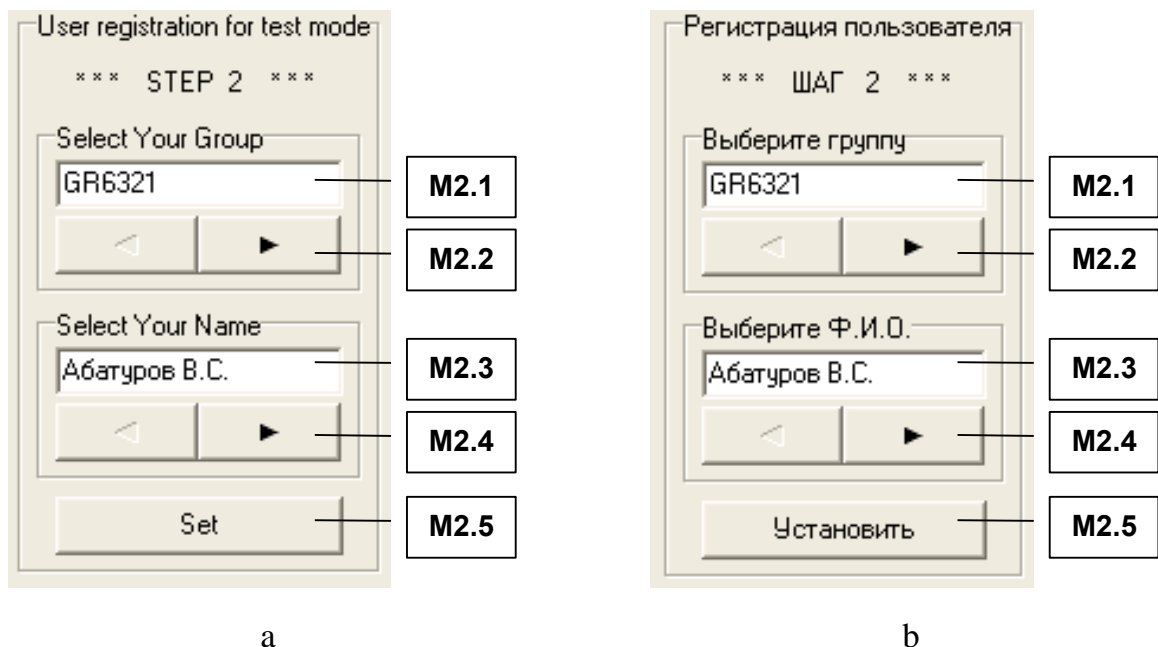
The information (structured data), related to the method of research (test), is contained in the database (knowledge base) of program and can be modified in the mode of administrating. The selection of the method of research (test) by the user is a mandatory procedure. The pressing of the button “M1.5” initiates the transition to the second step – the authentication of user.

A7.1.2. The procedure of authentication of the user

Directly after the confirmation of choice of the method of research (test) and its localization (of a certain language) at the previous step (the pressing of the button “M1.3”), the final user needs to go the procedure of authentication in the system (if the final user was not previously registered in the system, then it is necessary to go the procedure of registration of the final user in the system). The procedure of registration of the user in the system consists directly in the fact, that the final user needs to specify the identifier of group and L.F.P. The procedure of registration is necessary for the delimitation of the rights of access to the information and the collection of individual statistics of the final user (stored in the database) by the results of performance of the tasks, proposed to him in the mode of diagnostics.

At the program level the applied diagnostic module allows the entering of the structured data of new final users independently directly in the course the procedure of registration of the user or previously in the mode of administrating.

For the examinee (trainee) the procedure of registration of the user in the system is mandatory and is presented in pic. A7.3 (the group of elements of the interface “M2”).



Picture A7.3. The group of elements of the interface “M2”, providing the registration of user

In pic. A7.3 presents the group of elements of the interface “M2” with the names (identifiers) in the two languages (of localization) – English (a) and Russian (b).

The data, specified by the new user at the primary registration in the system, is entered into the database of program for the providing of the potential possibility of their subsequent multiple use in the applied diagnostic module: at the authentication of user in the system and the working of user in the certain mode.

For the repeated registration of the final user in the program system the final user needs to specify (to select) the group of users and L.F.P., at the same time it is necessary to use the elements of interface of the group of elements of the interface “M2”, the name and appointment of which are presented directly in tabl. A7.3.

Table A7.3

The appointment of the elements of interface of the program at the registration of user

The identifier of element	The name	The appointment
“M2.1”	The field of indication	Displays the identifier (codifier) of the group of users from the database
“M2.2”	The navigator	The pressing provides directly the selection of the group of users from the database, at the same time the name (identifier) of group is displayed in the field of indication “M2.1”
“M2.3”	The field of indication	Displays L.F.P. of the final user
“M2.4”	The navigator	The pressing provides the selection of L.F.P. of user, at the same time the displaying of L.F.P. of user is provided in the field of indication “M2.3”
“M2.5”	The button	The pressing directly confirms the selection of the group and L.F.P. of final user and completes the procedure of authentication, and then carries out the transition to the step 3 (the selection of the mode of functioning of the program)

The nominal values of parameters of the examinee, specified at the registration and accumulated subsequently at its working in the mode of diagnostics are available for the viewing to the administrator in the mode of administrating of the database of the users of the system.

A7.1.3. The selection of the mode of working of the system

The program allows to the various categories of users (the administrator, the teacher, the expert methodist, the analyst and the trainee) to work in one of the following modes:

- the administrating – the formation and modification of the knowledge base and database;
- the diagnostics – the research in the form of testing of the nominal values of parameters, characterizing the individual features of personality of the examinee (trainee);
- the analysis – the analysis of a posteriori data of research in the form of testing.

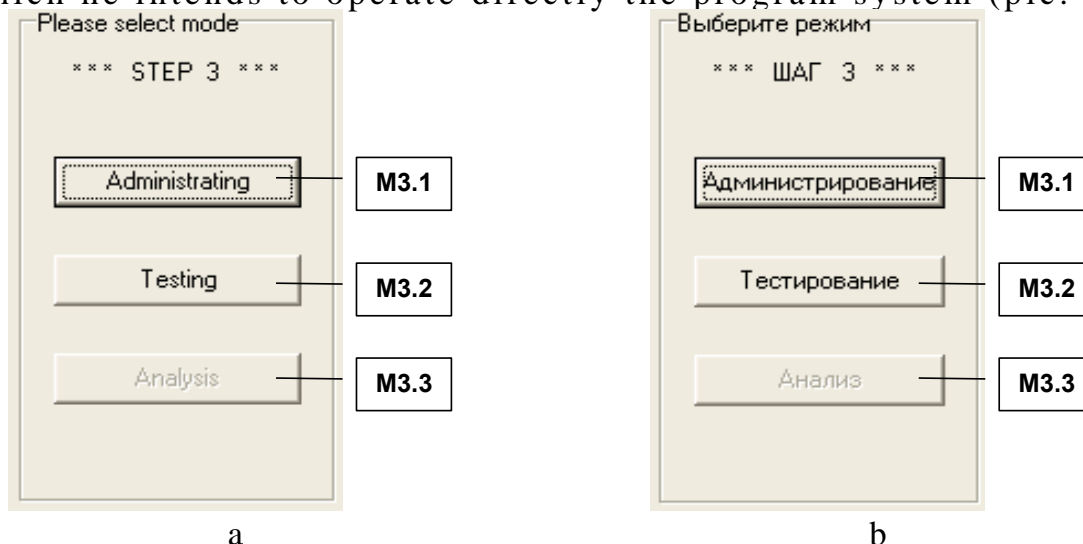
In dependence from the belonging of the final user to the certain category the various operating modes of working of the program are allocated (tabl. A7.4).

Table A7.4

The categories of users and the modes of functioning of the program

The name of the categories of users	The mode of working of the program
the expert-methodist	the administrating and the analysis of data
the teacher	
the examinee	the diagnostics (testing)
the analyst	the analysis

In dependence from its category (tabl. A7.4) the user needs to specify the mode, in which he intends to operate directly the program system (pic. A7.4).



Picture A7.4. The selection of the mode of functioning of the program system

The selection of the mode of working of the applied diagnostic module is carried out with the help of the group of elements of the interface “M3”, the appointment of which is presented in tabl. A7.5.

Table A7.5

The appointment of the elements of interface at the selection of the mode of functioning of the program system

The identifier of element	The name	The appointment
“M3.1”	The button	The pressing allows the transition of system into the mode of administrating of the database
“M3.2”	The button	The pressing transfers the program into the mode of diagnostics of the examinees
“M3.3”	The button	At the pressing the system transfers into the mode of analysis of a posteriori data

The selection and starting of the defined mode by the final user initiates the opening of the corresponding form (window) of interface of the applied diagnostic module.

A7.1.4. The modes of working of the applied diagnostic module

At the using of the specified developed program toolkit the different tasks of users in the various modes of functioning are solved. In the process of functioning of the program each mode has the specific features, therefore the forms of interface in the context of the various modes significantly differ from each other and are oriented on the working of a certain category of users (see tabl. A7.4).

At the working of user in the certain mode the window of interface of the application contains a necessary and sufficient set of the elements of interface of the program, which allow to carry out the navigation and control in the course of solution of the various tasks: the adding and deleting of accounts in the database of users of the system, the modifying of content of the questions in the database of tests of the individual features of personality of the examinees, the viewing and analysis of a posteriori results of testing.

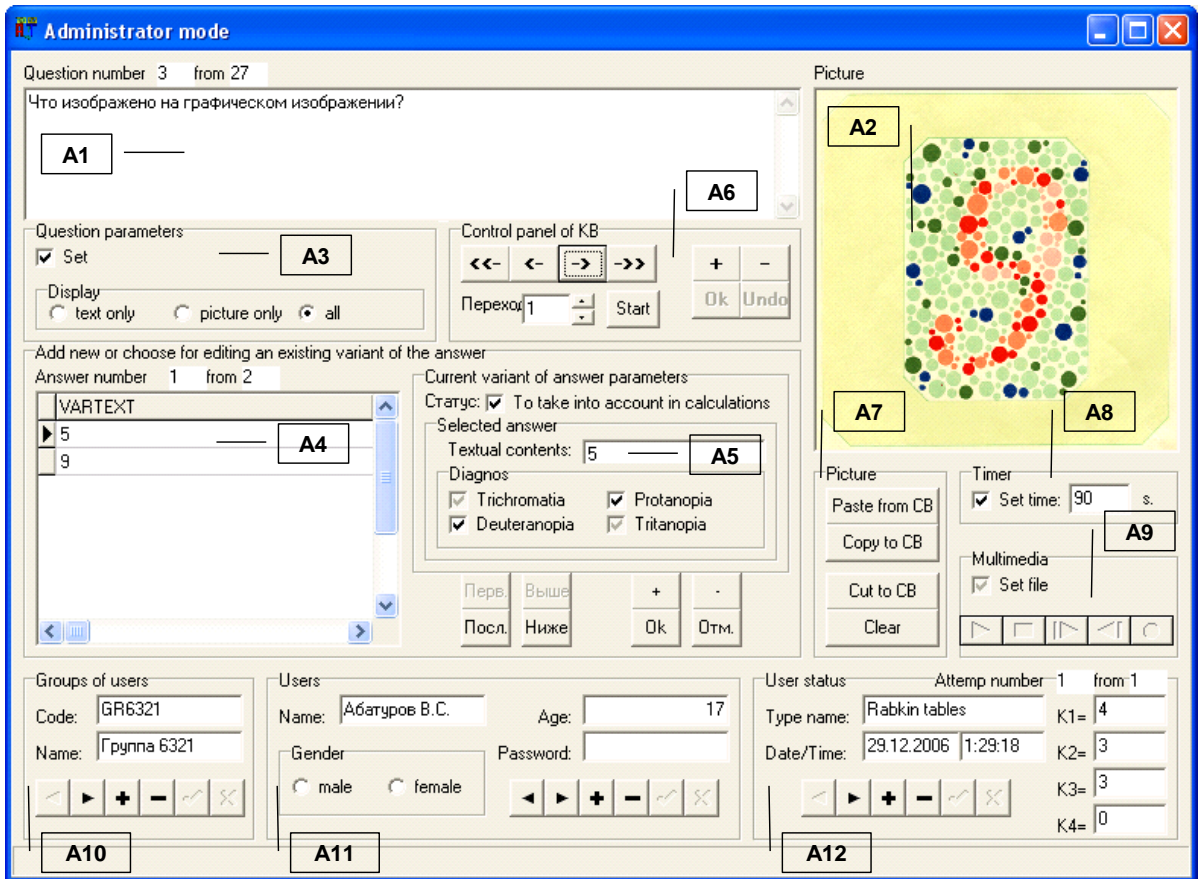
The setting up of experiment, the adding and modifying of procedures and structured data, relating to the new and existing methods of research (tests), is recommended to be carried out with using of the specially developed methods of research (tests) of the nominal values of parameters of the cognitive model of the subject of training.

At the adding of a new method of research (test) it is necessary to carry out the preliminary structuring, and then to realize the corresponding its procedure, allowing to carry out the automated testing of new parameters.

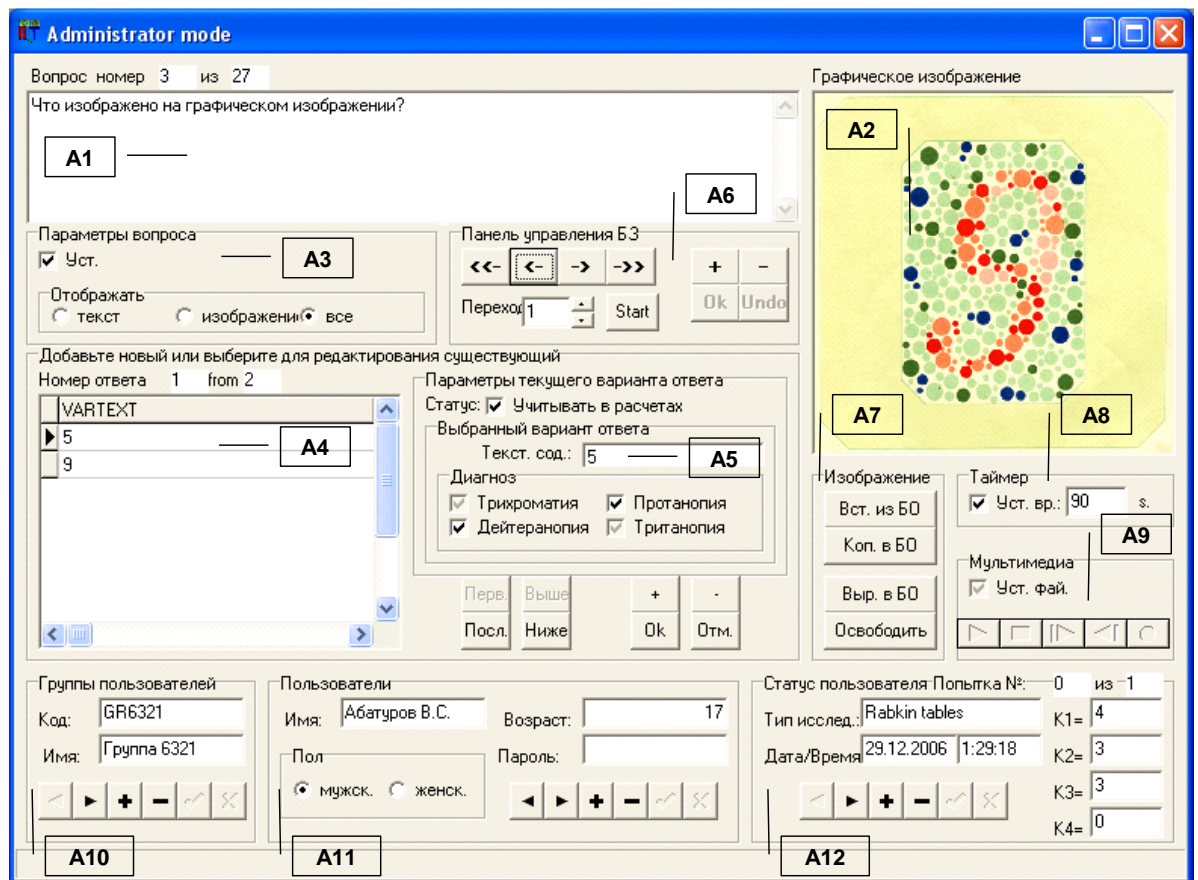
A7.1.4.1. The mode of administrating

The form (window) of interface in the mode of administrating is saturated by the elements of interface, which allow to adjust and record the various nominal values of parameters of the method of research (test) directly into the knowledge base of the program system for the providing of the upcoming work of the examinee (trainee) in the mode of diagnostics.

In pic. A7.5 presents the structure of the interface of program in the mode of administrating, allowing to modify directly the parameters of the method of research (test).



a



b

Picture A7.5. The form of interface of the program in the mode of administrating

In the context of the adopted system of designations of the elements of interface of the program, tabl. A7.6 reflects the appointment of the main groups of elements of the interface “A1” – “A12” at the working of final user directly in the mode of administrating.

Table A7.6

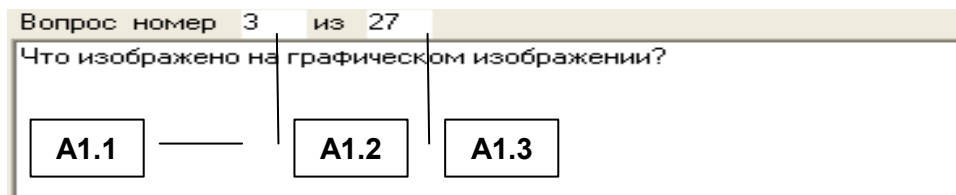
**The appointment of the groups of elements of the interface of program
in the mode of administrating**

The identifier of group	The name	The appointment
“A1”	The indicator of question	Displays to the final user and allows to modify the textual content of the question
“A2”	The indicator of graphical image	Provides directly the displaying to the final user and the uploading of graphical image (picture) to the question
“A3”	The selector of the parameters of question	Allows to the final user to set the parameters of displaying of the question (task)
“A4”	The indicator of the variants of answer to the question	Provides the displaying and editing of the list of possible variants of answer to the current question of the method of research (test)
“A5”	The selector of parameters of the variants of answer to the question	Allows to activate the accounting of the variant of answer in the algorithm of calculating of the parameters of estimation, to modify the name of the variant of answer and the parameters of processing of the variant of answer
“A6”	The control panel of the questions in KB	Provides the switching of questions, the adding and removing of question of the method of research, the saving and discarding of made changes
“A7”	The control panel of graphical image	Provides the inserting from the clipboard, the cutting and copying into the clipboard, and also the cleaning of the field with the graphical object
“A8”	The component “timer”	Intended for the setting up of the status of timer and the value of the interval of limitation of the time, in the course of which to the examinee needs to answer to the current question in the mode of diagnostics, and then carrying out the transition to the next question
“A9”	The component “multimedia”	Allows to connect the playback of audio-file for the sound accompanying of the current question in the mode of diagnostics
“A10”	The indicator of group	Allows to edit the code and name of the group of users in the database of system
“A11”	The indicator of user	Required for the displaying and modifying of the values of parameters in the list of users
“A12”	The indicator of the status of user	Intended for the displaying of the parameters of user (the type, the date, the time of research and the nominal values of coefficients)

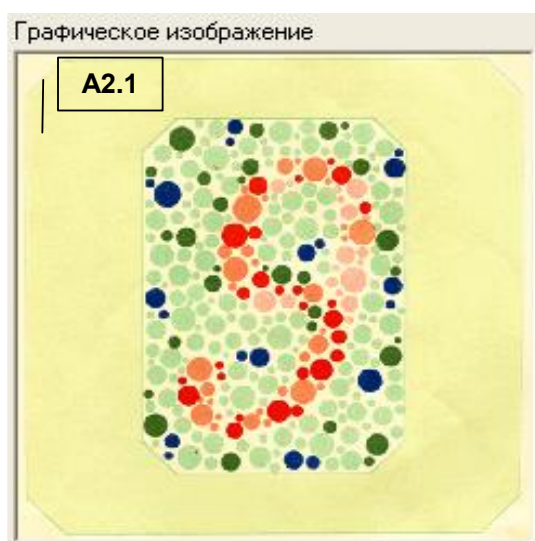
The presented in tabl. A7.6 groups of elements of the interface of program in the mode of administrating allow the final user to set the main and additional parameters of the questions, included in the given method of research.

Let's consider a closer at the groups of elements of the interface of program “A1” – “A12”, presented to the final user earlier directly in pic. A7.5.

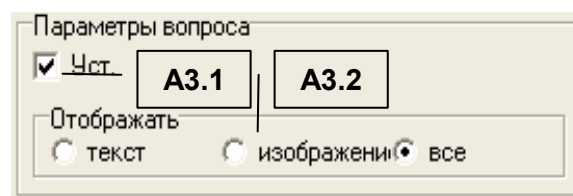
For this in pic. A7.6 each group of elements of the interface is considered separately: a – the indicator of question (“A1”), b – the indicator of the graphical image of question (“A2”), c – the selector of the parameters of question (“A3”), d – the indicator of the variants of answer to the question (“A4”), e – the selector of parameters of the variants of answer to the question of the method of research (test) (“A5”), f – the control panel of the questions directly in the database (knowledge base) (“A6”), g – the control panel of the graphical image (picture) of the question (“A7”), h – the component “timer” (“A8”), i – the component “multimedia” (“A9”), j – the indicator of the group of users (“A10”), k – the indicator of user (“A11”) and l – the indicator of the status of user in the basis of the interface of program (“A12”).



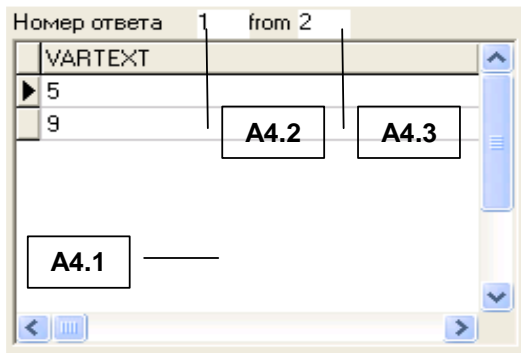
a



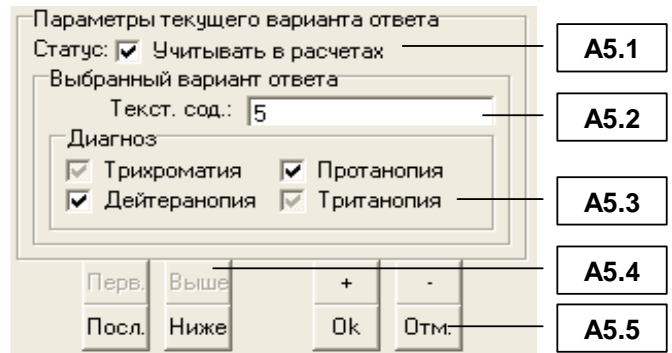
b



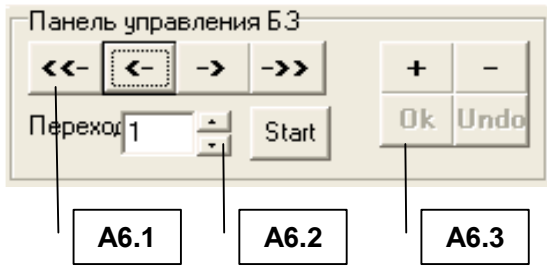
c



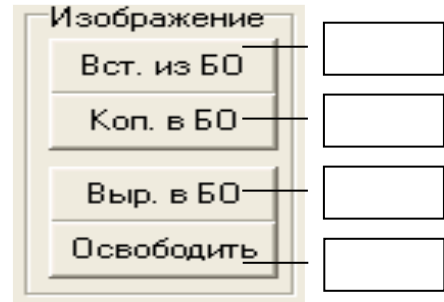
d



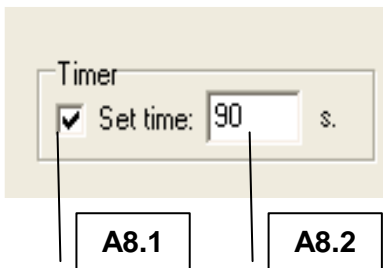
e



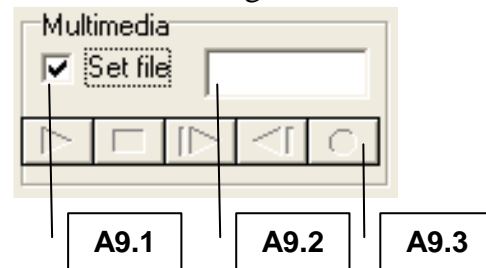
f



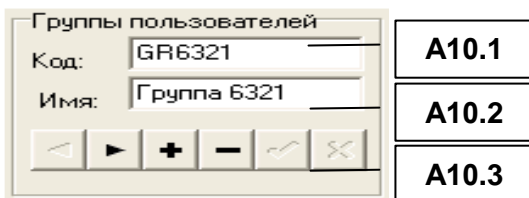
g



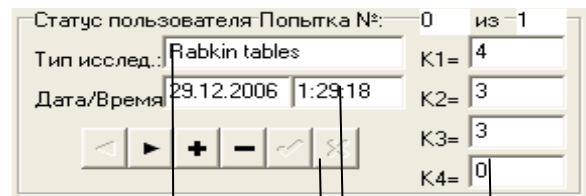
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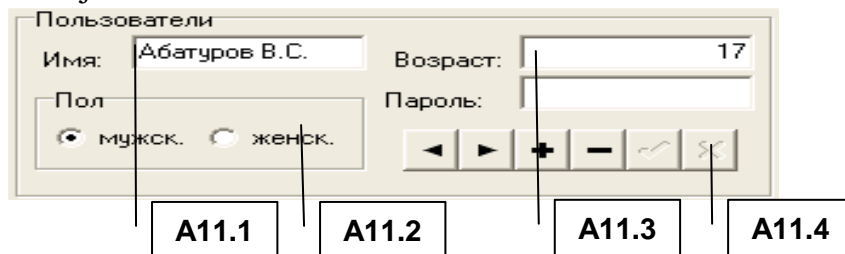
i



j



k



l

Picture A7.6. The elements of interface of the program in the composition of the groups “A1” – “A12”

Tabl. A7.7-A7.18 directly reflect the name and appointment of the corresponding elements of interface of the program in the composition of the groups “A1” – “A12”.

At the researching of the anomalies of color-sensation by the method of research (test) of Rabkin E.B., each polychromatic table directly represents a various set of pigment spots of the different color and size (the elements of picture), at the visual perception of which the examinee (the subject of training) can distinguish the certain geometrical figures and digits, acting as the variants of answer. The elementary visual stimulus (the polychromatic table) provides one or more variants of answer (are selected or entered into the editable field), which are formed directly by the examinee (the subject of training) and are processed by the algorithm of estimation of the system at the working in the mode of diagnostics.

Each type of the anomaly of color-sensation is characterized by the value of coefficient, the changing of which evidences about the degree of severity of the anomaly of the perception of color.

Thus, in the mode of administrating it is necessary to enter directly the text of each question (task) and to upload the graphical images to them. Then in each question (task) of the method of research (test) it is required to enter the list of possible variants of answer of the examinee (the subject of training) and to set their parameters, influencing on the features of calculation of the coefficients in the mode of diagnostics according to the certain method of research (test).

At the editing of the content of questions (tasks) by the final user (the switching, adding, deleting and changing of the various values of parameters) directly the elements of interface of the program “A1.1”, “A1.2” and “A1.3” (tabl. A7.7) in the mode of administrating of the database (the knowledge base) of the program product provide the automatic update of the nominal values, displayed in them.

Table A7.7

The appointment of the elements of interface of the indicator of question (“A1”)

The identifier of element	The name	The appointment
“A1.1”	The field of indication	Intended for the displaying and editing of the textual content of question (task)
“A1.2”	The field of indication	Displays the number of question (task) by order
“A1.3”	The field of indication	Displays to the user the total quantity of questions (tasks) in the method of research (test)

It should be noted, that the element of interface “A2.1” (tabl. A7.8) displays the picture in dependence from the condition of the selector of the parameters of question “A3” (tabl. A7.9).

Table A7.8

The appointment of the elements of interface of the indicator of the graphical image of question (“A2”)

The identifier of element	The name	The appointment
“A2.1”	The field of graphical image	Provides to the user the displaying and uploading of the picture, accompanying the question (task)

The question (task) can contain a row of various information elements: the textual content (text), the graphical content (picture) or their combination. The value by default is the textual content (text), and the method of research (test) of Rabkin E.B. provides the combined displaying. For the changing of the values of parameters of the displaying of question (task) by default needs to use the elements of interface of the program, presented in tabl. A7.9.

Table A7.9

The appointment of the elements of interface of the selector of the parameters of question (“A3”)

The identifier of element	The name	The appointment
“A3.1”	The selector	Provides the activation of the selector “A3.2”, allowing to the final user to change the parameters of displaying of the question (task)
“A3.2”	The selector	Allows to the final user to select the necessary elements for the displaying of question: text, graphical image and all

The list of possible variants of answer to the question of the method of research (test) is modified by means of the group of elements of the interface of program “A4” (tabl. A7.10).

Table A7.10

The appointment of the elements of interface of the indicator of the variants of answer to the question (“A4”)

The identifier of element	The name	The appointment
“A4.1”	The field of indication	Intended for the editing and displaying to the final user the list of possible variants of answer to the current question (task)
“A4.2”	The field of indication	Provides the displaying to the final user of the number of the variant of answer to the question by order
“A4.3”	The field of indication	Displays to the final user the total quantity of possible variants of answer in the current question (task) of the method of research

Each (entered by the final user) variant of answer to the question (task) is added directly into the list (list), ordered by alphabet, which is automatically sorted and displayed in the element of interface “A4.1”. The listing of the list is carried out by the final user by means of the scroll bars, which are located in the right from the list of the variants of answer to the question (task).

The selecting of one from the list of possible variants of answer in the element of interface “A4.1” allows to modify a row of its key parameters, influencing on the features of calculation of the coefficients by the algorithm of processing of the program in the mode of diagnostics. The appointment of each from the parameters to be modified is presented in tabl. A7.11.

Table A7.11

**The appointment of the elements of interface
of the selector of parameters of the variants of answer to the question (“A5”)**

The identifier of element	The name	The appointment
“A5.1”	The selector	Provides the activation of taking into account of the selected variant of answer by the algorithm of processing of the parameters at the calculating of the nominal values of coefficients
“A5.2”	The field of indication	Provides the displaying of the textual content of the selected variant of answer
“A5.3”	The selector	Allows in the selected variant of answer to specify the type of anomaly of color-sensation, subsequently taken into account by the algorithm of processing of the parameters at the calculating of the values of coefficients in the course of diagnostics of the examinee (the subject of training)
“A5.4”	The button	Provides the switching respectively to the first, previous, next and last variant of answer in the displayed list “A4.1”
“A5.5”	The button	Intended directly respectively for the adding and removing of the variant of answer, and also the saving and discarding of changes, made by the final user in the parameters of the current variant of answer

The selector “A5.3” is intended for the selecting of the type of taken into account anomaly of color-sensation in the certain variant of answer to the question (task) of the method of research (test): trichromatia (K_1) – the normal perception of the colors of polychromatic spectrum; the dichromacy of the cone apparatus of retina of the visual sensory system of the examinee: protanopia (K_2) – the absence of sensitivity to the red color and its shades, deuteranopia (K_3) – the absence of sensitivity to the green color and its shades and tritanopia (K_4) – the absence of sensitivity to the blue color and its shades.

If in the mode of administrating the certain variant of answer is entered in the list “A4.1”, and also the marker is set for it in the selector of anomaly of color-sensation “A5.3”, characterizing the certain type of anomaly of color-sensation of the examinee and in the mode of diagnostics the examinee will enter an identical variant of answer to the question (task), then the algorithm of processing of the nominal values of parameters of the program will provide an incrementation (the increasing by 1) of the nominal value of the corresponding coefficient.

The control panel of knowledge base (the group of elements of the interface “A6”) provides the navigation on the selection of questions (tasks), included in the method of research (test) (tabl. A7.12).

Table A7.12

The appointment of the elements of interface of the control panel of knowledge base (“A6”)

The identifier of element	The name	The appointment
“A6.1”	The button	Provides the switching accordingly to the first, previous, next and last question (task) of the method of research (test)
“A6.2”	The button	Intended for the transition (searching) to the question with the certain number
“A6.3”	The button	Intended accordingly for the adding and removing of question, the saving and cancelling of changes in the parameters of question (task)

In each task to the examinee is offered the certain graphical image (the visual stimulus) (“A2.1”), accompanying the text of formulation of each question (“A1.1”). The functional appointment of the various elements of interface of the program, included in the control panel of graphical image (“A7”) is presented in tabl. A7.13.

Table A7.13

The appointment of the elements of interface of the control panel of graphical image (“A7”)

The identifier of element	The name	The appointment
“A7.1”	The button	The pressing by the final user initiates the inserting of picture from the clipboard into the indicator of graphical image “A2.1”
“A7.2”	The button	The pressing by the final user initiates the copying of picture into the clipboard, contained directly in the indicator of graphical image “A2.1”
“A7.3”	The button	The pressing by the final user initiates the transferring of picture into the clipboard, contained directly in the indicator of graphical image “A2.1”
“A7.4”	The button	The pressing initiates the cleaning of content of the indicator of graphical image “A2.1”

For the loading of graphical image into the element of interface of the program “A2.1” it is expediently to use directly the defined graphical editor, for example, “Adobe Photoshop”, “Corel Draw”, “MS Paint”, “Kodak Imaging” and others. The graphical image need be previously prepared in the graphical editor (to draw, to set the optimal ratio of size, resolution and color depth, cause the small size of disk space at the storage), and then to place it in the clipboard and to press the button “A7.1” for the saving in the knowledge base.

For the copying or moving of the certain graphical image, contained in the specialized element of interface of the program “A2.1” into the graphical editor with the purpose of modification need to press the button “A7.2” or “A7.3” respectively (the graphical image will be placed directly in the clipboard), and then required to start the graphical editor and to execute the pasting from the clipboard.

In tabl. A7.7-A7.13 there are considered the main groups of elements of the interface of program minimally necessary for the entering of the nominal values of key parameters, provided by the method of research (test) of Rabkin E.B. and sufficient for the automated testing of the contingent of examinees in the mode of diagnostics.

The component “timer” (“A8”), description of which is presented in tabl. A7.14, refers to the additional functional capabilities of the program and allows to set the nominal value of the interval of time of the restriction only in the case of need (used in the extended experimental purposes).

Table A7.14

The appointment of the elements of interface of the indicator of timer (“A8”)

The identifier of element	The name	The appointment
“A8.1”	The selector	Intended for the including of the time limitation on the displaying of question (task), at the same time the accounting of the interval of time of the limitation acts directly in the mode of diagnostics
“A8.2”	The field of indication	Provides the displaying and editing directly the nominal value of the interval of time (specified in seconds), and the interval limits the time of the examinee at the answer to the question in the mode of diagnostics

In the mode of diagnostics provides the potential possibility to the user to playback parallelly the audio-record (comment) to each question (task) for the increasing of efficiency of the perception of information by the examinee (the subject of training), and the adjusting of these parameters is carried out directly in the mode of administrating by means of use of the group of elements of the interface of program “A9” (tabl. A7.15).

Table A7.15

The appointment of the elements of interface of the indicator of multimedia (“A9”)

The identifier of element	The name	The appointment
“A9.1”	The selector	Intended directly for the actuation of the sound accompaniment of task (the playback is performed directly in the mode of diagnostics automatically)
“A9.2”	The field of indication	Provides the inputting and displaying of the name of file, containing the sound accompaniment
“A9.3”	The component of control of the multimedia	Provides directly the control of the multimedia - player (playback, stop, scroll and record)

In the process of diagnostics the analysis of the quantity of correct answers is carried out for the taking into account of the level of residual knowledge of the examinee (the rough analysis).

The program provides the two variants of registration of the final user: the registration of new user and the registration of existing user, the parameters of which are already contained in the database of program realization. There is the possibility to speed up the process of carrying out of the automated research due to the preliminary adding of the lists of users into the database of program. If the lists of the groups of examinees (users) are available, then for the providing of the accelerated procedure of registration it is necessary to enter the list of groups of users and their L.F.P. in the mode of administrating.

The entering of the list of the groups of users is carried out with the help of the group of elements of the interface “A10”, the appointment of which is presented in tabl. A7.16.

Table A7.16

The appointment of the elements of interface of the indicator of the group of users (“A10”)

The identifier of element	The name	The appointment
“A10.1”	The field of indication	Provides the displaying and editing of the codes of the groups of users (examinees)
“A10.2”	The field of indication	Provides the displaying and editing of the names of the groups of users (examinees)
“A10.3”	The element of control	Allows to the user to carry out directly the navigation and modification of the registration data (the accounts) in the limits of a row of the groups of users

In the limits of the group of users (“A10”) there is the possibility of editing of the list of users (examinees) with the specifying of their L.F.P. (tabl. A7.17).

Table A7.17

The appointment of the elements of interface of the indicator of users (“A11”)

The identifier of element	The name	The appointment
“A11.1”	The field of indication	Provides directly the inputting and displaying of L.F.P. of the user (examinee) with the possibility of editing
“A11.2”	The element of control	Allows to carry out the navigation and modification in the limits of the list of users (examinees)

Each user (examinee) is characterized by the status of user, in which includes a row of coefficients, reflecting the presence of a certain anomaly of color-sensation: K_1 – trichromatia, K_2 – protanopia, K_3 – deuteranopia and K_4 – tritanopia. The description of the structure of the status of user (examinee) is presented in tabl. A7.18.

Table A7.18

The appointment of the elements of interface of the indicator of the status of user (“A12”)

The identifier of element	The name	The appointment
“A12.1”	The field of indication	Provides the displaying of the name of the method of research, which was used
“A12.2”	The field of indication	Provides directly the displaying of the date and time of carrying out of research
“A12.3”	The control panel	Allows to switch between the several attempts of the examinee
“A12.4”	The field of indication	Displays the nominal values of the coefficients, testifying about the severity of the anomaly of color-sensation at the examinee: K_1 – trichromatia, K_2 – protanopia, K_3 – deuteranopia and K_4 – tritanopia

In the mode of administrating all information fields of indication of the status of user (examinee) have the possibility of editing. In the mode of diagnostics at the carrying out of the procedure of testing the examinee not have the possibility to make changes into these fields.

After the entering of all nominal values of the parameters of the method of Rabkin E.B. and the checking of their correctness by the user in the mode of administrating, the possibility of carrying out of the automated testing of the various categories of users (examinees) in the mode of diagnostics is appeared.

A7.1.4.2. The mode of diagnostics

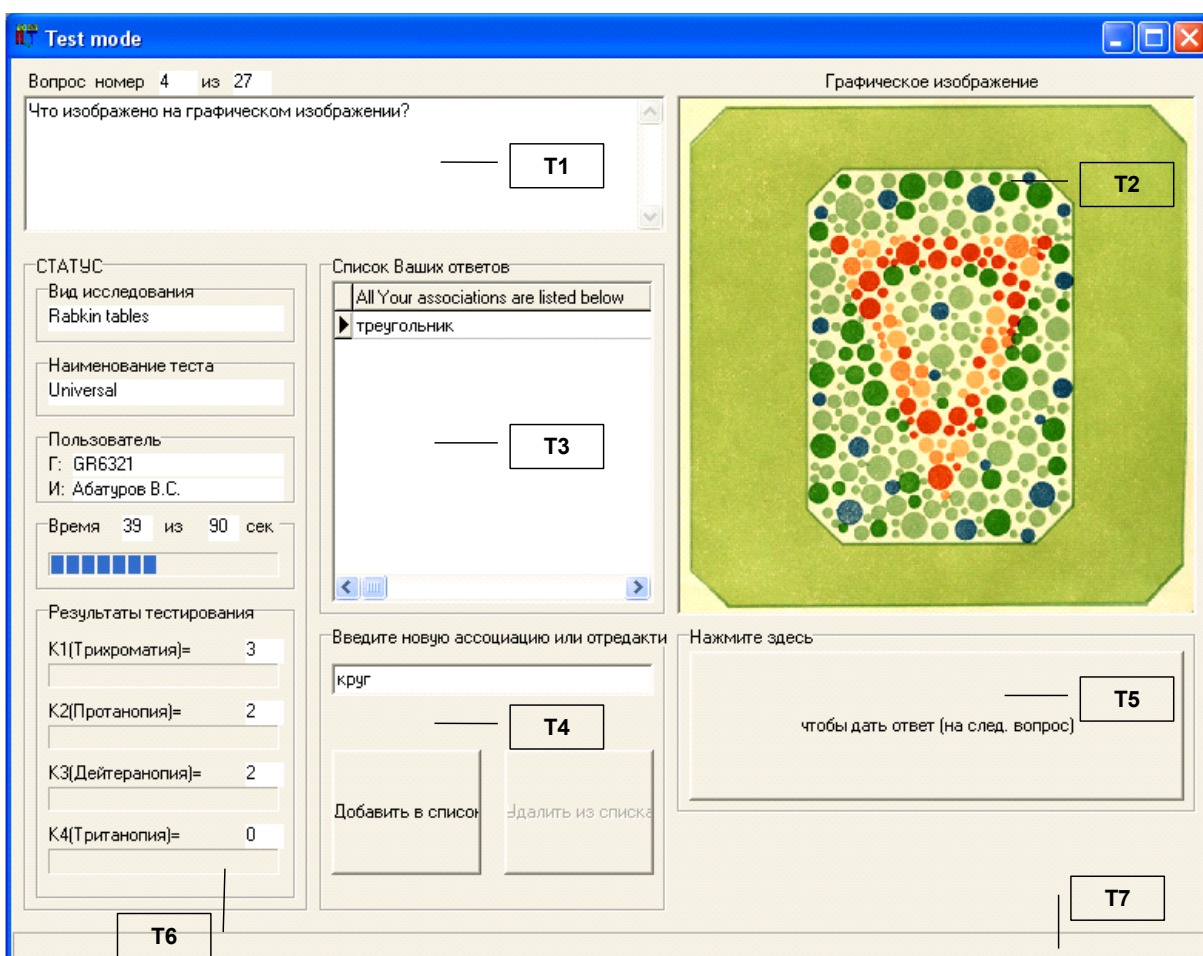
The given mode provides directly the carrying out of the automated diagnostics of the anomalies of color-sensation of the contingent of examinees (trainees).

Before the beginning of diagnosing it is necessary fully to set and verify the nominal values of parameters of the method of research in the mode of administrating. It is desirable to form the lists of the groups of examinees in advance and to enter them into the database, this will allow to avoid the significant temporary and transaction costs.

In the mode of diagnostics the entering is carried out from the main window of application, presented in pic. A7.1, for this it is need to perform a row of actions:

- to select the method of research (test) and its localization (see “M1” in pic. A7.1);
- to register in the program system (see “M2” in pic. A7.1);
- to start the mode of diagnostics of the examinee (trainee) (see “M3” in pic. A7.1).

After the transition of the applied diagnostic module into the mode of diagnostics its characteristic window of interface is displayed directly (pic. A7.7).



Picture A7.7. The interface of user in the mode of diagnostics

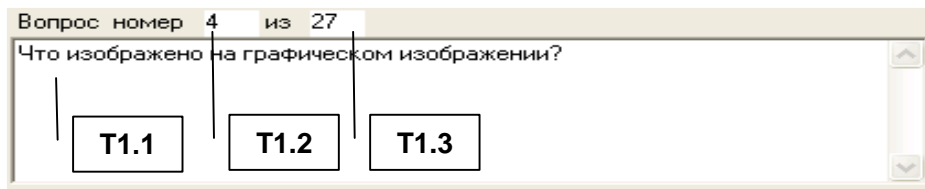
Let's consider the main groups of elements of the interface (“T1” – “T7”) and their functional appointment in the mode of diagnostics (tabl. A7.19).

Table A7.19

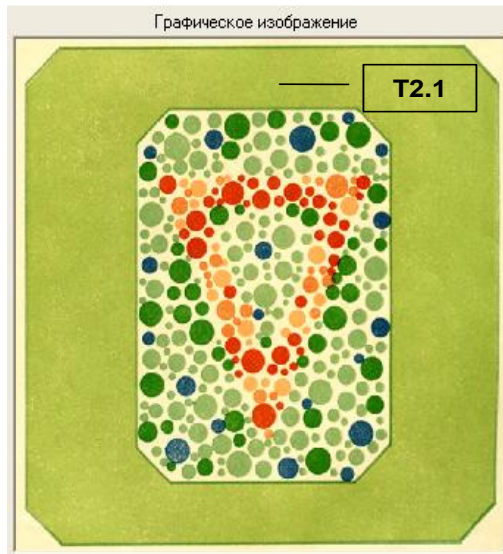
The appointment of the groups of elements of the interface in the mode of diagnostic

The identifier of group	The name	The appointment
“T1”	The indicator of question	Provides the displaying of the text of question, and also the number of question by order and the total quantity of questions
“T2”	The indicator of graphical image	Displays the picture, accompanying the formulation of question (task)
“T3”	The indicator of the variants of answer to the question	Provides the displaying of the list of answers of the examinee to the current question (task)
“T4”	The control panel of the variants of answer of the examinee to the question	Provides the editing (inputting and deleting) of the variants of answer of the examinee (trainee), which are displayed directly in the element of interface of the program “T3”
“T5”	The button of registration and checking of the answer	The pressing confirms the answer to the question and initiates the transition to the next question (task)
“T6”	The indicator of the status of examinee	Displays: the identifier of group, L.F.P. of examinee, the remaining time, allotted to the examinee for the answer to the question, the nominal values of coefficients testifying about the severity of the certain anomaly of color-sensation at the examinee: K_1 – trichromatia, K_2 – protanopia, K_3 – deuteranopia and K_4 – tritanopia
“T7”	The status line of program	Intended for the displaying to the user the auxiliary and reference information in the course of the period of execution of the program

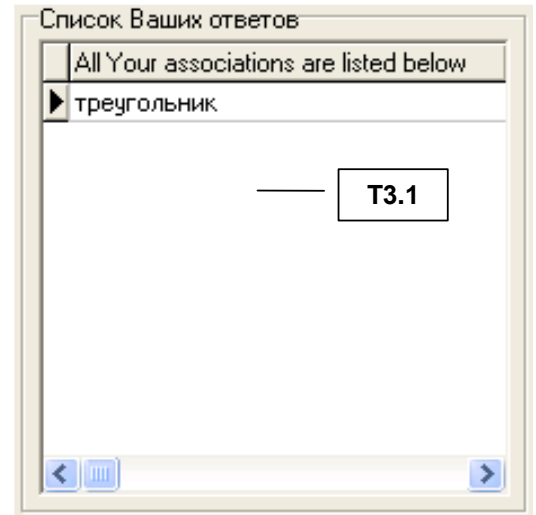
Let's consider a closer at the groups of elements of the interface “T1” – “T7”, presented earlier to the final user directly in pic. A7.7. For this in pic. A7.8 each group of elements of the interface is considered separately: a – the indicator of question (“T1”), b – the indicator of graphical image (“T2”), c – the indicator of the variants of answer to the question to the examinee (“T3”), d – the control panel of the variants of answer of the examinee to the question (“T4”), e – the button of registration and checking of the answer (“T5”) and f – the status of user (“T6”).



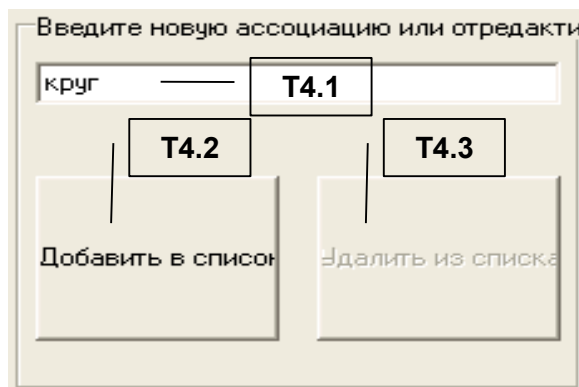
a



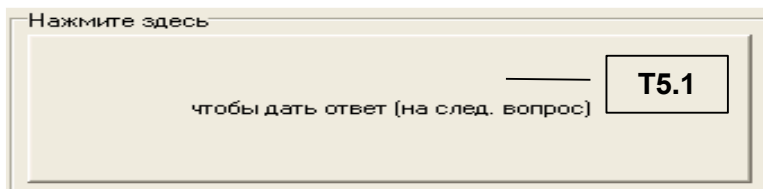
b



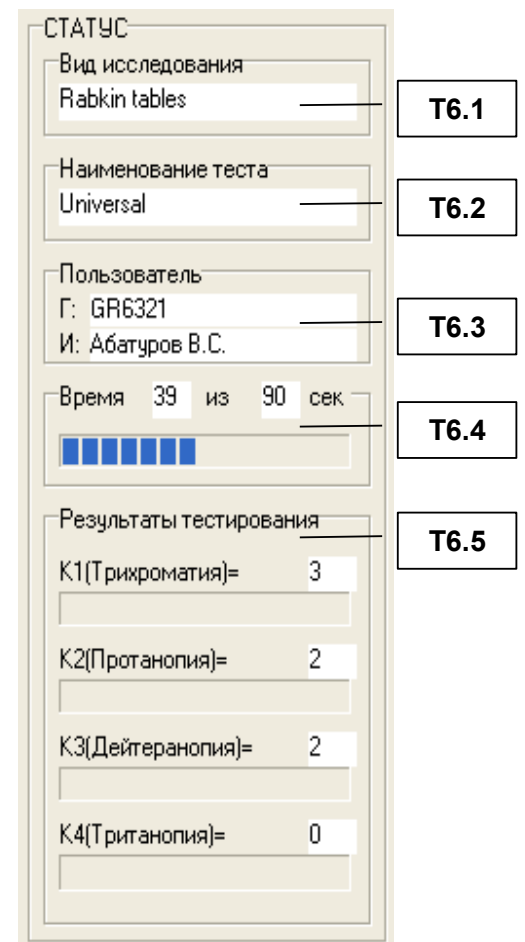
c



d



e



f

Picture A7.8. The elements of interface of the groups “T1” – “T5”

Directly after the start of the mode of diagnostics the elements of interface “T1” (the indicator of question) and “T2” (the indicator of graphical image) are loaded by the nominal values of parameters (data) of the first question (task), and the elements of interface “T3” (the indicator of the variants of answer to the question), “T4” (the control panel of the variants of answer of the examinee to the question), “T5” (the button of registration and checking of the answer), “T6” (the panel of status of the examinee) and “T7” (the panel of status of the program) are reset directly and in the course of testing of the examinee (trainee) are updated according to the algorithm of program until the last question in the database is reached.

In particular, the indicator of question (“T1”) is intended directly for the displaying of the textual content and the parameters of question (task). The appointment and composition of elements of the indicator of question (“T1”) are presented in tabl. A7.20.

Table A7.20

The appointment of the elements of interface of the indicator of question (“T1”)

The identifier of element	The name	The appointment
“T1.1”	The field of indication	Provides directly the displaying of the textual content of question (task)
“T1.2”	The field of indication	Displays the number of task by order
“T1.3”	The field of indication	Displays the total quantity of tasks, provided by the method of research

The indicator of the graphical image of question (“T2”) is intended directly for the displaying of the picture, accompanying the formulation of question (task). The appointment and composition of the elements of interface of the indicator of graphical image of question (“T2”) are presented directly in tabl. A7.21.

Table A7.21

The appointment of the elements of interface of the indicator of graphical image (“T2”)

The identifier of element	The name	The appointment
“T2.1”	The field of graphical image	Provides the displaying of the picture, accompanying the formulation of question (task)

The indicator of the variants of answer to the question (“T3”) is intended directly for the displaying of the list of answers to the question, entered by the examinee (trainee). The appointment and composition of elements of the indicator of answers to the question (“T3”) are presented in tabl. A7.22.

Table A7.22

The appointment of the elements of interface of the indicator of the variants of answer to the question (“T3”)

The identifier of element	The name	The appointment
“T3.1”	The field of indication	Provides the displaying directly the list of the variants of answer to the question (task), entered by the examinee by means of the element “T4”

The control panel of the variants of answer of the examinee to the question (“T4”) allows to the examinee to edit (to add and remove) the variants of answer to the question (task). The appointment and composition of the elements of interface of the control panel of the variants of answer of the examinee (trainee) to the question (“T4”) are presented directly in tabl. A7.23.

Table A7.23

The appointment of the elements of interface of the control panel of the variants of answer of the examinee to the question (“T4”)

The identifier of element	The name	The appointment
“T4.1”	The field of indication	Provides the possibility of editing of the name, the selected (in the element “T3.1”) variant of answer of the examinee to the current question (task) in the context of the method of research
“T4.2”	The button	The pressing initiates directly the addition of the variant of answer to the question (task), entered by the examinee (the field “T4.1”) into the general list of the variants of answers (“T3.1”) to the presented question (task)
“T4.3”	The button	The pressing initiates directly the deleting of the variant of answer to the question (task), earlier entered by the examinee (trainee) from the general list of the variants of answer (“T3.1”)

If the examinee (trainee) specified all (in his view) the correct answers, then it is necessary to approve the answer by the pressing of the button (“T4.1”), in more detail in tabl. A7.24.

Table A7.24

The appointment of the elements of interface of the button of registration and the checking of answers (“T5”)

The identifier of element	The name	The appointment
“T5.1”	The button	The pressing initiates directly the starting of the procedure of checking (entered by the examinee) of the variants of answer to the current question and provides the calculation of the values of coefficients (“T6.5”)

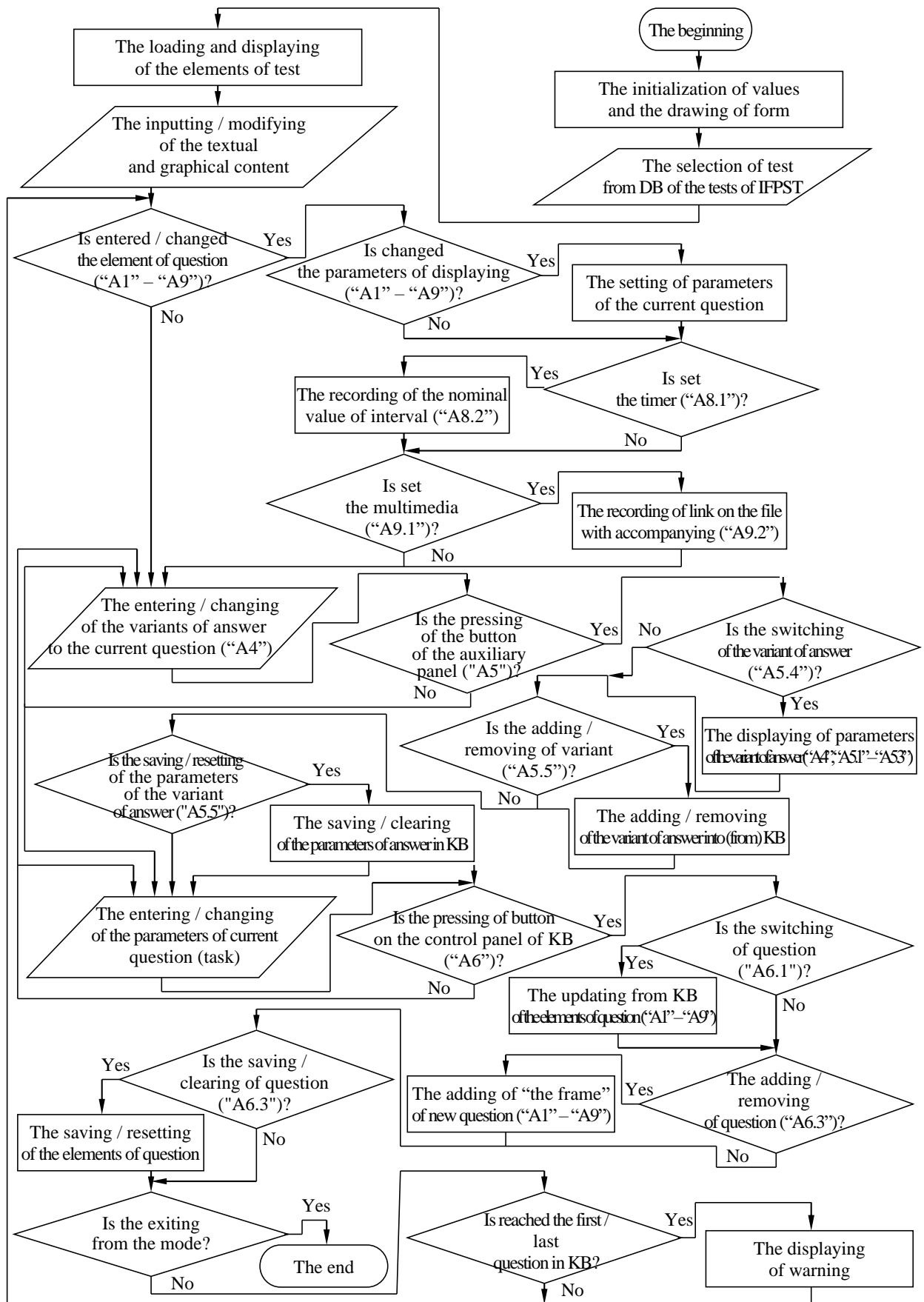
For the displaying of the names of the method of research and its localization, the identifier of the group of users and L.F.P. of the examinee (trainee), and also the value of the interval of time allotted on the issuing of the answer by the examinee and the nominal values of coefficients K_1 , K_2 , K_3 , K_4 in the real scale of time the indicator of the status of examinee (trainee) (“T6”) is directly used, the appointment of the elements of interface of which is presented in tabl. A7.25.

Table A7.25

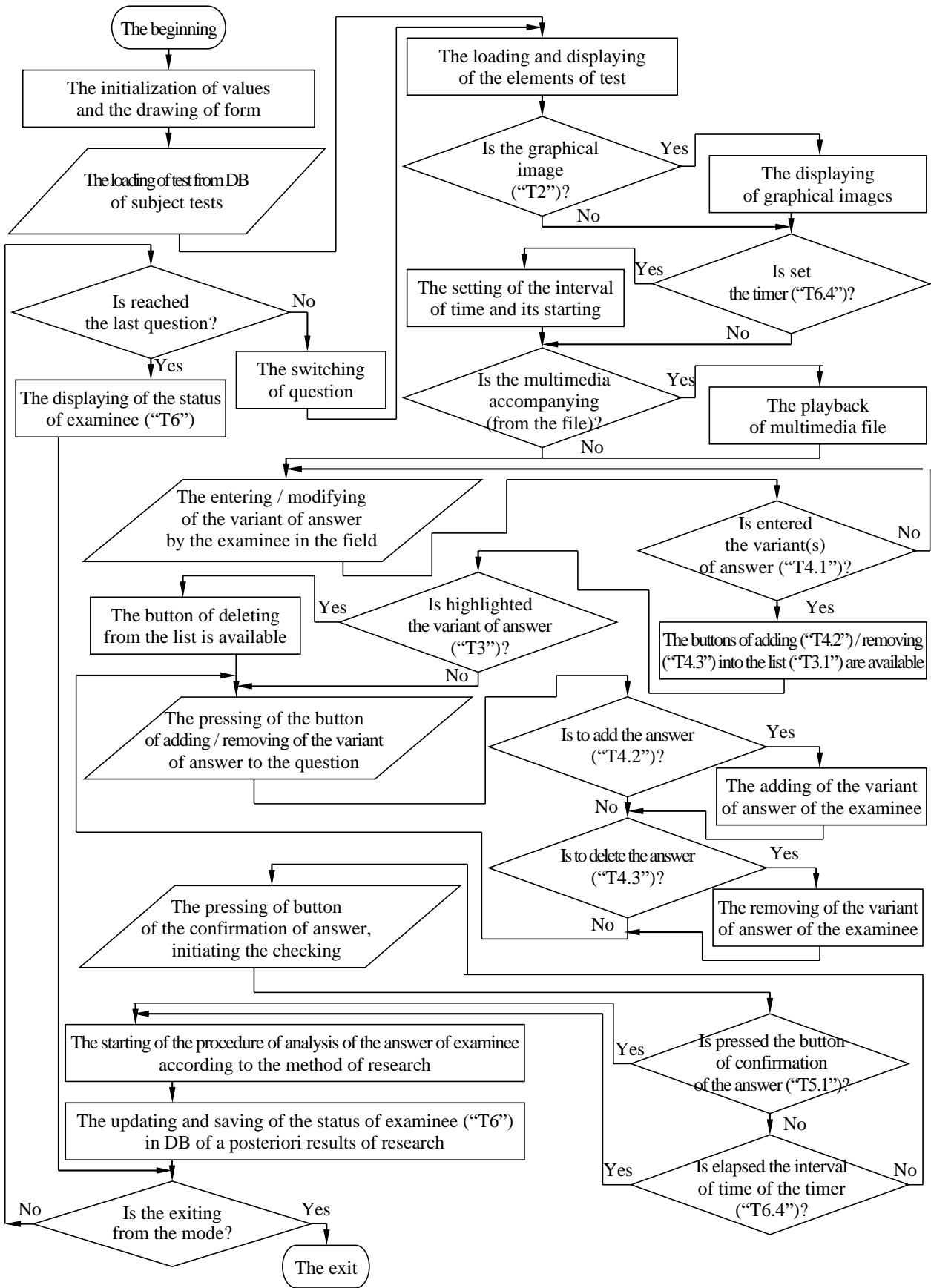
The appointment of the elements of interface of the indicator of the status of examinee (“T6”)

The identifier of element	The name	The appointment
“T6.1”	The field of indication	Displays the name of the method of research, used for the providing of diagnostics of the contingent of examinees (trainees)
“T6.2”	The field of indication	Displays the name of localization of the method of research (test), used for the providing of diagnostics
“T6.3”	The field of indication	Displays the group and L.F.P. of examinee
“T6.4”	The field of indication	Provides the output of the nominal values of the intervals of time (in seconds): initially given and remained on the development of answer by the examinee
“T6.5”	The field of indication	Provides the output of the nominal values of coefficients, characterizing the anomalies of color-sensation of the examinee (K_1 – trichromatia, K_2 – protanopia, K_3 – deuteranopia and K_4 – tritanopia)

The completion of the process of diagnostics is achieved by the two ways: automatically – if the examinee answered to all questions (tasks), provided by the certain method of research (test), manually – by means of forcibly closing of the window of interface of the applied diagnostic module (the program realization).



Picture A7.9. The algorithm, reflecting the principle of functioning of the applied diagnostic module in the mode of administrating of the questions of test



Picture A7.10. The algorithm, reflecting the principle of functioning of the applied diagnostic module in the mode of diagnostics of IFPST

Appendix 8 (information).

The specifics of the process of understanding of the text in the natural language from the point of view of cognitive linguistics

For applied linguistics is characterized the increasing interest to the ratio of the first two concepts from the triad “thinking – language – extra-linguistic knowledge”, and the need of taking into account of the inextricable connection of language and thinking is included into the linguistic credo of a row of prominent linguists. Shcherba L.V. characterizes this linguistic connection: “the language and thinking form an inextricable unity, and the observations over the language are the observations over the thinking, because this latter cannot be observed outside the linguistic forms”. The taking into account of an universal thought component of language lies in the researches of conceptual categories in the works of Bruno F., Espersen O. and Meshchannikov I.I. The fundamental research of the speech and thought categories of understanding of language was the monography of Katznelson S.D., in which the process of generation of speech is interpreted as the process of formation not only of text (textual content), but and the meaning, as “a unique process of generation of the speech and thought actions”. An essential object of linguistic analysis in the modern linguistics is the grammatical means, with the help of which “the logical content, that is the connections and relationships of objective reality reflected in human thinking” is expressed. It should be noted, that a wide and fruitful application in linguistics has received a whole row of concepts, camming from the formal mathematical logic: quantors, functions, predicates, terms, assertions, presuppositions and others.

At the research of IEE actualizes the special role of language competence in the process of interactive interaction of the subjects and means of training.

The main one is the research of such components of linguistic competence, which allow to treat the non-linguistic knowledge, embodied into the text, independently from the concrete content of the latter, as the functions with the variable arguments, fixed in relation to the certain language (national or foreign).

Such treatise of the ratio of linguistic and extra-linguistic knowledge of the subject allows to model the operations, in which the role of language as an tool of cognition is manifested, the cognitive role of linguistic competence, the research and description of which is the subject of special attention of the scientists, engaged in the field of cognitive linguistics.

The importance of given approach for the applied tasks of linguistics, involving the research of understanding of the content of text is visible. The efforts of specialists in the area of AI are closely related with the modeling of understanding, as already noted, were significantly concentrated, mainly, on the finding of ways of the adequately describing of knowledge about the around world. At the same time the language was considered as an element of such knowledge, occupying an equal-right, if not subordinate, position in relation to the other means of cognition. An example is the analysis by Minsky M. of the story about the Wolf and the Lamb and the thesis, formulated by him in connection with this, that it is impossible to understand the essence of text, until will not master the personal features of his perception by the subject.

A much more convincing treatment is the ratio between the language and extra-language knowledge, lying in the basis of the analysis of the comprehension of text.

In the works the modeling of the process of developing of representations about the role of characters on the basis of the knowledge, captured in the meanings of language units and “the semantic templates”, fixing the manifestations of certain properties of personality (of the subject of training). At the same time the most diverse facts have the cognitive significance.

The significance of the cognitive approach to the description of the language is presented the extremely significant and for a row of other practical tasks, in particular for the training to the subjects in the national and foreign language, an important component is the development of the intelligence of trainees. The research of the linguistic portrait of CM acts an important contribution at the realization of the dialogue systems of artificial intelligence in the various applied areas.

Undoubtedly, it is impossible to call the developed structure of the linguistic portrait of CM by the complete linguistic description of the linguistic competence of the subject in the system of language, not to orient on the linguistic concretization of the thesis about the role of language as an tool of cognition, does not including the concrete data about the linguistic mechanisms of cognition of the subject of training.

The scientific task of cognitive linguistics can be defined directly as the research of the cognitive value of language objects (categories) – the research of the inventory units of language and their classes between the elements of text, being the source of information, forming the knowledge of the subject of training. It should be noted, that the various cognitive components of a certain language differ significantly by their “cognitive” weight (“the language load”).

The same applies to the various types of information, contained in the text. The textual information (the textual content) is not uniform both in form (explicit and implicit), and in the content aspect.

Cognitive linguistics considers the two categories of information:

- the explicit – directly following from the text and the revealing of essence of the considered object in the context of the subject area;
- the implicit – characterizes the lexical signs of the considered object, event and phenomenon, at the same time bearing the hidden subtext.

To the explicit information (the textual content) includes:

- the communicative-actual information – intended for the expression of the common signs between the properties of the researched object, process or phenomenon, allowing to reveal its essence and regularities of functioning;
- the auxiliary (service) information – the meta-information, reflecting the hidden dependencies between the properties of object.

In the implicit information (the textual content) the two types are distinguished:

- the initial (reference) information – expresses directly the (direct) content, stated by means of a set of diverse lexical units or in a not verbalized form (in a certain language);
- the assertive information – causes the potential possibility of cognitive dissonance (dual interpretation) and may contain:
 - the singular (random) subtext (context) – follows without an explicit regularity (standard);
 - the regular (logical) subtext (context) – formed according to some regularity.

All considered types of information are operated in the context of cognitive linguistics.

The greatest interest at the cognitive approach is presented the implicit (reference and regular subtext) and the explicit (direct) information. The first is based on the principle of presupposition (of the object, process and phenomenon of research), allowing not only to reveal the meaning of text, but also to form the deep knowledge.

The disclosure of the meaning of text requires the introduction of the dictionary of terms with the disclosure of their meanings, and also the additional terminological refinements (the dictionaries and reference-books).

One from the decisive criteria (factors) at the selection of language facts, subject to the priority research at the cognitive approach to the language, is the degree of universality of the dictionary and textual content. Unacceptable for cognitive linguistics is presented such criterion of linguistic relevance, according to which what distinguishes one language from another is directly relevant, and that is characteristic to all languages – is trivial.

Cognitive linguistics due to the maximal proximity of the areas of its competence to the border “language-thinking” requires first of all the description of a certain type of trivialities – the common for all languages (according to the cognitive paradigm in the traditional or automated IEE) of the properties and regularities allowing to extract the knowledge from the text, although the description of such diverse properties and regularities, naturally, includes and concrete forms of their manifestation in one or another language.

Applied computer and theoretical structural linguistics over the past ten years have paid special attention to the diverse study of organization of the dialogue (including in the virtual IEE). Such staring interest to the problematics of dialogue interfaces is dictated by the social order of the information society: the modern achievements in the area of ICT and the high rates of scientific-technical progress initiate the need of research of the interactive information interaction of the subjects of training (the non-specialists in the area of ICT) and the means of automation in the various subject areas and problem environments, that is reflected in the project of creation of ECM of a next generation.

The specialists in the area of applied linguistics did not remain indifferent to the actual problematics and made the significant contribution into the studying of the models of communication in the virtual IEE, not without reason believing, that in the basis of the algorithms of human-machine dialogues should be lie the general principles of speech communication.

The existence today experience of classifying of the dialogues relies on the realization of verbal and non-verbal communication in the natural language.

The works of linguists of “The Freiburg research centre” are known, which describe the extralinguistic signs of natural dialogue, differentiating the acts of information interaction, among which: the connection of a certain communicative act with a stereotypical situation, the equal-right of partners in the act of communication, the fixation of the theme of discussion and etc. The typology of the synthesis of (natural) dialogues was discussed on the seminars and the scientific-methodical conferences on the theme “The models of communication” back in the 80^s years.

The concept of (natural) dialogue itself refers to the indeterminate in the structural linguistics and its applications in the solving of tasks of the artificial intelligence. From the point of view of applied linguistics the dialogue is general view understood as a text, arising in the process of communication of the two subjects of information exchange.

Therefore, the main linguistic feature of such text is the dynamics of the contained information (the textual content). The latter is manifested in the ability of the subjects of (natural) dialogue to the expression of information and its effective perception by the subject of training. Recently even a couple of replicas in the human-machine interaction have been called the dialogue, invariably we orient on the dialogues significant in length in the temporary continuum (the prolonged dialogues) on a limited subset of natural language. The illustrative material is served the texts (the textual content), studied with the help of the (adaptive) means of training in the automated IEE.

The signs, characterizing the roles, occupied by the subjects of dialogue, are unconscious or forced, proceeding from a certain situation throughout all interval of time of communication or on its certain part.

At the passing of qualification examination the subject of training is oriented in advance on the fact, that his role is reduced to the extracting of own information from the brain, and not perceiving it, and, that he owns this information worse, than the tutor.

At the determining of the main principles (parameters), which are laid in the basis of the constructing of the structure of the linguistic portrait of CM of the subject of training, we proceeded from the appointment and sphere of application of the created basic structure of IEE.

The systems of RT are intended for the functioning in the context of any given organizational model on the achievement of certain educational purposes.

The structure of solvable task has the significant influence on the organization of dialogue, arising at the joint decision of educational tasks by the subjects of training.

The strict hierarchical structure of the virtual (natural) dialogue arises, which in the practice of real communicative activity ("the live dialogue") is often violated.

This can happen directly on a row of reasons, among which can be distinguished:

- the diverse subjects of information exchange in the technological process of communicative (duplex) interaction may not adhere to any beforehand determined regulation at the discussing of solved task;
- the initial (a priori) presentations about the structure of dialogue at the subjects can vary, and the direct adaptation is realized in the course of the (natural) dialogue;
- in force of the various reasons already in the course of the dialogue communicative act here a more priority task for the subjects of training may arise.

The structure of the elementary cycle of virtual dialogue in the natural language (on a subset of natural language) represents (in relation to the subjects of communicative act) a set of communicative moves (transitions), the following in the logical (semantic) sequence in a temporary continuum.

Among a set of communicative moves between the subjects and means of IEE can be distinguished, for example: the statement of task, the request of information, the delivery of answer, the estimation of correctness of the question-answer structure in the process of diagnostics of the level of residual knowledge of the contingent of trainees (the subjects of training) and other, and also the initial components (open the natural dialogue), the intermediate means (are located between two adjacent replicas) and the various finishing elements (finish the natural dialogue).

The elementary communicative move is a set of communicative steps, one from which is considered the dominating (determines the essence of dialogue), and the rest the serving (provide the additional information for the consumer, allowing to more accurately identify a certain pragmatic meaning and a context of current communicative move in the context of a communicative strategy).

At the research of IEE of the system of (adaptive) RT it is possible to allocate a continuum of various communicative steps, but there is the general differentiation: the directive (defining the main and additional purposes), expressing the reaction (positive or negative) and the auxiliary (justification and motivation).

Along with its semantic basis the dialogue can be considered as a sequence of information messages (fragments and replicas) – the continuous pieces of text of arbitrary length (the textual content), having the subject-source and oriented on the subject-receiver. Then arises the question about the correlation of a certain sequence of information messages and communication moves and steps.

A communicative step is always presented in the context of one replica, and a communicative move can contain communicative steps, presented in the various replicas of natural dialogue (in the virtual environment). At the same time, as in any information system, act the restrictions of various kind on the compatibility in one replica of communication steps of various types.

With taking into account of the entered concepts can list a row of models in the organizational basis of natural dialogue in the virtual environment:

- the model of the text of dialogue – contains the frame of text (the textual content), generated by the partners in the course of communication to the given moment of time;
- the model of communicative situation – is a specific add-on over the model of text in the terms of communicative steps, moves and cycles;
- the model of task – it is built and operated in coordination with the solver (device), with its help is provided the control of the solution of any given task, arising before the system of (adaptive) training (at distance);
- the model of purposes – provides the control of organizational unity in the process of processing of the transactions and the cooperative interaction of components: the purposes, set before the subjects; the purposes, set before the system; the initially initialized purposes and the purposes, developed by the system of training with taking into account of the individual orientation on the personality of the subject of training.

The sense of purpose of the reasoning, carried out by the basic system of communication, is provided by the interaction of the subsystem of planning with KB about the purposes and the model of purposes. The behavior of the system of communication in the dialogue is determined by the purposes of the second kind, which are formed from the reactions on the purposes of the first kind and the purposes of the third kind, the achievement of which without the help of the subject of training is proved impossible or extremely difficult, with taking into account the purposes of the fourth kind (the stereotypical situation).

The subsystem of planning on a set of purposes of the second kind establishes the relations of order – is defined, what from them are subject to the realization in the first turn, what are less important and urgent (are subject to the realization in the second turn). In a particular case, where there are no the contradictions between the purposes of the subjects of training and the solved tasks are well structured, the store may become a suitable mechanism for the organizing of functioning of the subsystem of planning. For conducting of dialogue of the more difficult structure (with the interruption of cycles) it is necessary to use the more difficult mechanisms, for example, a set of stores or methods with the determination of weight coefficients. The subsystem of planning establishes a sequence of realization of the purposes in the context of the concrete tasks of the subjects of training in IEE of (adaptive) training. The working of the subsystem of control of the (virtual) dialogue of the system of training begins with the consideration of the priority purpose and the model of the purposes of training (at distance). On the basis of knowledge about communicative steps and moves and their relationships with the purposes is determined, which communicative moves and steps can be used in IEE of the system of training.

According to the models of communicative situation (communicative strategy), the graph of dialogue interaction from KB about the dialogue establishes, whether it is possible to realize any from the suitable moves (steps), with that, than the requirements to the structure of virtual dialogue are not violated, that is, the behavior of the system of communication is provided adequate to the current situation. If it possible, then with taking into account of the structure of the realized purpose, the structure of the communicative move is determined (in the terms of communicative steps).

After performing a certain sequence of actions, the received frames of communication move and steps are placed into the model of communication situation, the working with them is continued by the subsystem of formation of answers of the subject of training, which creates the instances of these frames (directly the frames-instances) and, continuing the processing of information, brings to the frames of sentences, which will make up the next replica of the system of training (at distance). The further processing is carried out by the linguistic subsystem of the system of (adaptive) training.

In the event of failure with the selection of appropriate communicative move (communicative step) there are two potential possibilities (alternatives). If the main purpose, scheduled to the realization directly, is very important, that is, much more important than the rest, then it is realized by the cost of interrupting of the current dialogue. For the satisfying of the requirement of subject to the cooperative interaction with the system, a corresponding clarification must be given (an explanation of answer is displayed). If the current (less important) the purpose marginally more important among others, then it is postponed, and instead of it the next in order becomes the current one. The scheme of functioning of the system of (adaptive) training remains the same.

In the process of preparation to the perception of the next replica of a partner the system of (adaptive) communication (at distance) builds an assumption. This process is similar to the above-described, the main differences are consist in the fact, that in the basis are put the presentations of system about the purposes of user and the forecast of new communicative situation (after a replica of the system of communication). The individual features (preferences) of the subjects of dialogue are taken into account.

On the basis of this the expected communicative moves and steps are displayed, which can contain the answer replica of final user (the subject of training). The process of interpretation, in the course of which first of all the frame of the text of replica is formed, continues by an attempt to determine the communicative moves and steps. If this fails, then the mechanism of recognizing of the linguistic units is used. By the results of the completion of interpretation the results are recorded in the models. The working of the system of communication with the replica of partner ends by the analysis of purposes, set before the system of (adaptive) training (the artificial intelligence).

The creation of the dialogue information system, operating on a limited subset of natural language, requires the solving of a row of linguistic character.

It should be noted, that each word-form of the elementary act of interactive interaction together with the syntactic and semantic information occupies one line of the matrix of the sentence of text in the natural language.

Many researchers of IEE of the (adaptive) systems of RT emphasize the question of reducing of the uncertainty (ambiguity) of the expressions of natural language, caused by the diverse subjective factors (parameters). Some kinds of uncertainties may also play a useful role, initiating the certain (refinement) language transformations. Besides, there is a class of insignificant linguistic uncertainties, not considered at all in the formal theories of natural language.

The vector of uncertainties reduces the efficiency of perception of the subject of training of the information influence, generated by the (adaptive) means of training.

The proposed linguistic portrait of the cognitive model is oriented on the creation of acting program-technical model of the estimation of efficiency of the communication interaction between the subjects and means of training in IEE, does not claim on the revealing of the real arrangement of language knowledge at a person.

As the communicative duplex information interaction occurs between the subject of training (the natural-intellectual entity) and the (adaptive) system of remote training (the artificial-intellectual entity), then the question about the compatibility of the formal theory of natural-linguistic communication and theory of perception (of the fragments) of information from the linguistic point of view is raised.

At the functional isomorphism of interactive interaction in the process of virtual communication the communication outwardly proceeds quite safely and the illusion of complete interactive mutual-understanding (consensus) is aroused. It is almost impossible to remove the uncertainty of this kind, without the carrying out of the technological process of parametric identification of the linguistic portrait of the cognitive model of the subject of training. Even most specialists in the field of psycholinguistics and the native-speakers of the (international) foreign language directly admit, that there are the various texts, at first view are predisposed to the effective perception and providing the formation of knowledge with the minimal costs. The use of existing abnormal languages is acceptable in accordance with the various techniques of psychological correction (the technologies of NLP).

The language communication is continuous in the temporal continuum, is carried out at the meta-language and meta-cognitive level of perception of the information.

Any construction of any given text with taking into account of the selected language is an experiment of its kind: will it be possible to adjust (to adapt) the selected language form for the transmission of the necessary information.

In the course of such experiment inevitably appear the non-standard or even “wrong”, but understandable texts (content) for any normal native-speaker.

There are the classes of semantic anomalies, the understanding of which is dual: the usual meaning of text (textual content) is combined with the anomalous. The genesis of such texts is caused by the description of one process, phenomenon and event in the linguistic terms, more suitable for the description of other, in some sense and relation opposed to the initial.

Applicable to the process of synthesis of “anomalous” (for perception) texts of various type and direction may arise the obvious question: which of the two contrasting phenomena and processes – the actual object of perception of the interlocutor or its distortion.

Some event is associated simultaneously with two different meaningful aspects for the perception, called an identical language expression.

In accordance with the first from the accepted properties of perception of the text these contents are alternative: for any national (foreign) language of the world in every moment of time the content of given perception is the only one, otherwise the anomaly is observed.

Suppose, that this text arose in a dialogue between two interlocutors, for one from which the real content of perception is located in the first world, and the distortion of these textual contents (details) in the second world. Then can build a linguistic duplicate of a certain (individual) language, coinciding with this national (foreign) language in everything, but one: in it the real object of perception (the subject of studying) is located in the second world, and the distorted textual content is accordingly in the first world. Then these two languages (source and duplicate) (national and foreign) are alternative. The first is intended for the description of the observed textual content, and the second only synchronously copies all manipulations with the consciousness of the subject of training.

One question remains: which from these interpretations (textual contents) corresponds to the perception of the second interlocutor of the communicative act. According to a certain scientific proposal about the properties of perception, the second language (national or foreign) should be logically imperfect. The first language (national or foreign) can serve as a standard for a logical sequence of linguistic reasonings for the second language. The individual language of the interlocutor will correspond the one from these languages, which he will use in a logically more perfect way. Such language should be found, if at least one from the alternative languages calls the real textual contents of perceptions of the subject of training. In other words, the following mind-conclusions (conclusions) can be proposed. The logical imperfection of language, does not calling the real perceptions, can be considerable for the subject of training, using of this language. However this imperfection of textual content becomes visible, being (at the moving to “the reference” alternative language) transferred to the another observed entity (the subject of studying) of the subject of training.

At the researching of IEE of RT for the formation of information KB in the subjects of studying with using any given national language, it should be noted, in particular, for the Russian language the characteristics of single objects of cognition are transmitted by means of describing of their role structure. For this purpose the various words denoting the single phenomena and objects of cognition are placed in a sentence in the cognitive roles. This is done by means of any given grammatical constructions (it is not the subject of consideration in the context of dissertation research): there are the certain grammatical repertoires for the presentation of each role.

It is important to note, that at the parametrical filling directly of the linguistic portrait of the cognitive model of the subject of training, it is from here an understanding of the meaning of words (the dictionary of terms) follows, denoting a single and concrete phenomenon in the textual content. After all and a single phenomenon (process) is located always in any stereotypical situation. For the designation of the common as such the certain language contains the concepts. By this it differs from the reality (the objective reality), in which the common (whole) does not exist separately from the single (private). In that case, when, for example, in the dictionary of key terms and definitions (see the structure of the linguistic portrait of the cognitive model of the subject of training) does not exist separately from a single, - a concept (term), - there are several of them in the textual content of a single and concrete phenomenon.

- any word (chair, tele-transmission and book) is presented in itself and we understand its appointment and essence: the private and general case of formation of the meta-cognitive awareness. It can denote as some concrete object (subject) as such. But in the linguistic description of concrete situation we understand these words as the denoting of single object, subject or phenomenon and other.

The role of any given concept (term) of the dictionary of terms of the trainee as the subject of training is acting a certain cognitive category, presenting the character of the observed connections of the studied object or subject. It does this by what, that is called the given place (function) of the denoted word in the cognitive structure of sentence, represented by the means of training of IEE of RT. Thus, all significant connections (pairwise correlation) between all verbal participants of the indicated linguistic structures are presented.

At the researching of the linguistic portrait of the cognitive model of the subject of training the general principle of designation of the concepts (terms) has the significant value. The different concepts (terms) denote the various general (similar), and also the similarities and general are located themselves first of all in the volumetric connections.

From the point of view of the conceptual bases of cognitive informatics it is at this moment can say, that “the thesaurus” of concepts (terms) based on the various cognitive connections is gradually developing. It allows to the subject of training to operate by the general concepts (terms) based on the cognitive connections (correlations), existing between them.

In the thesaurus of concept (term) are described not only with the help of a definite kind of so-called “signs”, as claimed in the formal logic, and namely in the certain cognitive categories of the subject of training (in the context of each national language it has the significant interest for the research).

The growth of the aggregate of knowledge is covariant to the development of the thesaurus of trainee and reflects the growth of the volume of various aspects of the general and their mutual relations, that he knows.

The practical interest is consisted in fact, that it is possible to carry out the parametrical identification of the linguistic portrait in the process of automated testing of a widely differentiated sample of examinees (see further).

For the presenting of the concept in the text there are the various grammatical means. The various meanings of any word can present a set of various concepts. With which concretely from these values we are heaving in a concrete case, becomes clear only in a concrete stereotypical situation in the subject area. In IEE of the (adaptive) system of RT this becomes especially actuality, as in the texts can bring single ones under the concrete concepts (terms). At the same time in the thesaurus (the aggregate of residual knowledge of the trainee) the meta-structures of concepts are connected (aggregated) between each other in the context of single objects, processes and phenomena in the situations with general concepts and their connections. Thus, the language as a verbal means of virtual communication does not lose its basic linguistic function: it seeks to convey the existing in the reality the unity of private and general.

The understanding of the content of text is seen as an iterative process. At first of all the subject of training on the basis of the content of text understands, which single object or single situation is described in it. But if in this textual content there are also and other concepts, which characterize and a certain general (process and phenomenon), then in the case, if the subject of training knows the content of these concepts – the understanding of text is reduced to the mutual connection of the described situation and conceptual (general) knowledge. The same happens and in case, when the subject of training already knows in advance, which single concept, described in the text is suitable for which concept. This is called a formal-logical understanding of text (textual content).

In the texts (the textual contents) can operate by the numbers. The understanding the connections, existing between them in some single case, is presented a summation of the single under the general and the arithmetical understanding of text.

The textual content can describe and such single cases, which contain the regularities of general order, considered in any field of science. If the subject of training sees the general in the text, then this is linked with the scientific understanding.

At the understanding of the same text a set of levels may take place in dependence from the case, which aspects of general the subject sees in the description, presented by the text. Such texts can occur, which describe only one or another general (the scientific texts). The understanding of these texts lies in the vision of general and its regularities. But this may and not be accompanied by the possibility, ability and skill to see the description in the text of the general in the concrete single cases. The understanding of textual content at the level of general automatically does not provide a vision of this general in a single description.

The result of understanding of the text is the accumulated knowledge of the subjects of training. Obviously, that the situational knowledge, existing relatively the single objects of cognition, is different from the conceptual and scientific knowledge about the general.

Some subject knowledge does not replace other knowledge from the problem sphere. The various scientific knowledge allows to solve the tasks of different order of complexity. Therefore, it seems, that the system of artificial intelligence is impossible to build on the scientific knowledge of only any one kind. Each kind of knowledge has its own object and internal regularities or logic. There is the logic of situational scientific knowledge, the formal logic of concepts and the scientific logic between the scientific categories of subject area (problem sphere). The equal description of scientific problems in the problem sphere is impossible.

The interconnection of scientific knowledge of a different character implies the ability to see in the single general – similarity, and in the general – the single objects of scientific cognition. This is the inborn and genetically inherited ability of a certain person. In all likelihood, at the different people the makings and abilities have differences. The development of different abilities is connected with the main tasks of (adaptive) training. In this is consisted the development of the technological process of scientific understanding. The level of organization of the system of artificial intelligence in the sphere of education considerably depends on the scale of development of the diverse abilities. This ability is closely related not only with the understanding of reality and text, but and with the structure of knowledge and with its use in the process of thinking.

Based from the author's statement, it seems, that the scientific knowledge is built on the unity of the single and the general. There is knowledge about the single subjects, phenomena and others and about the situational connections. There are the various scientific knowledge from the different subject areas about the general (about the scientific concepts, the arithmetical actions and the scientific categories). This and allows to solve the various general-scientific, private scientific and applied tasks.

By linking the objects of scientific cognition with taking into account the accumulated knowledge in the same way, as they connect the concepts, the knowledge forms a model of the world (known by the person). In the consciousness the model of known is located in the form of formed knowledge. On the given model with the help of knowledge in their boundaries can simulate everything, that exists and happens in opinion of a certain person (the subject of training).

However, on the basis of analogy the consciousness of person is able to create the various non-conforming reality cognitive models, which a person himself can perceive as the true scientific knowledge. Hence and the subjective character of “knowledge” and “scientific knowledge”, which can considerably can influence on the thinking of a concrete person.

From the point of view of the process of the formation of knowledge and operation by them one from the central problems is the vision in the single objects of scientific cognition of the general (similarity) and the identification (recognition) on the basis of the content of statements and texts of the general for the single cases. This is necessary at all levels of cognitive and thought processes. Without such ability cannot exist the development (activation) of human thinking (natural and artificial) in the process of scientific knowledge.

In IEE of RT system the process of the formation of knowledge is provided by means of information fragments (text, graphics and sound), perceived by the subject of training. The text is presented a linear or branched (structured) sequence of character information – the cognitive structure. The scientific knowledge is not stored in the memory of the subject of training in the view of linear structures, that is, in the view of a ordered sequences of thoughts of the subject of training. From these sequences the subject of training synthesizes the cognitive model of that part of reality, about which is discussed in the textual content. The given model consists from the earlier formed and acquired knowledge at a given moment.

The thinking of person operates on the basis of “the model” of formed (accumulated) knowledge. In the process of cognitive activity (thought activity) the subject of training chooses from the model the necessary scientific knowledge for the solving of concrete task and purposefully operates by it for the achievement of result (mind-conclusion). Awareness of the fact, which ones meta-structures of scientific knowledge are necessary for the solving of any given task, arises from the context of a certain task. A set of meta-structures of scientific knowledge, associated with the context of a certain task, allows to solve this task – to form the mind-conclusion (the conclusion on knowledge). The solution of scientific task is connected with the fact of understanding of the textual content (context) in the process of thought activity of the subject of training. The solution of scientific task by the subject of training can be carried out more simply – on the basis of analogy (the selection of the method of solution based on the experience of the subject of training, formed at the solving of the analogous class of scientific tasks in the problem sphere).

It is important to emphasize, that the solving of task is usually carried out not only with the help of knowledge, contained in its context, but and at the taking into account of all knowledge, necessary for the creation of the cognitive model of the developing of the solution of task. About the errors, which may occur at the incomplete model of knowledge, are evidenced a priori. A priori difficulties arise precisely from the aspiration to develop the solution of task based on only that scientific knowledge, which is connected with a certain context.

If the subject of training cannot select and use some from the accumulated scientific knowledge for the linguistic analysis of the data contained in the task, he with a high probability will not be able to develop the solutions of task in the problem sphere.

One from the aspects of (adaptive) training (at distance) is the fact, whatever knowledge is needed for the solving of a certain class of tasks. This can happen both on the basis of separate examples (of the solving of tasks), and at the level of general (scientific) rules (the procedures of the solving of task) in the area of knowledge.

The second aspect of (adaptive) training (at distance) is the training to that scientific knowledge, which is necessary in a certain subject area.

The third aspect of training is opposed the formation of abilities and skills, necessary for the improving of performance of a certain operations with using of the accumulated scientific knowledge not only in the process of training, but and in the process of practical (productive) activity in the problem sphere. The possibility is caused by the ability of subject to formalize in the first approximation the algorithm of performance of operations and the criteria of estimation of the quality of performed actions. A s m a n y s u b j e c t a r e a s a r e p o o r l y f o r m a l i z e d , than there is araised the difficulty in the development of a sequence of regulated actions, providing the achievement of the purposes of (adaptive) training and the obtaining of the results of productive activity, but in some cases this is practically impossible.

The technological process of the formation of knowledge of the subject of training is based not only on the morphological, syntactical and semantic levels of system analysis of the understanding of verbal information in the course of interaction with the (primary-)source of information. On their basis the cognitive model, formed from the knowledge does not yet arise. The formation of knowledge of the trainee causes the necessary of organization and the arrangement of a sequence of statement of the information fragments.

At the absence of additional knowledge in the area of pedagogics and didactics to form the model of dialogue, the model of required knowledge of the subject of training and the model of statement of the information fragments is the difficult scientific task.

The models of dialogue (the simplex or duplex information interaction) are based directly on the various theoretical scientific positions, but have the concrete scientific justification of the role of the subjects and means of dialogue. Considering one from the models of organization of dialogue the additional concept “the model of the subject of communication” (the model of the subject of training) is introduced [Popov E.V., 1982 y.] – characterizes the cognitive potential of the participant of communication [Van Dijk T.A., 1984 y.], the consciousness of communicant (the subject of training) [Kibrik A.E., 1983 y.] and others. In the models of communication (dialogue), created in the context of computer linguistics, the model of communicant (the subject of training) is often treated as the finite-state machine with the certain internal arrangement (structure) [Gorodetsky B.Yu., 1985 y.]. Apart from the model of communicant (the subject of training) at least two more components of language interaction are distinguished in the models of communication: the model of surrounding world (the model of the environment of interaction and the circumstances of communicative act) and the features of the channel of data transmission and the kind of transmitted information (the visual channel of data transmission – the textual and graphical information and the acoustical channel of data transmission – the natural speech and the various sounds).

In the quality of one from the central problems of building of an adequate model of communication the revealing of correlation between the external and internal sides of language (duplex) information interaction is moved forward [Koit M.E., Oim H.Ya., 1985 y.]. The external, available directly to the observer the sides of language interaction – are the text and the world around, that is the information and social environment of interaction, the model of the participant of communication (dialogue), that is the internal world of the subject of training, act as the internal side of language information interaction, as the communicants (subjects) for the researcher are the black boxes, about the structure and internal functioning of which can only be judged by the external sides of language interaction – the text paired with the environment, in which it is used.

In the context of the linguistic aspect (the linguistic portrait) a lot of experience has been accumulated in the studying of “the functions” of natural-language interfaces, among which in addition to the main function of language,- the transmission of information,- called and many other less important functions from the information point of view.

Thus, the activity of researcher, revealing the model of the participant of concrete dialogue based on the analysis of text with taking into account the circumstances of its creation, is similar to the daily practice of person (scientist or specialist in the problem sphere), making his subjective conclusions about the internal world of the subject of training.

The research of the linguistic portrait of the cognitive model, in particular, will lead to the qualitative increase in the efficiency of functioning of IEE of RT system.

At the researching of communicative act in IEE of the automated (remote) training the problem of the system analysis of information interaction of the kind “the source of information (knowledge) – the means of training – the consumer of information (knowledge)” or “the subject of training – the subject of training” partially mediated through the means of training is actualized.

In the works of psychologists and linguists the theoretical provisions about the specifics of the given kind of information interaction in IEE of the system of training have been developed, which can be reflected in the linguistic portrait of the cognitive model of the subject of training.

The communication (dialogue) between the subject of training and the means of training in IEE of RT system is the mediated duplex information interaction (exchange), but is determined by the features of personality and the relationships between the involved subjects, that is its parameters in the course of communication depend from the relations between the subjects of training and the means of training in the process of communication in IEE of the (adaptive) training system, at the same time the dialogue (the virtual communication) acts as a specific form of interpersonal communicative duplex information interaction. The problematics of research of the virtual dialogue is connected not only with cognitive psychology, but and refers directly in their specific scientific aspects to applied linguistics and private physiology of sensory systems.

The interest, which has recently summoned the problems of virtual communication, has led the specialists in the area of information technologies, psychologists, linguists and physiologists to the searching of the new and original sources of ideas in the related areas.

The essence of virtual communication lies in the fact, that two subjects of training (a source – a teacher and tutor – a trainee) exchange by the information of various character by means of the information and communication technologies.

The information fragments act as the means of the formation (transferring) of knowledge, at the same time they contain a set of different lexical units and semantic constructs. The lexically (linguistically) – a set of various signs, words and sentences. The proposal is considered directly as the element of sign system, performing the specific difficult communication function in IEE of RT system.

From the point of view of cognitive linguistics as the fundamental science in the structure of the communicative process the following elements are distinguished:

- the communicator as the subject of training, transmitting the information (data);
- the communicant as the subject of training, receiving and interpreting the information;
- the communication field as the situation, about which the information can be transmitted;
- the actual information about the communication field for the subjects of training;
- the channels of communication as the means of training and the transfer of information.

At the exchanging of information it is necessary to take into account three aggregates of data:

- the basic information – provides the formation of knowledge of the subject of training and is connected with the factual meaning of language structures (information fragments);
- the additional information – characterizes the linguistic and psychological features of the communicator, reflecting its condition and determining its role, which is assigned to the participant of interactive interaction in IEE of RT system;
- the regulatory information – the data about the course of interactive interaction, serves directly for the purposes of beginning, continuing and ending of the most interactive interaction between the subjects of training.

The first type of information, basic, is located usually in a greater or lesser extent under the conscious control of the speaker and forms the main purpose of dialogue – the exchange of information, whereas the two other types (additional and regulatory) remain factually unconscious for the subject of training (the communicant). The organization of dialogue in IEE of the automated (remote) training requires taking into account all three kinds of information and is located in the dependence from the two last at the realization of control of the course of dialogue and the choosing of the way of presentation of the information to the subject of training (if the technical capabilities allow it).

The communicative process is really carried out as a sequence of communicative steps, each from which performs a certain function in the communicative exchange and is linguistically formed in the view of statements. The function of the request of information is carried out by the interrogative statements (the natural dialogue) or themselves requests (the virtual dialogue), and the development of answer is provided on the basis of a request, initiated by the subject of training (the natural dialogue) or the means of training (the virtual dialogue). The transfer of information, expressed in data, is carried out by the limited portions – by means of the information fragments of various contents and kind. The greatest effect is achieved if the kind of presentation of the information is adequate to the individual features of personality of the subject of training.

As the transmission of information is carried out between the two subjects of training (at least – the source of information and the receiver of information is needed), then the communicative action of one communicator always involves the response action of the second communicator in the process of communicative act – the exchange of information: the receiving of certain question involves the developing of adequate answer. The communicative process proceeds in the view of the conjugate communicative actions of both communicators – the subjects of training (the proficit unit and the deficit unit).

In conception of Bakhtin M.M. the communicative process and its components are considered as the system of concepts, dialogue relations and information:

- the content of the conception of Bakhtin M.M. reveals the system of scientific concepts, describing the communicative process as a set of components;
- the dialogue relations by the psychological content are interpersonal, and by the form of course (in the social environment) – the communicative relations;
- the initial concepts for the analysis of dialogue give the structural representation of separate statement, and also the group of concepts and the modal information;
- the virtual dialogue is the subject of separate scientific consideration and is represented a set of diverse information fragments, containing the basic information of various kind in the subject of studying, and also the additional information of certain kind for the displaying (characterizes the individual features of personality of the subject of training for the realization of the interactive dialogue information interaction).

The problem of speech communication in the context of psychology, linguistics and IT of RT occupies a specific place, as in the quality of the main means of communication here the complex, historically established and highly dynamic system is performed – the language. The language, used by the subjects of dialogue in their special moduses of existence – the oral, written, in the primary and derivative systems of sign communication, makes the multi-level and multi-planned information influence both on the trainees (in the course of the primary perception and understanding of speech in the national or foreign language), and on the very character of communication of the subjects of training (the features of organization of the dialogue). From the point of view of applied linguistics as the recognized science by many scientists: the language of communication should largely be paid attention from the point of view of historical traditions. The knowledge, acquired (extracted) in some field of scientific knowledge, as well as ideas, can be used in the other (scientific) area or problem sphere, but the rethinking of conceptions and interpreted facts for the formulating of new hypotheses from the point of view of the chosen subject area is usually required, that is a scientific problem of a different order and rank of certainty.

It is important to note the importance of scientific research of the linguistic portrait at the consideration of cognitive processes in the (adaptive) training (at distance). The word acts as some means, at the information interaction with which the subject of training can restore the presentation, and then the meaning in dependence from the context.

The question about the understanding of trainee of the verbal image of perceived object, about the fact, that in reality and at the this moment directly presents the analyzed word for the examinee, does not seem to us so trivial, as usually at the analysis the experimenter is forced to address (in dependence from the experimental situation – stereotypical or non-stereotypical) or to a certain action of the examinee on the basis of heard word (correctly or incorrectly he understood its define sense and meaning), or to the physiological reaction (here the mechanism of understanding fades on the background), or to the dictionary value of given word, word-combination or expression (which may have, or may not have relation to the given concrete situation), or, finally, to the comparing of value of the given word with the own understanding (exactly what certain cognitive association it causes directly, how the intuitive presentation is true and coincides with its factual meaning).

The treatment of understanding in the speech communication through the image and sign opens up more methodological perspectives compared to the verbal communication (writing) and a certain meaning in their semiotic or other linguistic treatment. The given approach leaves open for the research the possibility of the fact, that requires the attempt of explanation of the speech and understanding as a creative process of the subjects of IEE of RT.

Attempts to the modeling of the process of understanding of the text and natural language are considered in the intelligent information systems of data processing, that acts a significant influence on the scientific research and development of the modern natural-language interfaces of any information systems, in particular it is find application in the systems of automated recognition, translation, speech perception and text reproduction (the tasks of analysis and synthesis).

A large quantity of works and scientific researches in the area of cognitive linguistics are connected with the names of such scientists as Hayes B., Selfridge M., Goodman K. and Schank R.

The problematics of the modeling of communicative processes cover two circles of phenomena: the understanding and verbalization as the basic categories of theory and models of communication. At the same time the supporting link is the knowledge, which aggregates these processes at the level of reprocessing, storage, judgment, transmission and assimilation of the information.

The verbalization – the process of registration of knowledge of the author in the context of a certain subject area on the information carrier: paper or electronic.

The understanding – the process of extracting of the sense and essence of objects, processes and phenomena from the text as a set of lexical units and semantic constructions.

The formation of knowledge – the process, connected with the perception and processing of diverse information at the level of the psychophysiological construct of the head brain of person, providing the increasing of the level of awareness and experience in the certain area.

The groups of signs are distinguished for the system analysis and the increasing of efficiency of the information interaction with the linguistic and psychological points of view:

- the sphere of communication – the first most important sign, distinguished by Bakhtin M.M., directly or obliquely reflects the range of potential subjects of dialogue and their functions;
- the place of carrying out of the dialogue – the environment of communication and the conditions of organization of the dialogue;
- the kind of dialogue – the kind of practical activity, part of which is the dialogue;
- the characteristics of communicants and the relationships between them – the social-psychological type of communicant, the relationships between the subjects, the experience of interaction, the degree and character of activity and emotional spirit;
- the period of dialogue – the chronological period, to which refers the given dialogue;
- the practical purpose of dialogue – the type of practical purpose of each communicant;
- the purpose of dialogue – the type of strategical communicative purpose of each communicant;
- the theme of dialogue – the theme of dialogue (mono-thematics and poly-thematics);
- the type, kind and way of dialogue – the type, kind and way of presentation of the information;
- the characteristic of dialogue – the characteristics of text in the dialogue (communication);
- the composition of dialogue – the scheme of dialogue and the dynamics of communication (interaction);
- the speech style of dialogue – the principles of choice of the language means of communication (dialogue);
- the degree of artificiality of the dialogue – the degree of absence of the naturality of dialogue.

Appendix 9 (information).

The basic approaches and the theories to the research of intellectual abilities of the subjects of training

There is a large quantity of different scientific approaches to the research of the psychological construct of the head brain and intellect as its latent property, therefore it is proposed to consider the essence of the main scientific approaches, which were taken into account at the formation of the structure of the cognitive model.

The essence of the social-cultural approach

Theory 1. In the opinion of Maccobi M. and Modiano N. our intellectual abilities not only engendered by the cultural context of the subject, but and are limited by it (sometimes – fatally, regardless of whether, the culture is “primitive” or “developed”).

In general the criterion of development of the intellectual abilities of social subject in the context of given scientific direction is connected by the specialists with the fact, how much the subject has mastered the content of the corresponding culture and in what extent his intellect is the carrier and realizer of dominant cultural orientations.

The essence of the genetic approach

Theory 1. According to the ethological theory of Charlesworth W.R. the studying of the behavior of person in the natural environment is considered. The intellect – is the way of adaptation of a living thing to the requirements of reality, formed in the process of evolution of the social subjects in the living environment. For the understanding of the adaptive functions of intellect of the social subject it is advisable to differentiate directly the scientific concept “intellect”, including the certain scientific knowledge, cognitive operations, and the scientific concept “intellectual behavior” of the subject in a certain environment, including the means of accommodation to the problematic (new and difficult) situations and the cognitive processes, which organize and control the behavior.

Theory 2. According to the operational theory of Piaget J.W.F., the intellect – is the most advanced form of adaptation of the organism to the environment, is representing the unity of the technological process of assimilation (the reproduction of elements of the living environment in the psyche of the subject of training in the view of diverse cognitive mental schemes at the level of mental construct) and the technological process of accommodation (the changing of these cognitive schemes in dependence from the essential requirements of the objective world and public formation).

Thus, the essence of intellect lies in the possibility to carry out a flexible and simultaneously stable accommodation to the physical and social reality, and its main functional appointment in the structuring (organizing) of information interaction of the person with the living environment (Piaget J.W.F., 1969 y.).

The development of intellect is considered as a spontaneous, subordinate to its special laws the technological process of formation of the operational structures (schemes), initiated by the influences of the external environment and the adaptation of organism to them in the course of life, which in the early, middle and late ontogenesis includes a row of stages of development:

- the stage of sensorimotor intellect (from 8-10 months to 1,5 years);
- the symbolic or additional-understanding intellect (from 1,5-2 years to 4 years);
- the stage of intuitive (visual) intellect (from 4 years to 7-8 years);
- the stage of concrete operations (from 7-8 years to 11-12 years);
- the stage of formal operations or reflexive intellect (from 11-12 years to 14-15 years).

The intellectual development of the social subject of training, therefore, is considered as the development of the difficult operational structures of intellect, in the course of which the thought operations gradually acquire a new character.

In the development of intellect, according to the theoretical views of Piaget J.W.F., the two main scientific lines of scientific research are distinguished. The first is related with the integration of operational cognitive structures, and the second – with the growth and formation of individual presentations about the reality.

The essence of the processual-activity approach

Theory 1. Theory of thinking as a process of activity of a subject Rubinstein S.L. gives a very actual provision about fact, that "... it cannot to determine the mental abilities and intellect of person by the results of his activity, without opening the process of thinking, which leads to them. In the attempt to come to the definition of intellect as the mental abilities of people and consists the root defect of the usual test definitions of intellect...".

The interesting in this plane the position of Kramarenko V.Yu. is presented, who differentiates the intellect as the mental ability and the thinking as the mental activity, noting, that there is no the unambiguous correspondence between the real basis, which acts in the form of intellect, and its actualization, manifested in the form of concrete thought process, and the surface structure of thinking is often deceptive and noninformative, it does not contain all information about the mental capabilities of subject. Therefore, for the scientific-theoretical analysis, in the opinion of Kramarenko V.Yu., it is necessary to overstep the bounds of simple registration and description of thinking and to go to the studying of deep structures and processes, allowing to explain the regularities of the observed thought activity (Kramarenko V.Yu., 1983 y.).

Theory 2 . Theory of cognitive learning

The various approaches the conviction in fact, that the nature of intellect is revealed through the special procedures of its acquisition by the social subject is united. Therefore, it is possible to study the intellect through the formation of certain cognitive skills in the specially organized conditions with the purposeful external guidance by the process of formation of the new forms of intellectual behavior.

The intellect, thus, is treated as "the basic behavioral repertoire", which is acquired due to means of the certain training procedures, as the system of functional behavioral skills, being the result of "the cumulative-hierarchical training" (Staats A.W., 1970 y.).

One more direction in the studying of the mechanisms of cognitive learning in the context of the problem of intellect, interest to us, is presented in the researches of Feuerstein R. The intellect, in his understanding, there is the dynamic process of interaction of the person with the world, therefore, the criterion of the development of intellect is the mobility of individual behavior. The source of mobility is acting the so called "mediated experience of training" (Feuerstein R., 1990 y.).

The essence of the educational approach

Theory 1. The research of intellect in the context of the problem of learning-ability

The problem of the ratio of training and the mental development of the subject throughout many years was the foundational for the domestic pedagogical psychology. The term “intellect” was practically not used in these researches. At the certain stage the problem of learning-ability acquired a new accent, extremely significant in the sphere of the general-psychological research of intellect.

Kalmykova Z.I., based on the long experimental-psychological researches of the intellectual activity of trainees in the course of training, proposes to determine the nature of intellect through “the productive thinking”, the essence of which is consisting in the ability to the acquiring of new knowledge (learning-ability). The indicators of learning-ability of the subject are the level of generalization of knowledge, the breadth of their application, the speed of assimilation and the pace of progress in the training. Accordingly, “the core” of individual intellect, in her opinion, is making the possibilities of person to the independently discover of new knowledge and the application of them in the non-standard (non-stereotypical) problem situations. Just the characteristics of learning-ability predetermine the success of school training, thereby acting in the quality of the criterion of intellectual development of the subject (Kalmykova Z.I., 1981 y.).

The essence of the information approach

Theory 1. The mental speed as the basis of individual differences of the intellect Eysenck H.J. emphasized, that the correlation and factor approaches of the traditional testology are clearly insufficient for the explanation of the mechanisms of intellect. In his opinion, the way of evidence of the existence of intellect – is the evidence of its neuro-physiological determination. In the quality of arguments in favor of such interpretation of the mechanisms of intellect Eysenck H.J. considers the facts of correlation dependencies of the indicators of IQ with the characteristics of the evoked potentials of the cortex of the head brain (the measure of their difficulty and synchronicity), and also with the time of simple motor reactions and the time of recognizing of the objects in the conditions of their short-term visual presentation to the subject of training (the examinee). “We come to the amazing conclusion,- declares Eysenck H.J.,- that the best tests of intellectual differences – are the tests, are non-cognitive in their nature” (Eysenck H.J., 1982 y.).

Theory 2. The elementary processes as the basis of individual differences of the intellect The common for the theoretical views of Hunt E.B. and Sternberg R.J. is the critical attitude to the traditional test model of intellect. So, it is affirmed, that the various intellectual capabilities of person cannot be described by the single indicator, similar to height or weight, and, that IQ as the sum of estimations on the battery of tests, rather the statistical convention, than the indicator of the individual intellect of the social subject and so on. In the quality of the main one the scientific provision is made about the fact, that the alternative to the psychometric approach should be the studying of the basic information processes, lying in the basis of the solution of tasks.

The elementary information processes – are the micro-operational cognitive acts, connected with the operative reprocessing of current information. For example, in what form and how selectively the information about the influence is encoded, how the information is reorganized at it passes through the operative memory, what is the character of storing of the new information at it reception into the long-term memory.

The essence of the phenomenological approach

Theory 1. The gestalt-psychological theory of intellect

One from the serious attempts of building of the explanatory model of intellect is characteristic for the gestalt-psychological tradition, connected with the treatment of the nature of intellect in the context of the problem of organization of the phenomenal field of consciousness. The prerequisites of such scientific approach were set by Köhler W., who in the quality of the criterion of presence of the intellectual behavior at the animals considered the effects of the degree of structure of the processing of diverse information: the emergence of solution is connected with the acquisition of the field of perception of new structure, in which the relationships between the elements of problem situation, are important for its resolution in the problem environment (the subject area) are grabbed. At the same time the solution of problem itself suddenly arises in the certain situation, based on the almost instantaneous restructuring of the structure of the image of initial situation (this phenomenon received the scientific name “insight”) (Köhler W., 1980 y.).

Wertheimer M., characterizing directly “the productive thinking”, also brings to the foreground the processes of structuring of the content of consciousness: the grouping, centering and reorganizing of existing impressions (Wertheimer M., 1987 y.).

Meili R., trying to correlate the theoretical positions of gestalt-psychology (in particular the provision about the decisive importance of the process of structuring of the image of situation) with the ideas and methods of testological scientific research (in particular with “the structural model of intellect” of person of Guilford J.P.), highlighted and interpreted the four factors of intellect of the learning subject: the difficulty (the ability to differentiate and connect the elements of test situation), the plasticity (the ability to quickly and flexibly rebuild images), the globality (the ability from an incomplete set of elements to build an integral meaningful image) and the fluency (the potential ability to the quickly generation of many diverse ideas regarding to the initial situation) (Meili R., 1946 y., 1981 y.).

Theory 2. The features of individual cognitive resource as the basis of intellectual competence of the subject

In the opinion of Glazer R., the main difference between the people with the various level of development of the intellectual abilities is caused by the differentiation by the level of organization of the system of knowledge – both the declarative (the knowledge about the fact, what), and the procedural (the knowledge about the fact, how to process or processing). Just the features of individual KB predetermine the efficiency of separate cognitive processes (the memorization and the solving of tasks), and the level of intellectual achievements in the professional activity.

KB of subject – are the existing semantic networks and the structure of semantic data, by means of which the subject builds his own presentations about what is happening, and also the rules (procedures), by means of which the subject uses the details available at him.

The indicators of the level of organization of KB are their easy-availability and suitability to the application in the problem sphere, and we are talking, as a rule, just about the scientific knowledge directly in the certain subject area.

The essence of the functional-level approach

Theory 1. The structural-level theory of intellect

In the quality of the initial scientific idea of Ananyev B.G., acts, that the intellect – is the difficult mental activity of the social subject, representing the unity of the cognitive functions of different level. Following the position of Vygotsky L.S. about the fact, that the transformation of connections between the various psychological functions makes the basis of mental development, in the context of the given scientific theory the thesis about the intellect as the effect of cross-functional connections of the basic cognitive processes was gained development.

As a result it was made the scientific conclusion about the fact, that the general directionality of intellectual development, as it moves through the different ages is characterized by the unity of the processes of cognitive differentiation (the increasing of severity of the properties of separate cognitive functions) and the technological cognitive processes of cognitive integration (the strengthening of cross-functional connections between the cognitive functions of different level), setting “the architectonics” of the integral structure of intellect (Ananyev B.G., 1972 y.).

Ananyev B.G. constantly emphasized the deep unity of the theory of intellect and the theory of personality. The needs, interests, attitudes and other personal qualities of the social subject directly determine the activity of intellect (the psycho-dynamic construct). The characterological properties of the personality and the structure of motives of the social subject depend on the degree of objectivity of its relationships to the reality, the experience of knowing of the world and the general development of intellect (Ananyev B.G., 1969 y.).

Theory 2. Theory of the functional organization of cognitive processes

The intellect, according to Velichkovsky B.M., is described as the meta-structure of cognitive processes, including the six levels of cognitive reflection (Velichkovsky B.M., 1987 y.).

Thus, the lower “floors” of intellect have relation to the regulation of movements in the subject environment, starting from the simplest motor reactions and the localization of objects in the space (the levels “A” and “B”) up to the deployed subject actions in the conditions of building of the subject image of situation (the levels “C” and “D”). For the understanding of the nature of intellect the two last of its higher “floors” are presented the greatest interest – is “the higher symbolic coordinations”, responsible for the representing and storing of the (scientific) knowledge (the level “E”), and “the strategies of transformation of the (scientific) knowledge” (the level “F”).

The level “E” is presented by the conceptual structures in the view of “proto-lexicon” (the visual-typical images of objects – “the primary concepts” according to Hofman E., or “the focus examples” according to Bruner J.S.), and also in the view of the cognitive schemes (the generalized and stereotyped presentation about the various subject areas – “the frames” and “the scenarios”).

The level “F” is presented by the procedures of changing of the available knowledge in the view of the operations of imagination, the propositional operations, the special kind of meta-operators such as language bundles “if, then...”, “let's say, that...” and so on. Thanks to these procedures there are created the conditions for the generation of new semantic contexts (“the mental spaces” according to Fauconnier G., 1984 y.), which can be filled directly by the new agents and objects, view-changed, acquiring the hypothetical character at the level of head brain.

The essence of the regulatory approach

Theory 1. The intellect as the condition of the control of motivation

The intellect is not only the mechanism of information processing, but and the mechanism of regulation of the mental and behavioral activity according to the scientific assumption, formulated by Thurstone L.L. in his monography “The nature of intelligence” in 1924 year (Thurstone L.L., 1924 y.). The difference between the early Thurstone L.L. with his theoretical analysis of intellect and the more later Thurstone L.L. as one from the founders of the testological approach, published directly in 1938 year his famous scientific work “The primary mental abilities” (Thurstone L.L., 1938 y.), is so startling, that one can only wonder to his professional biography.

Theory 2. The intellect as the mental self-control (self-regulation)

In the opinion of Sternberg R., the problem of intellect should be solved in the context of more wider scientific problem, specifically: how the subject controls himself. Accordingly, the answer should be sought simultaneously to the three questions:

- 1) what is the attitude of intellect to the internal world?
- 2) what is the attitude of intellect to the external world?
- 3) what is the attitude of intellect to the experience of person?

These questions formed in the basis of “the triarchical theory of intellect”, in the context of which the intellect was defined as the form of mental self-control and which included the three interconnected subtheories: the component, context and experience (Sternberg R., 1985 y., 1986 y., 1988 y.).

Sternberg R. emphasized, that the concept “the mental self-control (experience)” accents the attention on the possibilities of the various alternative ways of organization of the intellectual activity of person (the learning subject) and is addressed not so much to the intellect as such, but to the fact, how people use their intellect (that is to that, how and for what the intellect acts).

Appendix 10 (mandatory).

The technical description of the basic diagnostic module for the automation of estimation of the level of residual knowledge of trainees

The technical description proposes the basic diagnostic module (DM), developed directly on the basis of the architecture of the expert system and providing the automation of research of the level of residual knowledge of the trainee based on a set of the methods of research (tests) in the studied disciplines.

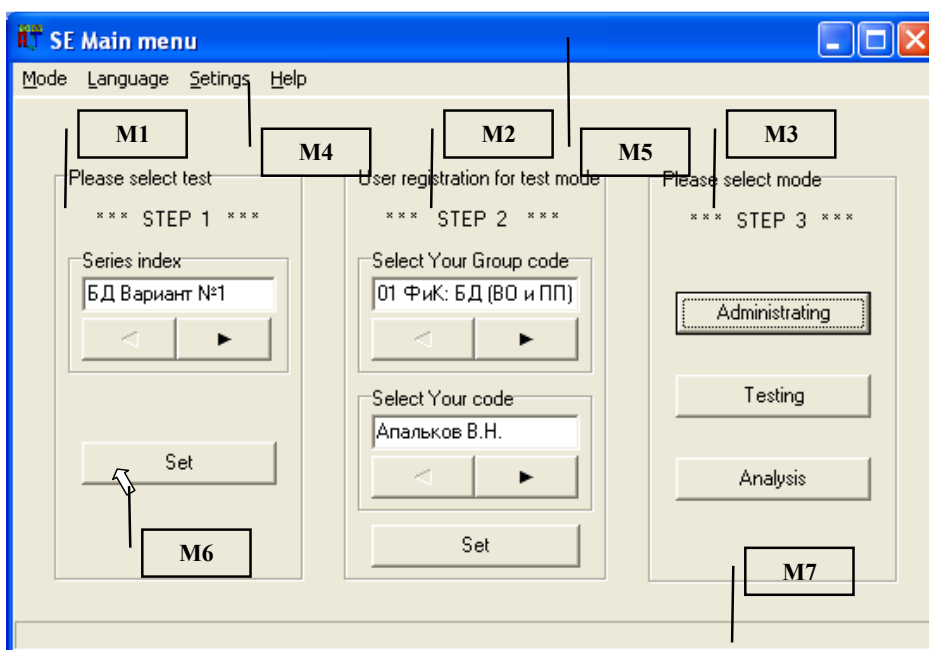
The database (knowledge base) of the program realization contains in its basis the structured method of diagnostics of the level of residual knowledge of the trainee (test).

In the pictures of the forms of interface of the program, accompanying the description of product use the different alphabetic-numeric identifiers of the certain structure ([letter][digit].[digit]), which allow to define to the user directly:

- the first part of identifier (letter) – the belonging of the form of interface to the certain mode of functioning of the program at its description: the main button form (“M”), the form in the mode of administrating of KB and DB (“A”) and the form of interface of the program in the mode of diagnostics of the examinee (“T”);
- the second part of identifier (digit) – the number of the group of elements of the interface, located on the form in the certain mode of functioning of the product;
- the third part (digit) – the number of element of the interface of program in the composition of group.

A10.1. The main button form of the application

On the main button form of the basic DM presents many various groups of elements of the interface, performing the different functions (pic. A10.1).



Picture A10.1. The main button form of application and the groups of its elements

In pic. A10.1 the callouts with the alphabetic-numeric identifiers (“M1” – “M7”) are used, designating directly the various groups of elements of the interface of program. The considered groups of elements of the interface realizes the certain functions of the basic DM. The appointment of the elements of interface of the main button form is presented in tabl. A10.1.

Table A10.1

The appointment of the groups of elements of the interface of the main button form of application

The identifier of group	The name	The appointment
“M1”	The selector of knowledge base	Allows to select the series of the method of research (the variant of test in the discipline), the selection and connecting of knowledge database (database) is carried out
“M2”	The selector at the registration of user	Provides the registration of user, at the same time the user must specify their group of users and L.F.P.
“M3”	The selector of mode	Allows to select the mode of working of the program: the administrating, diagnostics and analysis
“M4”	The menu bar	It is intended for the selection (setting) of the mode of working, the localization of interface, the parameters and the output of reference information
“M5”	The title of window	Displays the icon and name of application, identifies the current mode of working, contains the control elements – the buttons of window: collapse, expand and close
“M6”	The cursor of manipulator	Identifies the position of manipulator type of mouse, touchpad, trackball and other
“M7”	The status line	Contains the additional information about the current condition of the program system (including the displaying of the appointment of elements)

The main button form of application operates in the step-by-step mode (each step on the main button form is accompanied by the flashing banners):

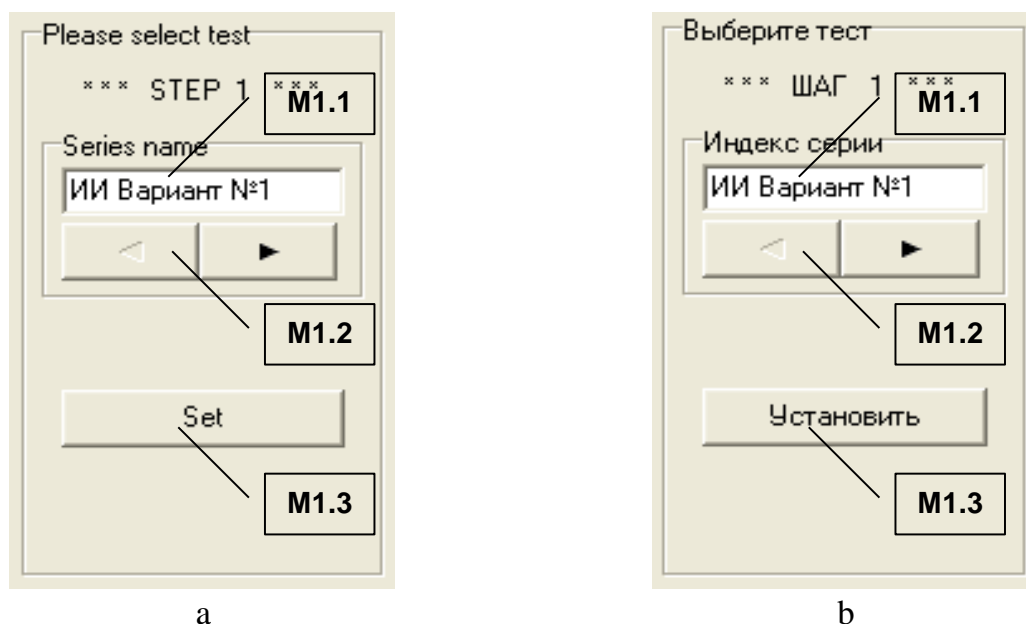
- at the first step (“M1”) – the final user carries out the selection of the series of the method of research in the form of testing (the variant of test);
- at the second step (“M2”) – the authentication of user is carried out (at the necessity the registration of new one in the program system is realized);
- at the third step (“M3”) – the mode of functioning of the product is selected.

By the method of computer modeling all steps are presented simultaneously, but factually each step is displayed to the final user one-by-one.

A10.1.1. The selection of subject area (knowledge base)

The basic DM provides the testing in the various subject areas (English language, banking, artificial intelligence, informatics and others). The list of subject areas is not limited, as there is the capability at the program level (without the additional modification of program code) to connect the additional database (knowledge base), and then to fill it by the knowledge (the structured data of the method of research) in the context of the other subject area.

The switching of series of the method of research (the variant of test) is provided by the group of elements of the interface, designated by the identifier “M1” in pic. A10.1. Let's consider the group “M1” at the level of elements of the interface of program (pic. A10.2).



Picture A10.2. The group of elements “M1”, providing the selection of series of the method of research (the variant of test in the context of the subject area)

In pic. A10.2 presents: a – the variant in the international English language; b – the version of identifiers of the elements of interface in the national Russian language, and tabl. A10.2 contains the explanations of appointments of the presented elements.

Table A10.2

The appointment of the elements of interface at the selection of series of the method of research (the variant of test in the context of subject area)

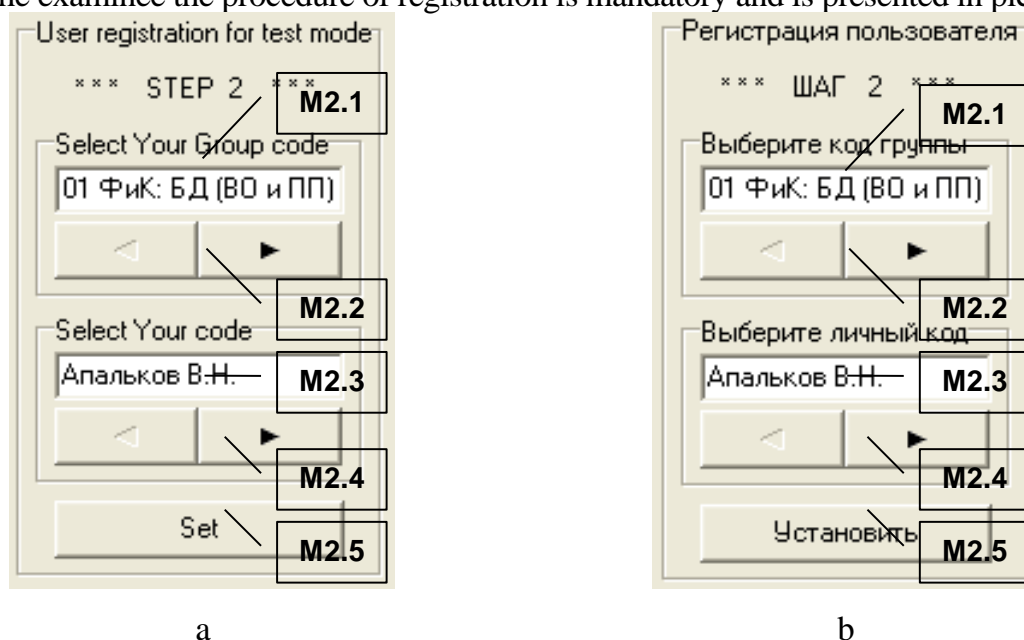
The identifier of element	The name	The appointment
“M1.1”	The field of indication	Displays the name of the selected series of the method of research (the variant of test on the discipline)
“M1.2”	The navigator	The pressing provides the switching of series, at the same time the name is displayed in the information field of indication
“M1.3”	The button	The knowledge base (database) is set (confirmed) by pressing and the transition to the next step of working is carried out

The selecting of knowledge base, containing the information of the method of research, is the mandatory procedure for each final user. After the pressing of the button “M1.3”, the transition to the second step is carried out – the authentication of final user in the information system.

A10.1.2. The procedure of authentication of the user

Directly after the confirmation of selection of the series of the method of research (the variant of test) by the user in the previous step (the pressing of the button “M1.3”), the user need go the procedure of authentication in the program system (if the final user was not previously registered, then the final user needs to go the procedure of registration). The procedure of registration of the final user consists in the fact, that the final user needs to specify the identifier of group and L.F.P. The procedure of registration is necessary for the collecting of individual statistics on the results of performance of the tasks by the user at the working in the mode of diagnostics.

For the examinee the procedure of registration is mandatory and is presented in pic. A10.3.



Picture A10.3. The group of elements “M2”, providing the registration of examinee
In pic. A10.3 it is presented directly the group of elements of the interface “M2”, the inscriptions (labels) in the two languages: the international English (a) and the national Russian (b).

For the registration in the system the user must specify the group and L.F.P., at the same time need be used the elements of interface, presented in tabl. A10.3.

Table A10.3

The appointment of the elements of interface of the program at the registration

The identifier of element	The name	The appointment
“M2.1”	The field of indication	Displays the identifier of the group of users from the existing list of identifiers
“M2.2”	The navigator	The pressing provides the selection of group, the name is displayed in the information field of indication “M2.1”
“M2.3”	The field of indication	Displays L.F.P. of user
“M2.4”	The navigator	The pressing provides the selection of L.F.P. of user, the displaying of L.F.P. of user is provided in the information field of indication “M2.3”
“M2.5”	The button	The pressing completes the procedure of authentication and the transition of user to the next step (the selection mode) is carried out

A10.1.3. The selection of the mode of working of the system

The program system has the capability of working in the several different modes:

- the administrating of knowledge base of the method of research and the database of users;
- the diagnostics of examinee;
- the analysis of data.

For each category of final users there is intended directly the defined mode of working in the process of operation of the diagnostic module.

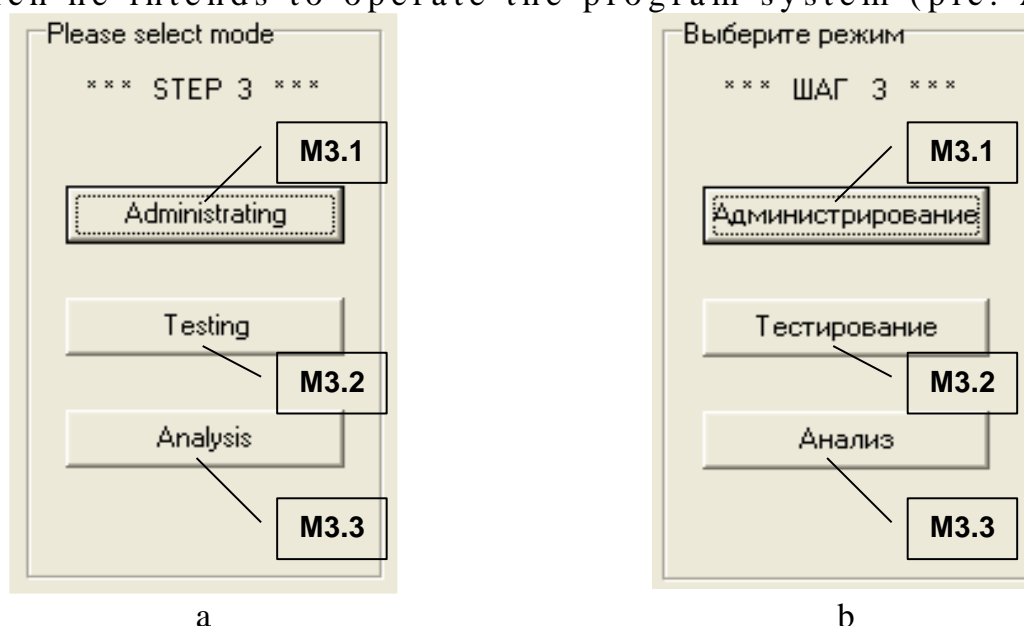
In dependence from the belonging of user to the certain category can determine directly the operational mode of working of the program toolkit (the program system) proceed from the tabl. A10.4.

Table A10.4

The categories of users and the modes of working of the program

The name of category of the user	The mode of working of the prototype
The expert	The administrating and analysis of data
The analyst	
The examinee	The diagnostics (testing)

The user must specify the mode (in dependence from his category in tabl. A10.4), in which he intends to operate the program system (pic. A10.4).



Picture A10.4. The selection of the mode of working of the prototype

The selection of the mode of working of the basic diagnostic module is carried out with the help of the group of elements “M3”, the appointment of which is presented in tabl. A10.5.

Table A10.5

The appointment of the elements of interface at the selection of the mode of working of the program

The identifier of element	The name	The appointment
“M3.1”	The button	The pressing provides the transition into the mode of administrating
“M3.2”	The button	The pressing puts the program into the mode of diagnostics
“M3.3”	The button	At the pressing the system transitions in the mode of analysis

A10.1.4. The modes of working of the diagnostic module

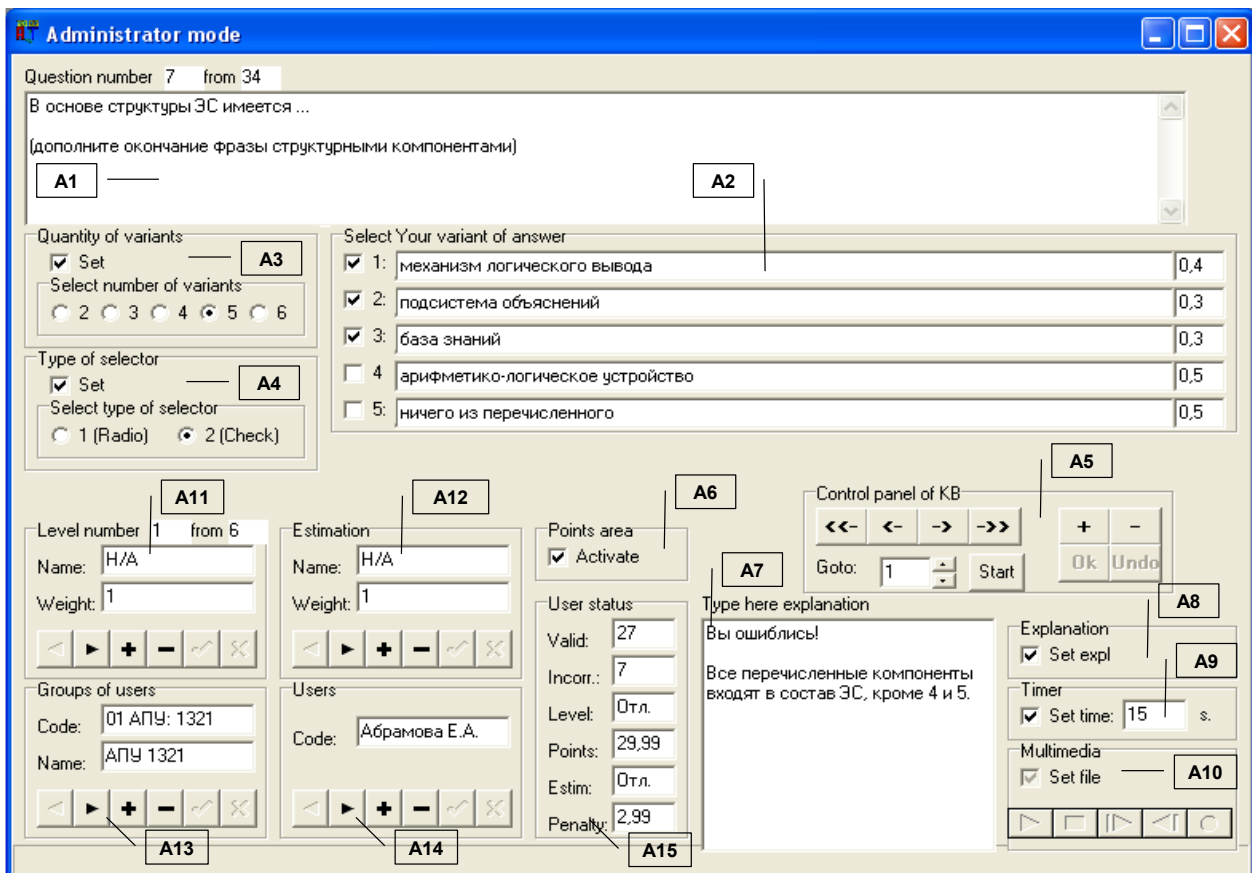
In the process the operation of the program toolkit the different tasks are solved, which are solved in the various modes of functioning of the program system. Each mode has the certain features in the process of functioning of the program.

The forms of interface in the various modes have the significant differences and each mode is intended for the certain category of users (see tabl. A10.4).

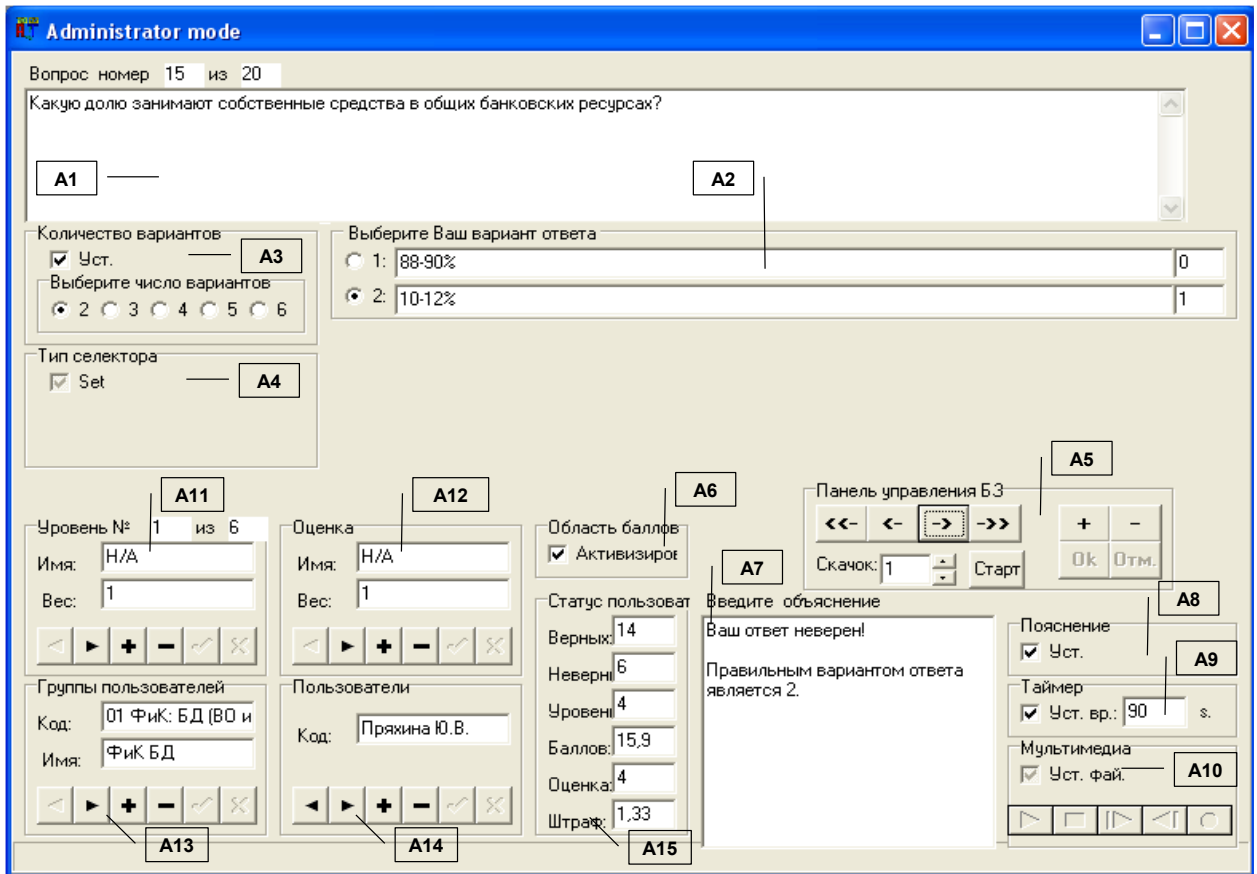
A10.1.4.1. The mode of administrating

The form of interface in the mode of administrating is saturated by the various elements, which provide the setting of product for the working in the mode of diagnostics.

In pic. A10.5 displayed the interface of prototype in the mode of administrating, and in the quality of the subject area (the problem sphere) is selected: a – “Artificial intelligence” and b – “Banking”.



a



b

Picture A10.5. The mode of administrating

In the context of the accepted sequence of statement tabl. A10.6 reflects the appointment of the main groups of elements “A1” – “A15” in the mode of administrating.

Table A10.6

The appointment of the groups of elements of the application in the mode of administrating

The identifier of element	The name	The appointment
“A1”	The indicator of question	Provides the recording and displaying the textual content of question, and also the number of question step-by-step and the total quantity of questions
“A2”	The indicator of answer	Provides recording and displaying textual content for the set quantity of the variants of answer, the selecting of the correct variant(s) (in dependence from the type of selector), and also the setting of weight coefficients to the correct variants of answer
“A3”	The field of selector of the quantity of the variants of answers	Allows to set the quantity of the variants of answer from 2 to 6 or to use 4 variants by default

“A4”	The area of selector of the type of switch	Required for the selecting of the type of switch of the variants of answer to the question: 1 – only one correct variant of answer is possible; 2 – if the correct answer includes more than one variant of answer
“A5”	The area of the control panel of KB	Provides the switching of questions, the adding or deleting of question, the saving or discarding of changes
“A6”	The area of selector of the status of estimation	Allows to activate the algorithm of estimation and to display the field for the inputting of weight coefficients (the accounting of point)
“A7”	The indicator of explanation	Allows to record and displays the text of explanation for the mode of diagnostics
“A8”	The area of selector of the status of explanation	Provides the setting of displaying of the text of explanation in the mode of testing, if the user gave the incorrect answer
“A9”	The area of timer	Intended for the setting of status and the interval of time of the restriction, in the course of which the examinee must give the answer to the current question in the mode of diagnostics
“A10”	The area of multimedia	Allows to connect the playback of audio file to the current question for the playback in the mode of diagnostics
“A11”	The area of the scale of level	Provides the displaying and modifying of names and weight coefficients for the levels of knowledge (the rough scale)
“A12”	The area of the scale of estimation	Required for the displaying and modifying of names and weight coefficients for the estimations (the exact scale)
“A13”	The indicator of group	Allows to modify the index and name of the group of users
“A14”	The indicator of user	Required for the displaying and modifying of the list of users
“A15”	The indicator of the status of user	Intended for the displaying of the parameters of user (the quantity of correct and incorrect answers, the level of knowledge, the quantity of points and estimation)

Let's consider closer the groups of elements of the interface, presented in pic. A10.5.

In pic. A10.6 the letters a – m designate the elements in the composition of the following groups: the indicator of question (“A1”), the indicator of answer (“A2”), the area of the selector of quantity of the variants of answer (“A3”), the area of the selector of the type of switch (“A4”), the area of the navigator of knowledge base (“A5”), the area of the selector of the status of estimation (“A6”), the indicator of explanation (“A7”), the area of the status of explanation (“A8”), the area of timer (“A9”), the area of multimedia (“A10”), the area of the scale of level (“A11”), the indicator of the scale of estimation (“A12”), the indicator of group (“A13”), the indicator of user (“A14”) and the indicator of the status of user (“A15”).

Вопрос номер 2 из 34

Поверхностными или глубинными могут быть ...
(выберите из перечисленного)

A1.1 A1.2 A1.3

a

Выберите Ваш вариант ответа

<input type="checkbox"/>	1: данные	A2.1	A2.2	A2.3	0,3
<input checked="" type="checkbox"/>	2: знания				0,5
<input checked="" type="checkbox"/>	3: закономерности ПО				0,5
<input type="checkbox"/>	4: структуры баз данных				0,3
<input type="checkbox"/>	5: базы данных				0,4

b

Количество вариантов

Уст. A3.1 A3.2

Выберите число вариантов

2 3 4 5 6

c

Тип селектора

Set A4.1 A4.2

Выберите тип селектора

1 (Radio) 2 (Check)

d

Панель управления БЗ

←← ← → →→ + -

Скачок: 1 ÷ × Старт Ок Отм.

A5.1 A5.2 A5.3

e

A6.1

Область баллов

Активизирове

f

Введите объяснение

Ваш ответ неверен (или, возможно, не полностью верен)!

Классификации по критерию глубинность-поверхностность поддаются только знания. Знания и закономерности ПО - это синонимичные понятия. Правильными вариантами являются 2 и 3.

A7.1

g

Пояснение

Уст. A8.1

Таймер A9.1

Уст. вр.: 25 s. A9.2

Мультимедиа A10.1

Уст. фай A10.2

▶ ◻ ▶▶ ◀◀ ↶

A10.3

h

Уровень № 1 из 6

Имя: H/A A11.1

Вес: 1 A11.2

◀ ▶ + - ✓ ✕ A11.3

i

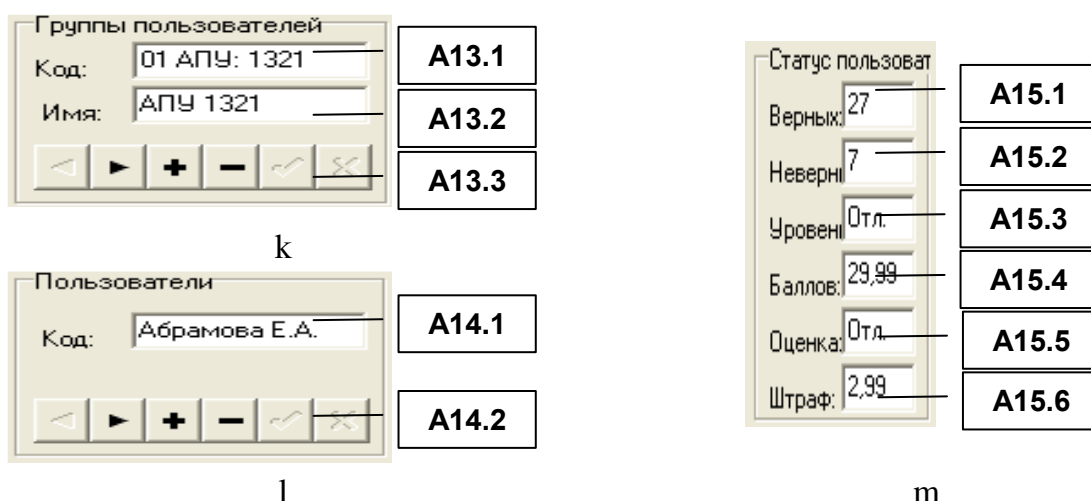
Оценка

Имя: H/A A12.1

Вес: 1 A12.2

◀ ▶ + - ✓ ✕ A12.3

j



Picture A10.6. The elements of interface of the groups “A1” – “A15”

Tabl. A 10.7 – A 10.20 reflect the name and appointment of the corresponding elements of interface in the composition of the groups “A1” – “A15”.

The mode of administrating of the program provides the automatic updating of the values in the elements of interface of the program “A1.1”, “A1.2” and “A1.3” at the modifying (the changing of values, the adding and deleting of record) (tabl. A10.7).

Table A10.7

The appointment of the elements of interface of the area of question (“A1”)

The identifier of element	The name	The appointment
“A1.1”	The field of indication	Intended for the inputting and displaying of the textual content of task (question)
“A1.2”	The field of indication	Provides the displaying of the number of current task
“A1.3”	The field of indication	Displays the total quantity of tasks in the subject area

It should be noted, that in tabl. A10.8: the element of interface “A2.1”, designates the correct variant of answer, the quantity of displayed elements “A2.2” depends from the selected quantity of the variants of answer (the group of elements of the interface “A3”), the quantity of the fields of indication “A2.3” also depends from the parameters of the group of elements “A3”.

Table A10.8

The appointment of the elements of interface of the area of answer (“A2”)

The identifier of element	The name	The appointment
“A2.1”	The selector	Intended for the designation of the correct variant of answer
“A2.2”	The field of indication	Provides the inputting and displaying of the textual content for the variants of answer to the question
“A2.3”	The field of indication	Provides the inputting and displaying of weight coefficients

In the context of certain task, the question provides the certain quantity of the variants of answer. By default 4, if there is a need to change this quantity, then needs to use the elements of interface, presented in tabl. A10.9.

Table A10.9

The appointment of the elements of interface of the selector of quantity of the variants of answer (“A3”)

The identifier of element	The name	The appointment
“A3.1”	The selector	Intended for the activation of the selection of quantity of the variants of answer to the question
“A3.2”	The selector	Provides the selection of quantity of the variants of answer to the task

The correct variants of answer are selected by the switch. The total quantity of the variants of answer (n) and the quantity of correct variants (m) may vary from 2 to 6 (tabl. A10.9). With the help of the elements of interface of the group “A4” (tabl. A10.10) possible the selection: 1 – the radio-switch (“1 from n”), applied for the clearly specifying of the only correct variant of answer among the n listed; 2 – the check-switch (“m from n”), allows the selection of the several variants of answer (m correct variants of answer among the n listed).

Table A10.10

The appointment of the elements of interface of the type of switch of the variants of answer (“A4”)

The identifier of element	The name	The appointment
“A4.1”	The selector	Intended for the activation of selection of the type of switch of the variants of answer to the question
“A4.2”	The selector	Provides the selection of the type of switch

The control panel of knowledge base (the group of elements of the interface “A5”) provides the navigation by the sample of questions (tabl. A10.11).

Table A10.11

The appointment of the elements of interface of the control panel of knowledge base (“A5”)

The identifier of element	The name	The appointment
“A5.1”	The button	Intended respectively for the displaying of the first, previous, next and last question
“A5.2”	The button	Intended for the transition to the question with in advance set number
“A5.3”	The button	Intended accordingly for the adding and deleting of question, the saving and undoing of changes in the parameters of question

The answer of examinee (final user) in the mode of diagnostics is counted as the correct only in that case if all variants of answer match, in advance set by the user-expert in the mode of administrating.

For example, if the correct answer includes the three variants of answer from the five listed, and the examinee (the final user) specified only two correct variants, then the program system counts directly the answer to the question as incorrect.

The algorithm of the program system provides directly the setting of weight coefficients on each variant of answer of the certain examinee, which are inputted by means of the element of interface “A2.3” (the appointment in tabl. A10.1), then the summary estimation of knowledge (the point method of counting) is calculated on their basis.

For the activation of the algorithm of accounting of the weight coefficients to the final user needs to use the elements of interface, presented in tabl. A10.12.

Table A10.12

The appointment of the elements of interface of the indicator of status of the estimation of knowledge (“A6”)

The identifier of element	The name	The appointment
“A6.1”	The selector	Activates the algorithm of estimation of knowledge based on the weight coefficients

In tabl. A10.13 the element of interface “A7.1” is connected with the group of elements of the interface “A8”: if the element of interface “A8.1” has the status “set” in the mode of administrating, and at the time of diagnostics the examinee (the final user) gives the incorrect answer, then the explanation is displayed (the information field of indication “A7.1”).

Table A10.13

The appointment of the elements of interface of the indicator of explanation (“A7”)

The identifier of element	The name	The appointment
“A7.1”	The field of indication	Serves for the inputting and displaying of the text of explanation

The status of explanation (tabl. A10.14) is connected with the field of indication of the text of explanation (“A7.1”).

Table A10.14

The appointment of the elements of interface of the indicator of the status of explanation (“A8”)

The identifier of element	The name	The appointment
“A8.1”	The selector	Intended for the switching on of displaying of the explanation in the mode of diagnostics (displayed, if the user gave the incorrect answer)

The timer (“A9”) presented directly in tabl. A10.15 refers to the additional functional capabilities of program system and allows to set the temporary limit only in the case of necessity.

Table A10.15

The appointment of the elements of interface of the indicator of timer (“A9”)

The identifier of element	The name	The appointment
“A9.1”	The selector	Intended for the turning on of limitation of time to the answer (the limitation is acting in the mode of diagnostics)
“A9.2”	The field of indication	Provides the inputting and displaying of the interval of time (in seconds), and the interval limits the time of examinee on the choosing of the correct variant of answer in the mode of diagnostics

In the mode of diagnostics provides the parallel playback of audio-recording (comment) for the increasing in the efficiency of perception of the information by the examinee, the group of elements of the interface “multimedia” “A10” (tabl. A10.16) is intended for this.

Table A10.16

The appointment of the elements of interface of the indicator of multimedia (“A10”)

The identifier of element	The name	The appointment
“A10.1”	The selector	Intended for the activation of sound accompanying of the current task (the playback is performed in the mode of diagnostics automatically)
“A10.2”	The field of indication	Provides the inputting and displaying of the name of file, containing the sound accompanying of the current question (task)
“A10.3”	The control component of multimedia	Provides the functions of control of the multimedia - player (playback, stop, scroll, and record)

In the process of diagnostics the analysis of the quantity of correct answers is carried out for the taking into account of the level of knowledge of the examinee (the rough analysis).

The scale contains the names of the levels, which to be assigned to the examinee, and the sum of correct answers for the entire period of diagnostics.

The appointment of the elements of interface is presented in tabl. A10.17.

Table A10.17

The appointment of the elements of interface of the indicator of the level of knowledge (“A11”)

The identifier of element	The name	The appointment
“A11.1”	The field of indication	Provides the inputting and displaying of the names of the levels of knowledge, assigned to the user in dependence from the quantity of correct answers
“A11.2”	The field of indication	Allows to specify the value of the sum of the correct answers, at which the user will be assigned the level of knowledge, specified in the name
“A11.3”	The element of control	Allows to carry out the navigation in the limits of the scale of the level of knowledge, and also to add and remove the names and the values of the sums of correct answers

Provides the displaying of the number of current level and also the total number of levels in the scale.

It is possible the modification of the scale of the level of knowledge by means of the element of control “A11.3”.

The system provides the point method of estimation of knowledge.

After the accounting of weights is activated with the help of the group “A6” (tabl. A10.12) and the values of weights for each variant of answer (tabl. A10.8) are specified, it is necessary directly to set the parameters of the scales of estimation, in which will the carrying out of determination of the point estimation and the level of knowledge.

The scale of point estimation of knowledge (the exact analysis) contains the names of estimations, which will be assigned to the examinee and the corresponding sums of weights (the summary value of weight coefficients). The appointment of the elements of interface is presented in tabl. A10.18.

Table A10.18

The appointment of the elements of interface of the indicator of estimation of knowledge (“A12”)

The identifier of element	The name	The appointment
“A12.1”	The field of indication	Provides the inputting and displaying of the names of estimation, calculated based on the weight coefficients
“A12.2”	The field of indication	Allows to set the value of the sum of weight coefficients, at which the examinee is assigned the estimation of knowledge, the specified in the name
“A12.3”	The element of control	Allows to carry out the navigation within the limits of the scale of point estimation, and also to add and remove the names and the values of the sums of weight coefficients

Moreover, the group of elements “A12” (tabl. A10.18) provides the displaying of the number of current estimation step-by-step and the total number of names of estimations in the scale. It is possible the modification (the adding, deleting and modifying) of the scale of estimation with the help the control component (“A12.3”).

The conception of development provides the documenting of status of the diagnostics of user. For this the special database was developed and the procedure of registration was introduced. At the given stage its structure is simplified and provides the most necessary actions over data.

For the providing of the procedure of registration in the mode of administrating need directly to specify the groups of users and their L.F.P.

The specifying of the nominal values of parameters of the group of users is carried out with the help of the elements, presented in tabl. A10.19.

Table A10.19

The appointment of the elements of interface of the indicator of the group of user (“A13”)

The identifier of element	The name	The appointment
“A13.1”	The field of indication	Provides the inputting and displaying of the codifiers of the groups of users
“A13.2”	The field of indication	Provides the inputting and displaying of the names of the group of users
“A13.3”	The element of control	Allows to carry out the navigation and modification of data in the limits of the groups of users

Within the limits of the group of elements of the interface (“A14”) there is the potential capability of inputting of the list of users with the specifying of their L.F.P. (see tabl. A10.20).

Table A10.20

The appointment of the elements of interface of the indicator of users (“A14”)

The identifier of element	The name	The appointment
“A14.1”	The field of indication	Provides the inputting and displaying of L . F . P . of user
“A14.2”	The element of control	Allows to carry out the navigation and modification of parameters within the limits of the existing list of users

Each user is characterized by the status, in which includes: the quantity of correct and incorrect answers, the level and estimation of knowledge, the quantity of scored points and penalty points. The description of the structure of the status of examinee (the subject of training) is provided in tabl. A10.21.

Table A10.21

The appointment of the elements of interface of the indicator of the status of user (“A15”)

The identifier of element	The name	The appointment
“A15.1”	The field of indication	Displays the displaying of quantity of correct answers of the examinee by the results of diagnostics
“A15.2”	The field of indication	Displays the quantity of incorrect answers
“A15.3”	The field of indication	Displays the level of knowledge of the examinee
“A15.4”	The field of indication	Provides the displaying of the sum of scored points
“A15.5”	The field of indication	Displays the estimation of examinee
“A15.6”	The field of indication	Provides the displaying of the sum of penalty points

In the mode of administrating all information fields of indication have the potential possibility of editing (the modification of nominal values). In the process of the procedure of diagnostics in the form of testing at the examinee does not have the potential capability to make changes into the information fields.

A10.1.4.2. The mode of diagnostics

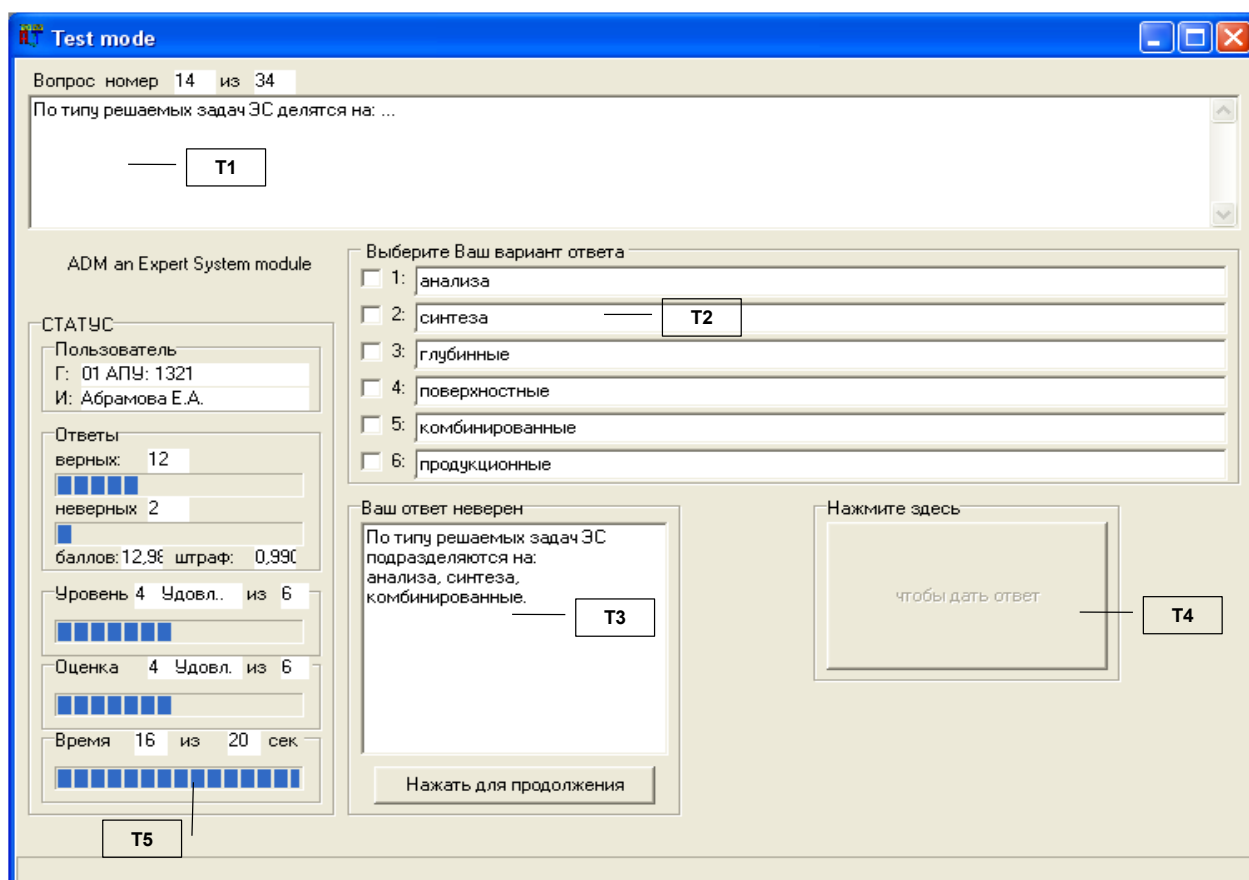
Served for the carrying out of diagnostics of the level of residual knowledge of the examinee.

In the mode of administrating it is necessary to set the parameters of the methods of research in the subject areas, located in the databases and knowledge bases, in which the diagnostics will be carried out in the form of testing. The entering of the final user into the mode of diagnostics is carried out from the main window of application, displayed in pic. A10.1.

The procedure of registration of the examinee is also mandatory (pic. A10.3).

For the transition in the mode of diagnostics in the form of testing needs to use the group of elements of the interface in pic. A10.4.

After the transition of final user (examinee) in the mode of diagnostics its characteristic window of the interface of program is displayed (pic. A10.7).



Picture A10.7. The interface of user in the mode of diagnostics

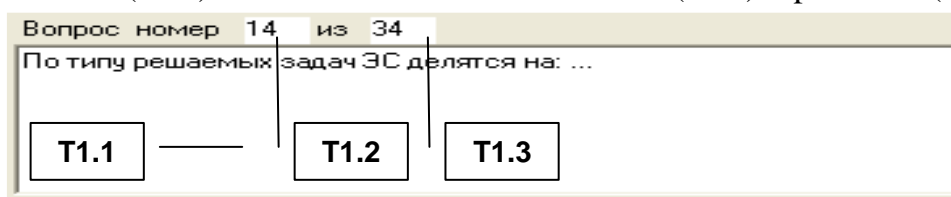
Let's consider the main groups of elements of the interface (“T1” – “T5”) and their functional appointment in the mode of diagnostics (tabl. A10.22).

Table A10.22

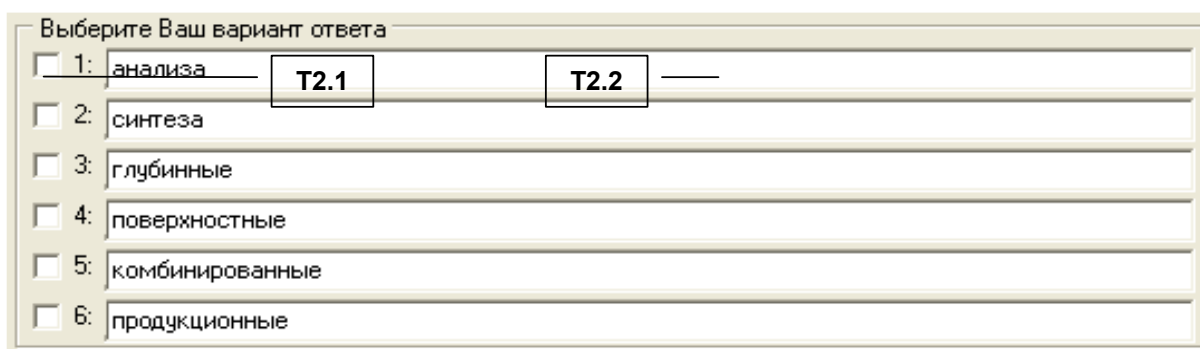
The appointment of the groups of elements of the interface in the mode of diagnostics

The identifier of element	The name	The appointment
“T1”	The indicator of question	Provides the displaying of the text of question, and also the number of question by order and the total quantity of questions
“T2”	The indicator of answer	Provides the displaying of text for the set quantity of the variants of answer, the selection of the correct variant(s) of answer (in dependence from the type of selector of the variants of answer)
“T3”	The indicator of explanation	Displays the text of explanation
“T4”	The button	Confirms the answer of user
“T5”	The indicator of the status of user	Continuously displays the identifier of the group, L.F.P. of examinee, the quantity of correct and incorrect answers, the sum of points, the level of knowledge, the estimation and the remaining time to the answer

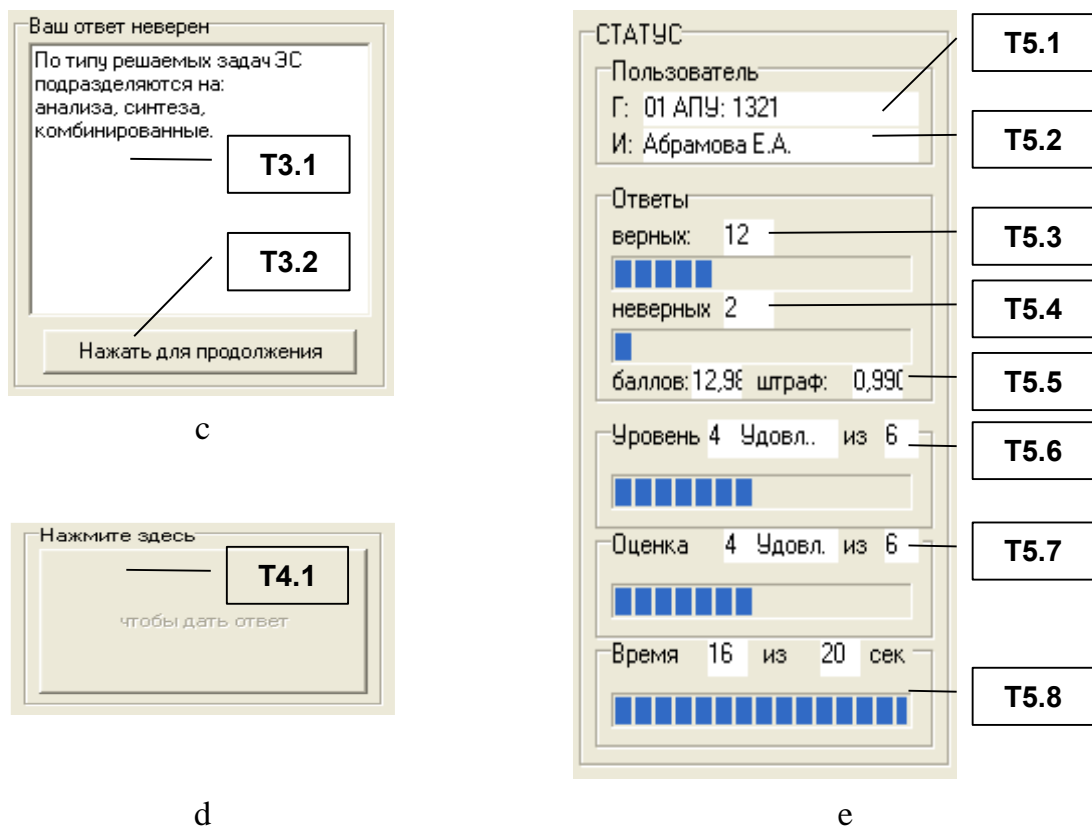
We will consider each group of elements of the interface separately: the indicator of question (“T1”), the indicator of answer (“T2”), the indicator of explanation (“T3”), the registrar of answer (“T4”) and the indicator of the status of user (“T5”) in pic. A10.8 (the letters a-e).



a



b



Picture A10.8. The elements of interface of the groups “T1” – “T5”

The indicator of question is intended for the displaying of the textual content and the parameters of question in the composition of task of the method of research (test). The appointment and composition of elements of the indicator of question (“T1”) are presented in tabl. A10.23.

Table A10.23

The appointment of the elements of interface of the indicator of question (“T1”)

The identifier of element	The name	The appointment
“T1.1”	The field of indication	Displays the text of task (question)
“T1.2”	The field of indication	Displays the number of the current task by order
“T1.3”	The field of indication	Displays the total quantity of tasks in the test

The indicator of question (“T2”) is served for the displaying of the textual content of the variants of answer and the capability of specifying of the correct variants of the examinee (tabl. A10.24).

Table A10.24

The appointment of the elements of interface of the indicator of answer (“T2”)

The identifier of element	The name	The appointment
“T2.1”	The selector	Provides to the examinee the capability of choosing of the variant(s) of answer
“T2.2”	The field of indication	Displays to the examinee the text of the variant(s) of answer to the current question

If the examinee gave the incorrect answer to the question of the method of research (test) and in the mode of administrating provides the displaying of explanation, then during the diagnostics the indicator of explanation (“T3”) will display the text of explanation (tabl. A10.25).

Table A10.25

The appointment of the elements of interface of the indicator of explanation (“T3”)

The identifier of element	The name	The appointment
“T3.1”	The field of indication	Displays the explanation to the examinee, if the (selected by him) variant(s) of answer are incorrect and the status of explanation has been set in the mode of administrating
“T3.2”	The button	The pressing leads to the closing of explanation and the continuing of diagnostics

If the examinee specified all (in his opinion) correct variants of answer, then it is necessary to approve the answer by the pressing of the button (“T4.1”), more detailed in tabl. A10.26.

Table A10.26

The appointment of the elements of interface of the registrar of answer (“T4”)

The identifier of element	The name	The appointment
“T4.1”	The button	The pressing provides to the examinee the capability of approving of the selected variant(s) of answer (if the value of time of answer within the limits of the acceptable interval)

For the displaying of the parameters of diagnostics in the real scale of time serves the indicator of the status of answer (“T5”), its elements are presented in tabl. A10.27.

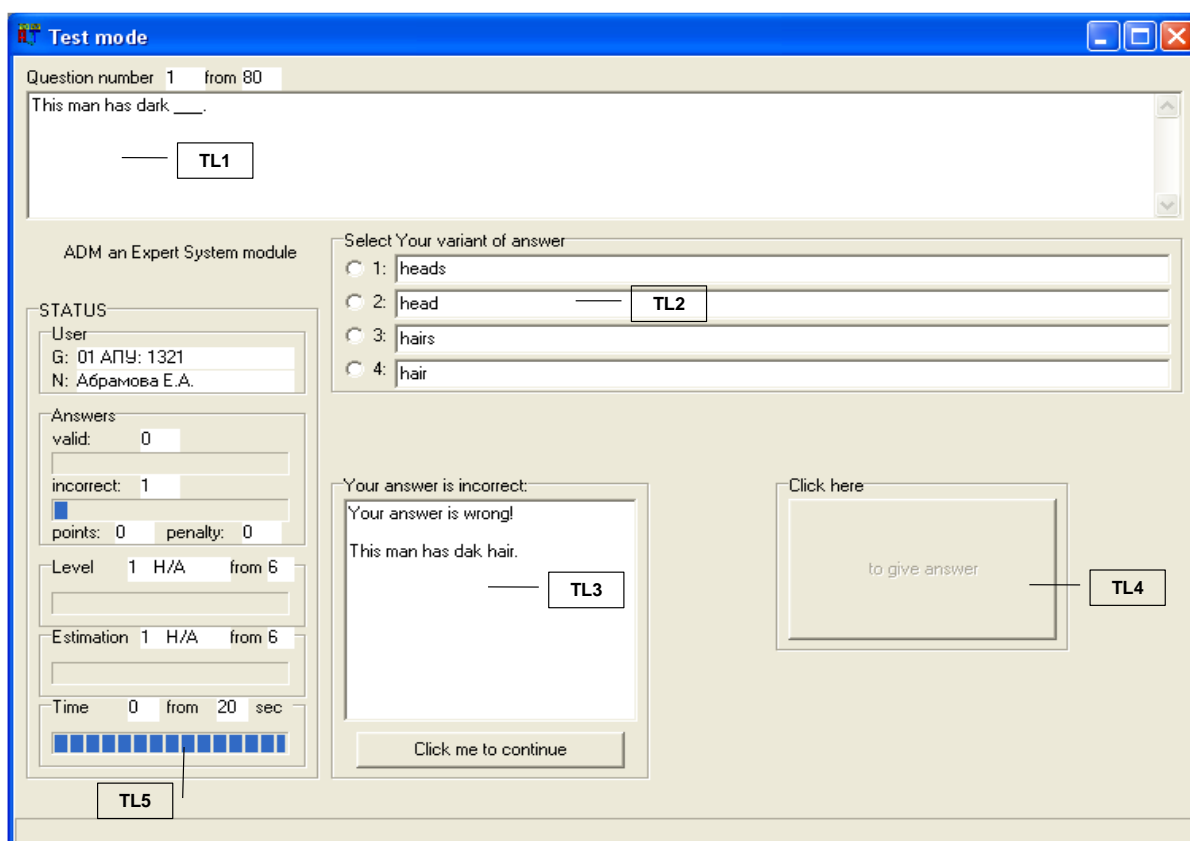
Table A10.27

The appointment of the elements of interface of the indicator of the status of examinee (“T5”)

The identifier of element	The name	The appointment
“T5.1”	The field of indication	Displays the codifier of the group of examinee
“T5.2”	The field of indication	Displays L.F.P. of examinee
“T5.3”	The field of indication	Provides the outputting of the quantity of correct answers
“T5.4”	The field of indication	Displays the quantity of incorrect answers
“T5.5”	The field of indication	Displays the sum of points
“T5.6”	The field of indication	Displays the number of the level of knowledge by order, the name of current level and their total quantity
“T5.7”	The field of indication	Displays the number of the estimation of knowledge by order, the name of current estimation and their total quantity
“T5.8”	The field of indication	Provides the outputting of remaining time to the answer (in seconds) and displays the value of time, initially given to the examinee on the development of answer

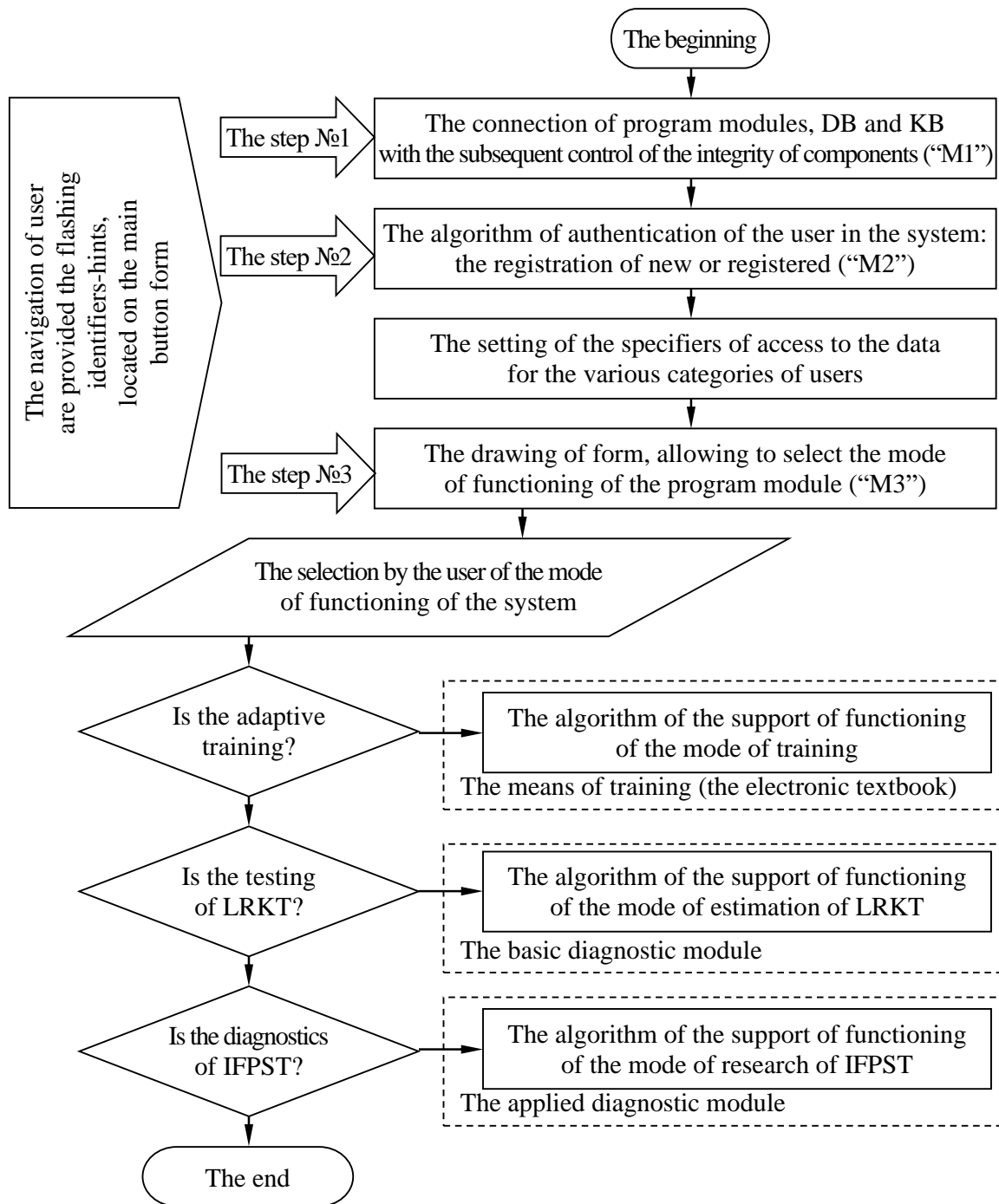
The mode of diagnostics in the form of testing is completed: automatically – if the examinee (the final user) gave the answers to all questions in the composition of task in the subject area, or manually – if the examinee wants to cease the diagnostics by means of closing of the window of interface of the program information system.

The program product can be used for the researching of the linguistic portrait of the cognitive model of the subject of training. In pic. A10.9 presents the form of interface of the application in the process of diagnostics of the parameters of the linguistic portrait of the cognitive model.

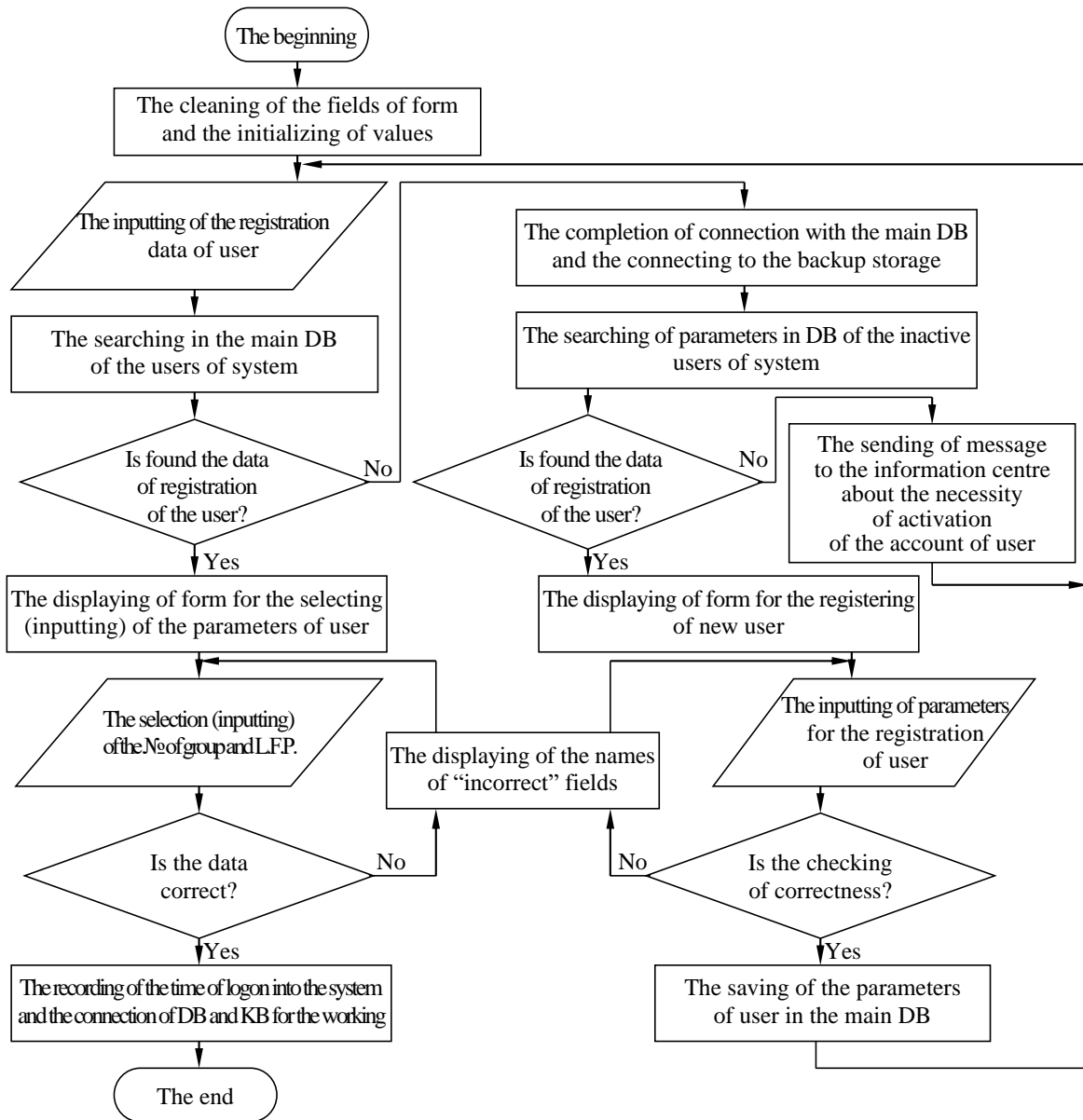


Picture A10.9. The form of interface in the mode of diagnostics of the level of proficiency in the language of statement of the material

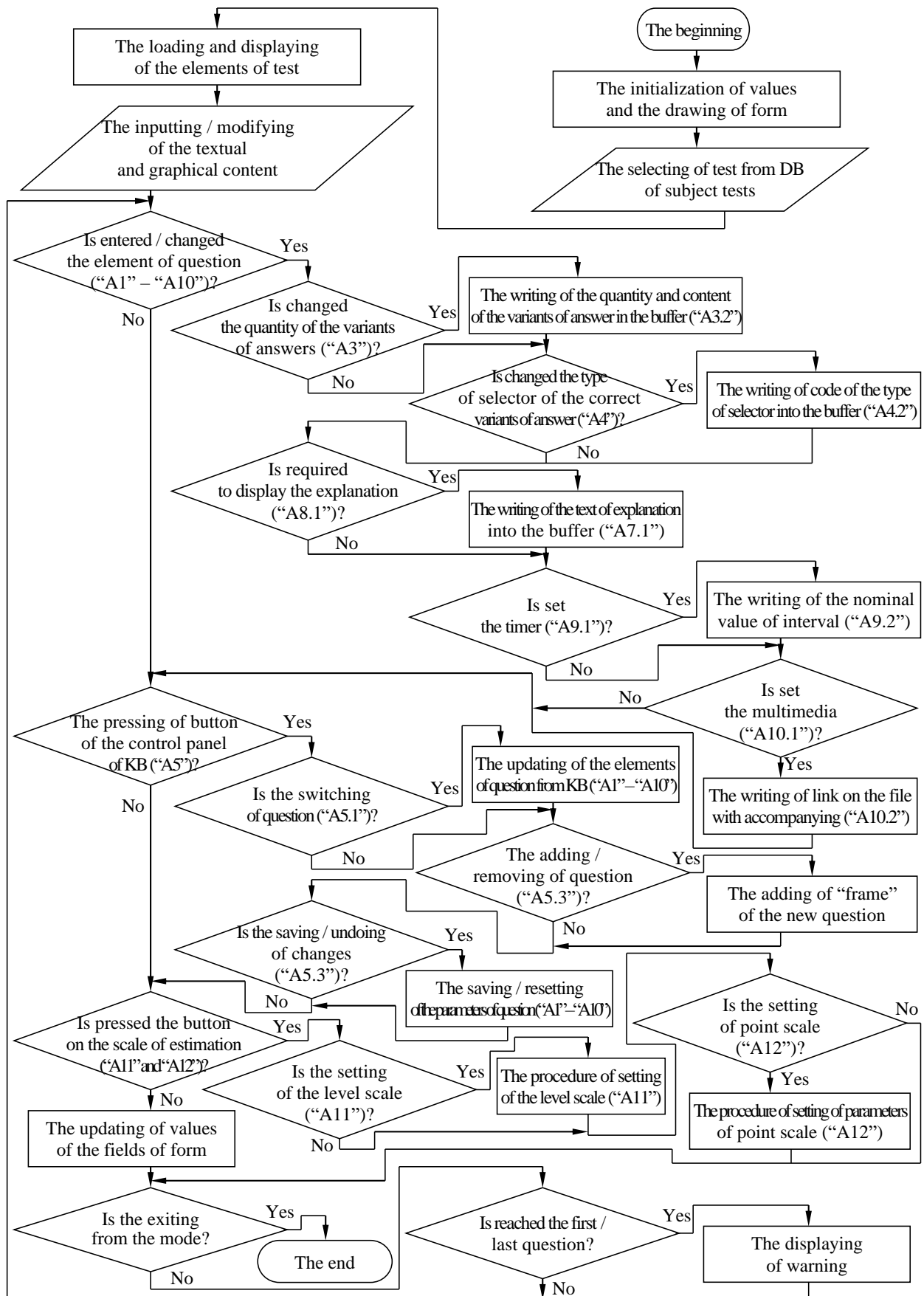
For the researching of the level of proficiency in the language of statement of the material it is necessary to input the specialized method of research (test) into the database, and then to conduct the control diagnostics in the form of testing of the examinee.



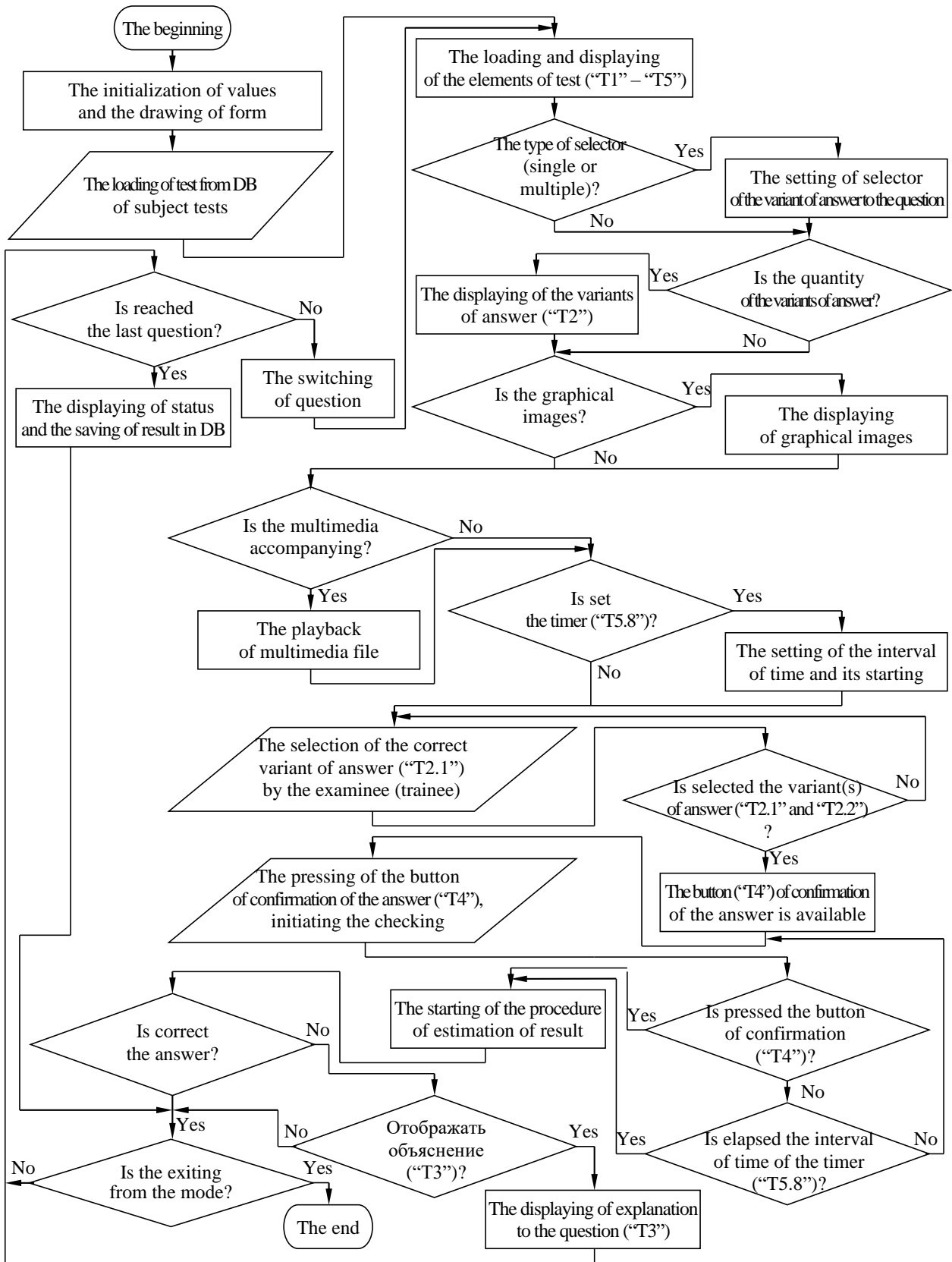
Picture A10.10. The algorithm of switching of the modes of functioning of the program complex



Picture A10.11. The algorithm of authentication of the user in the system



Picture A10.12. The algorithm of support of functioning of the mode of administrating of the questions of test (the basic diagnostic module)



Picture A10.13. The algorithm of support of functioning of the mode of estimation of the level of residual knowledge of the trainee (the basic diagnostic module)

Appendix 11 (mandatory).

The technical description of program toolkit for the automation of research of the vector of convergent intellectual abilities

The developed program is the component of the applied diagnostic module, is positioned as the expert system and operates in the context of the psychologically-oriented method of research, contained in the basis of the knowledge base and intended for the research of the vector of convergent intellectual abilities (the level properties of intellect) of the examinee.

The knowledge base allows to save the several modifications (adaptations) of the previously structured method of research (test). In the given case the author's method of research (test) of the German psychologist Amthauer R. in the adaptation of Galkina T.V. ("IP" of "RAS") was used, intended for the research of the convergent intellectual abilities of the subjects of training (the vector of parameters of the psychological portrait of the cognitive model), operating with the means of training in the information-educational environment.

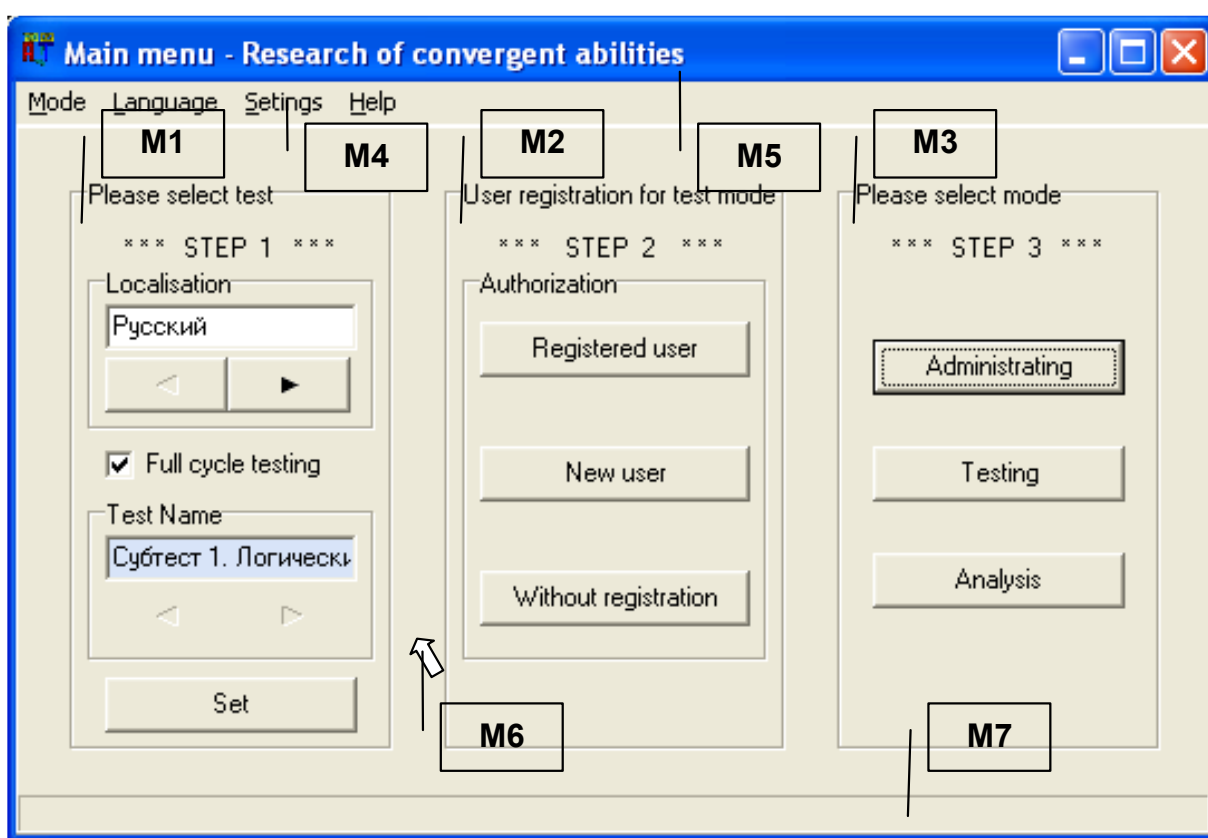
The method of research (test) includes the 9 blocks of questions (subtests): "The logical selection and the addition of sentences", "The searching of general signs and the exclusion of word", "The searching of verbal analogies", "The classification of concepts and the generalization", "The arithmetical tasks", "The numerical rows", "The attention and memory", "The selection of figures" and "The cubes", intended for the differential diagnostics of the level of development of a row of structural components of intellect of the examinee: the verbal intellect, the inductive speech thinking, the verbal combinatorial abilities, the ability to the reasoning, the analytical thinking, the inductive arithmetical thinking, the short-term and long-term memory, the planar imagination and the volumetric thinking.

In the pictures of the forms of interface, accompanying the description of product use the alphabetic-numeric identifiers of the certain structure ([letter][digit].[digit]), which mutually-unambiguously define the functions:

- the first part of the identifier (letter) – the belonging of the form of interface to this or that mode of functioning of the program realization (at the description of the main button form of the interface of program, the form in the mode of administrating of KB and DB and the form in the mode of diagnostics);
- the second part of the identifier (digit) – the number of the group of elements of the interface on the form of interface in the certain mode of functioning of the product;
- the third part of the identifier (digit) – the number of the element of interface in the composition of group.

A11.1. The main button form of the program

It is intended directly for the selecting of the localization of the method of research (test) and the block of questions (subtest), the registration of final user in the system, and also the choosing of the mode of working of the program (the program realization). In the form of interface of the program presents some set of various elements of interface, performing various functions of the program (pic. A11.1).



Picture A11.1. The main button form of application and the groups of its elements

In pic. A11.1 there are the callouts with numeric identifiers (“M1” – “M7”), which designate the various groups of elements of the interface of program, realizing the certain functions of the applied diagnostic module, their description and appointment are presented directly in tabl. A11.1.

The appointment of the groups of elements of the interface of the main form of application

The identifier of group	The name	The appointment
“M1”	The selector of localization and the block of questions (subtest)	Allows to the user to select the localization of the method of research (the variant of method in the national language), and also to carry out the choice of certain subtest
“M2”	The selector of the variant of authorization of the user	Provides to the user the selection of the variant of authorization of the user in the system (the registered, new, and without registration), at the same time to the user is required to specify their group and L.F.P. of user
“M3”	The selector of the mode of working	Allows to choose the mode of working of the program: administrating, diagnostics and analysis
“M4”	The menu bar	Is intended for the selection (setting) of the mode of working, the localization of interface, the parameters and the output of reference information
“M5”	The title of window	Displays the icon and name of application, identifies the current mode of working of the program, contains the control elements – the buttons of window: collapse, expand, restore and close
“M6”	The cursor of manipulator	Displays the current position of manipulator (mouse, touchpad, trackball, joystick and other)
“M7”	The status line	Provides the additional information about the current condition of program system (including displays directly the help about the appointment of elements)

The main button form of application operates in the step-by-step mode (each step is accompanied by the flashing banners):

- at the first step (“M1”) – the user carries out the selection of localization of the method of research (the variant of test) and the block of questions (subtest);
- at the second step (“M2”) – the authentication of user is carried out (at necessary the registration of user in the system is realized);
- at the third step (“M3”) – the mode of functioning of the product is selected.

In pic. A11.1 presents simultaneously all steps (for the purposes of illustration), but factually they are displayed to the user sequentially (step by step).

A11.1.1. The selection of the localization of the method of research (test)

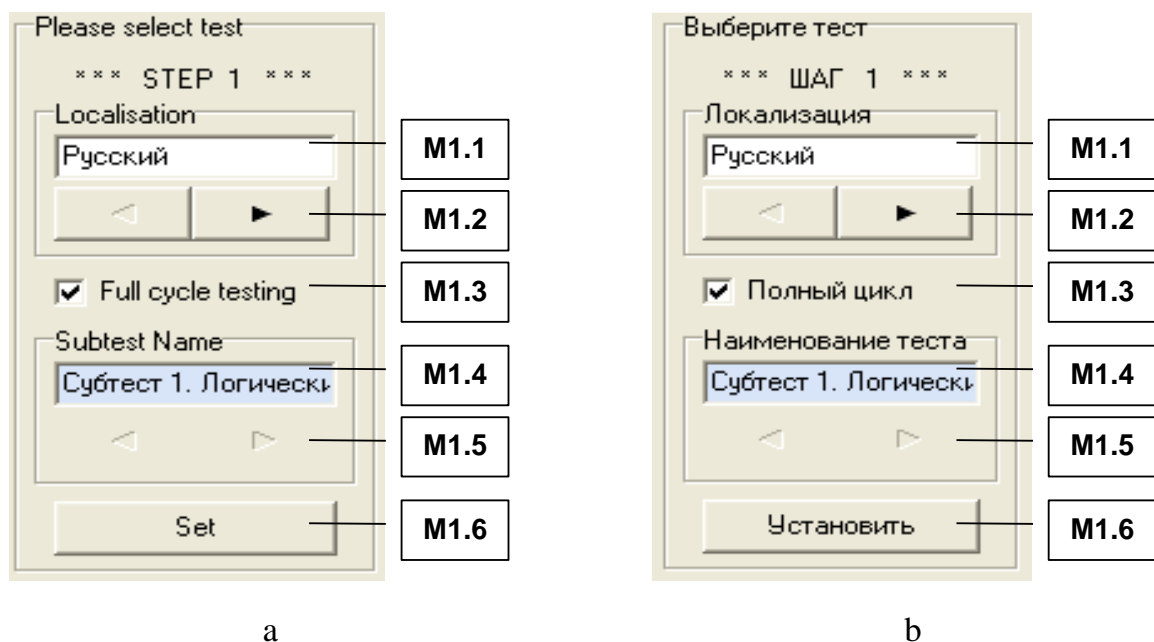
The diagnostic module allows to use the several localizations of the method of research (in the basis of knowledge base is realized the Russian localization of the method of Amthauer R., developed by Alekseeva L.G. and Galkina T.V., ““The institute of psychology” of “RAS””).

The switching of the localization of the method of research and the choosing of the variant of passing of the test (the full cycle by all subtests or only by the specific subtest) is provided by the group of elements, designated by the identifier “M1” in pic. A11.1.

For the carrying out of the procedure of testing by all blocks of questions (subtests) to the final user (examinee) needs to set the marker-checkbox in the selector “The full cycle of testing (Полный цикл тестирования)”.

If the need of testing arises by the separate block of questions (subtest), then required to reset the marker-check box in the selector “The full cycle of testing”, and then to select the name of the corresponding block of questions (subtest).

Let's consider the elements of interface of the program, included into the group “M1” (pic. A11.2).



Picture A11.2. The group of elements of the interface “M1”, providing the selection of the series of the method of research (the variant of test in the context of subject area)

In pic. A11.2 presents the names of elements of the interface of program in the two languages: a – the variant of identifiers in the English language; b – the variant in the Russian language, and in tabl. A11.2 the description of appointment of these elements of interface is presented.

**The appointment of the elements of interface at the selecting of the series of the method of research
(the variant of test in the context of subject area)**

The identifier of element	The name	The appointment
“M1.1”	The field of indication	Displays to the final user the name of the selected localization of the method of research (test)
“M1.2”	The navigator	The pressing provides to the user the switching of localization, at the same time the name is displayed in the information field of indication “M1.1”
“M1.3”	The selector	Allows the user to select the variant of carrying out of research: if the marker of selector is set, then the research is carried out by all subtests; if the marker of selector is reset, then the research is carried out only by the selected subtest
“M1.4”	The field of indication	Displays the name of the selected subtest (available only at the reset marker of selector “M1.3”)
“M1.5”	The navigator	The pressing provides the switching of subtest (available only at the reset marker of selector “M1.3”)
“M1.6”	The button	By the pressing is set (confirmed the selection) the knowledge base, containing the localization of the method of research and carries out the transition to the next step

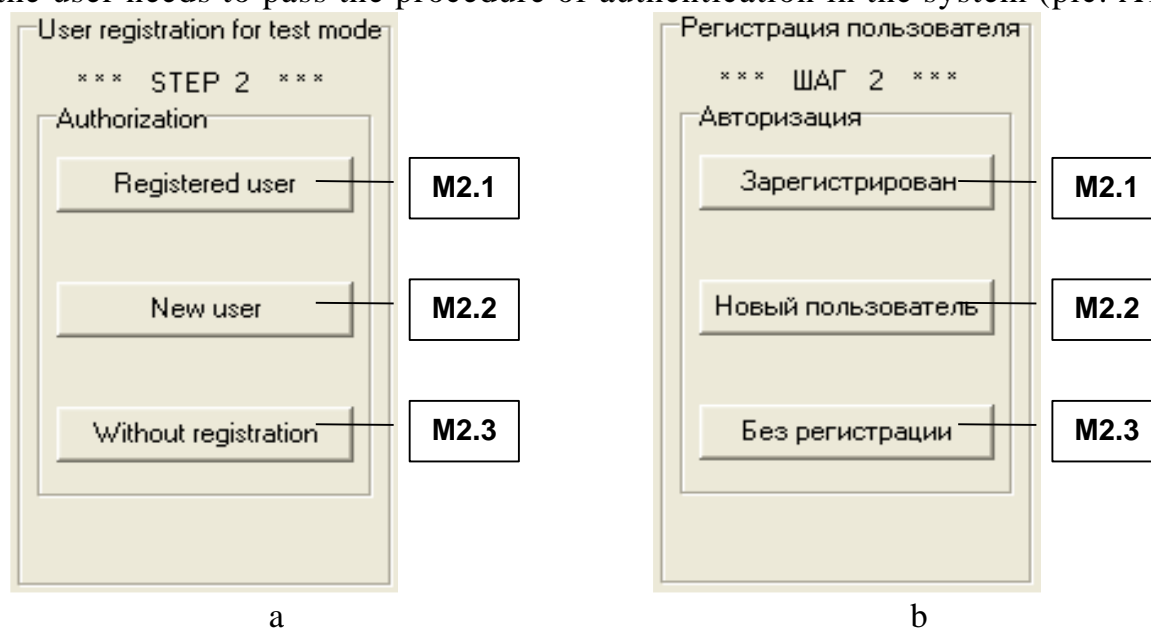
The nominal values of parameters, refer to the method of research, are contained in the database (knowledge base) of system and are subject to modification in the mode of administrating.

The selecting of the localization of the method of research is the mandatory procedure.

The pressing of the button “M1.6” provides the setting the parameters, selected by the user and initiates the transition to the second step – the authentication of final user.

A11.1.2. The procedure of authentication of the user

Directly after the confirmation of selection of the localization of the method of research at the previous step (the pressing of the button “M1.6”), to the user needs to pass the procedure of authentication in the system (pic. A11.3).



Picture A11.3. The group of elements of the interface, providing the choice of variant of the procedure of authentication of the user

The appointment of the elements of interface of the program (the program realization), providing the selection of the variant of the procedure of authentication is presented in tabl. A11.3.

Table A11.3

The appointment of the elements of interface at the selecting of variant of the procedure of authentication of the user

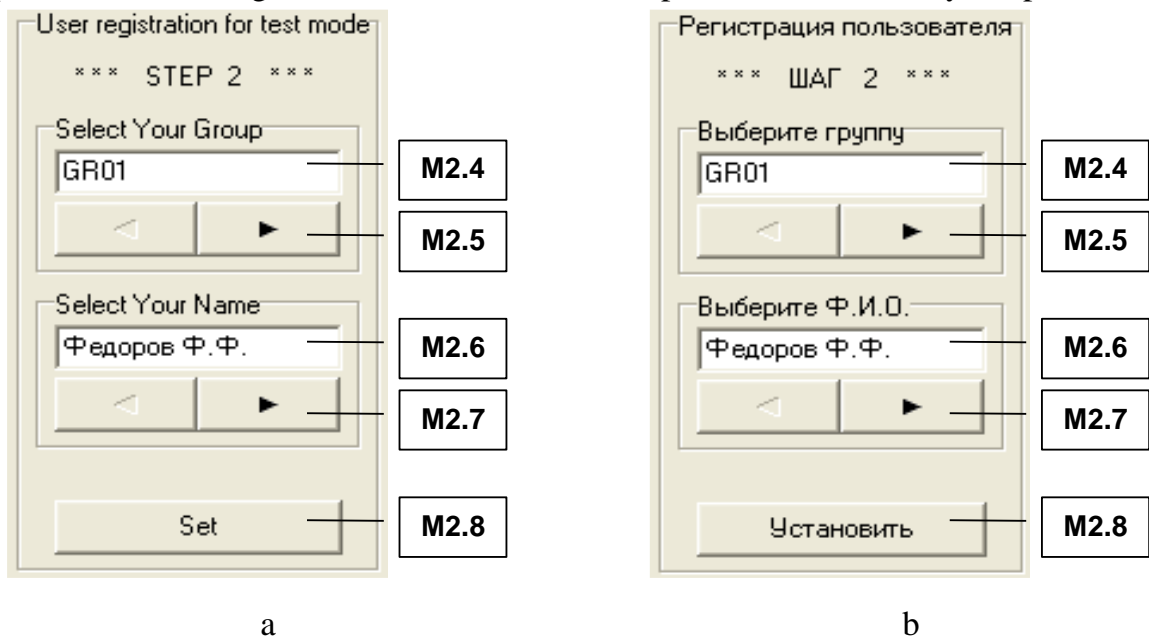
The identifier of element	The name	The appointment
“M2.1”	The button	The pressing initiates the starting of the windows of selection of the group and user (if he was earlier registered in the system)
“M2.2”	The button	The pressing initiates the starting of the procedures of registration of a new user
“M2.3”	The button	The pressing initiates the ignoring of the procedure of authentication (the documenting of results into the database is not performed)

The procedure of authentication of the user in the system has a row of features:

- if the final user is earlier registered in the system, then to the user needs to press directly the button “M2.1”;
- if the final user is not already registered in the system, then needs to start the procedure of registration, by pressing the button “M2.2”;
- if the computer program is running in the autonomous mode (there is not required to document the results of research into the database), then to the user needs to press directly the button “M2.3”.

The procedure of registration of the final user consists in the fact, that the user needs to specify the identifier of group and L.F.P. The procedure of registration is necessary for the collection of individual statistics by the results of performance of the tasks by the user at the working in the mode of diagnostics.

For the registered final user (the examinee) in the system, the procedure of registration of the user is presented directly in pic. A11.4.



Picture A11.4. The group of elements of the interface “M2”, providing the registration of examinee

In pic. A11.4 presents the group of elements of the interface “M2”, the inscriptions-identifiers in the two languages – English and Russian, respectively the letters a and b.

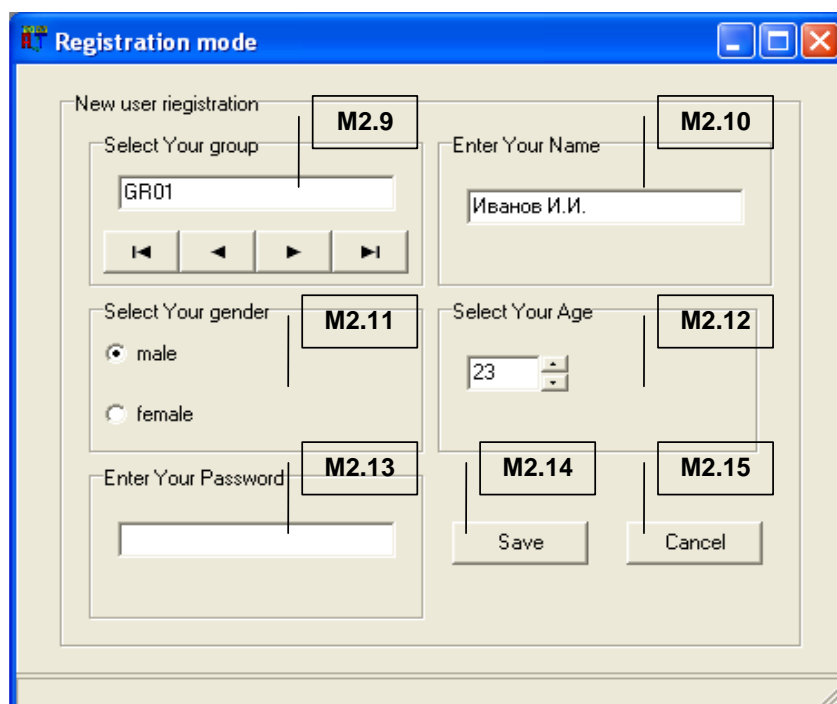
For the registration in the system the user must specify the group and L.F.P., at the same time it is necessary to use the elements of interface, presented in tabl. A11.4.

Table A11.4

The appointment of the elements of interface of the group “M2”, providing the repeated registration of user

The identifier of element	The name	The appointment
“M2.4”	The field of indication	The identifier of the group of users
“M2.5”	The navigator	The pressing provides the selection of group, the name is displayed in the field of indication “M2.1”
“M2.6”	The field of indication	Displays L.F.P. of user
“M2.7”	The navigator	The pressing provides the selection of L.F.P. of the user, the displaying is provided in the field of indication “M2.3”
“M2.8”	The button	The pressing completes the procedure of authentication and carries out the transition to the next step (the selection of mode)

For the examinee (the new user) nonregistered in the system the window of interface of the procedure of registration is presented in pic. A11.5.



Picture A11.5. The procedure of registration of a new user

In tabl. A11.5 presents the appointment of the elements of interface, providing the registration of a new user in the system.

Table A11.5

The appointment of the elements of interface at the registration

The identifier of element	The name	The appointment
“M2.9”	The field of indication and the selector of group	Displays the identifier of the group of users, the selector allows to select the group (the list of groups is modified in the mode of administrating of DB)
“M2.10”	The editable field	Is intended for the inputting of L.F.P. of user (the new data)
“M2.11”	The selector	Allows to select the gender of user
“M2.12”	The editable field	Allows to set the age of user
“M2.13”	The editable field	Allows to set the password of user
“M2.14”	The button	The pressing initiates the saving of parameters of the user and the exiting from the procedure of registration of a new user
“M2.15”	The button	The pressing initiates the cleaning of made changes and the exiting from the procedure of registration of a new user

The procedure of authentication of the user is completed by the pressing of button “M2.8” and carried out the transition to the third step of the procedure of authentication of the user.

A11.1.3. The selection of the mode of working of the system

The selection of the mode of working of the program is carried out at the third step.

The program system has the capability of working in the several modes:

- the administrating of knowledge base and database;
- the diagnostics of user;
- the analysis of data.

For each category of final users the certain mode of working in the process of operation of the diagnostic module is intended.

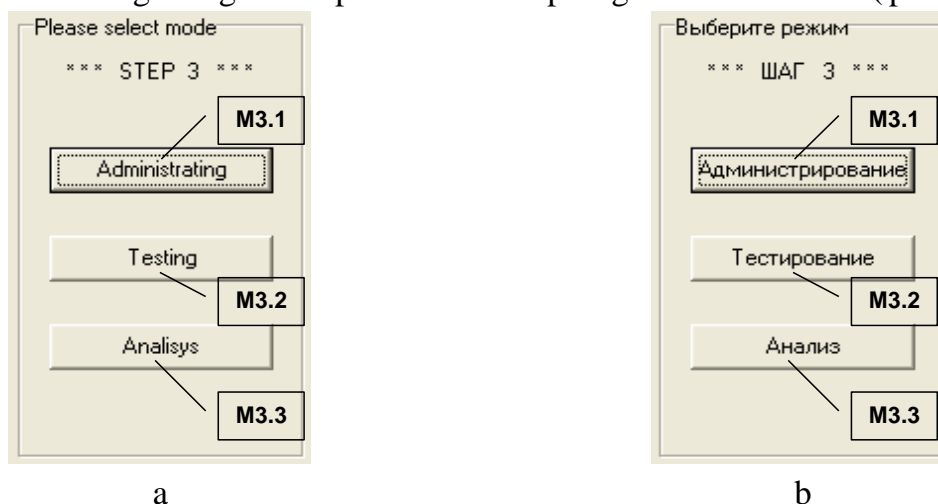
In dependence from the belonging of user to the certain category the operating mode of working of the program toolkit is distinguished proceeding from tabl. A11.6.

Table A11.6

The categories of users and the modes of working of the program

The name of the category of users	The mode of working of the program
An expert (a psychologist)	The administrating and analysis of data
An analyst	
An examinee	The diagnostics (testing)

The user must specify the mode (in dependence from his category in tabl. A11.6), in which he is going to operate the program toolkit (pic. A11.6).



Picture A11.6. The selection of the mode of working of the applied diagnostic module

The selection of the mode of working of the diagnostic module is carried out with help of the group of elements of the interface “M3”, the appointment of which is presented in tabl. A11.7.

Table A11.7

The appointment of the elements of interface at the selection of the mode of working of the program

The identifier of element	The name	The appointment
“M3.1”	The button	The pressing provides the transition into the mode of administrating
“M3.2”	The button	The pressing puts the program into the mode of diagnostics
“M3.3”	The button	At the pressing the system goes into the mode of analysis

A11.1.4. The modes of working of the program toolkit

In the process of operation of the program toolkit it is possible the solution of various tasks, that is realized in a row of modes. Each mode has the certain features in the process of functioning of the program.

The forms of interface in the context of various modes have the significant differences and each mode is intended for the certain category of users (tabl. A11.6).

A11.1.4.1. The mode of administration

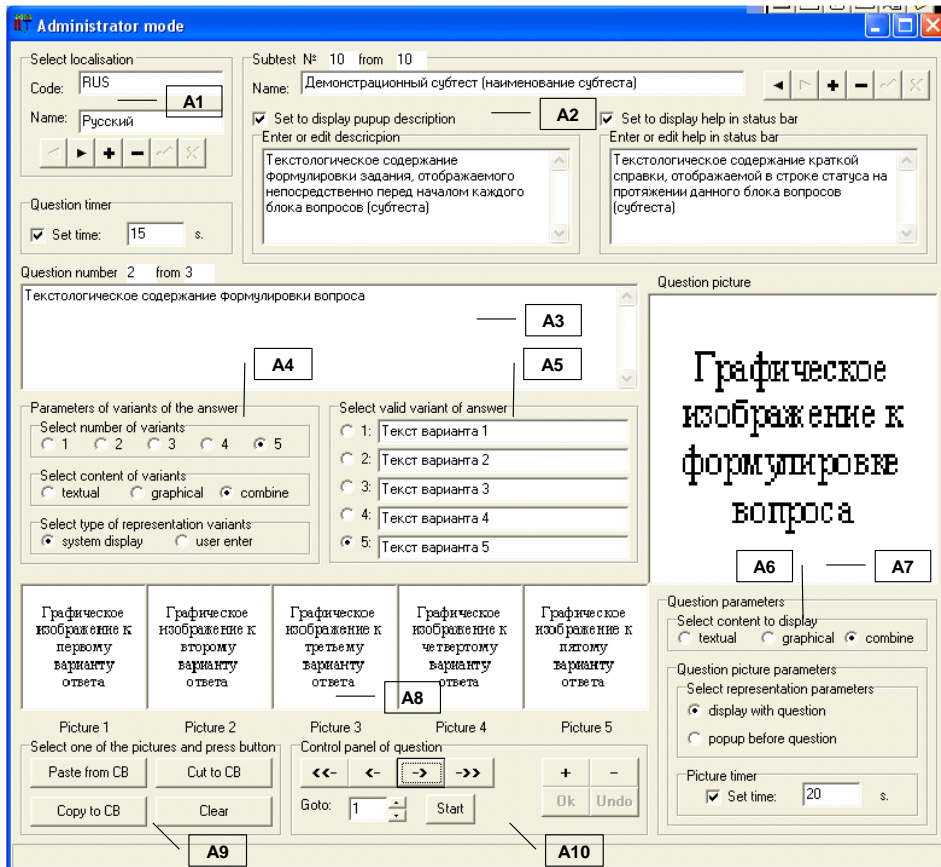
The form (window) of interface in the mode of administrating is saturated with the various groups of elements of the interface, which provide the setting of product for the subsequent working in the mode of diagnostics of the contingent of examinees.

In the process of functioning of the program product of the various elements of interface are connected between each other, therefore the displaying of ones elements depends from the condition of others and this is related to the fact, that each block of questions (subtest) in the context of the method of research has the significant differences at the level of the used elements of interface.

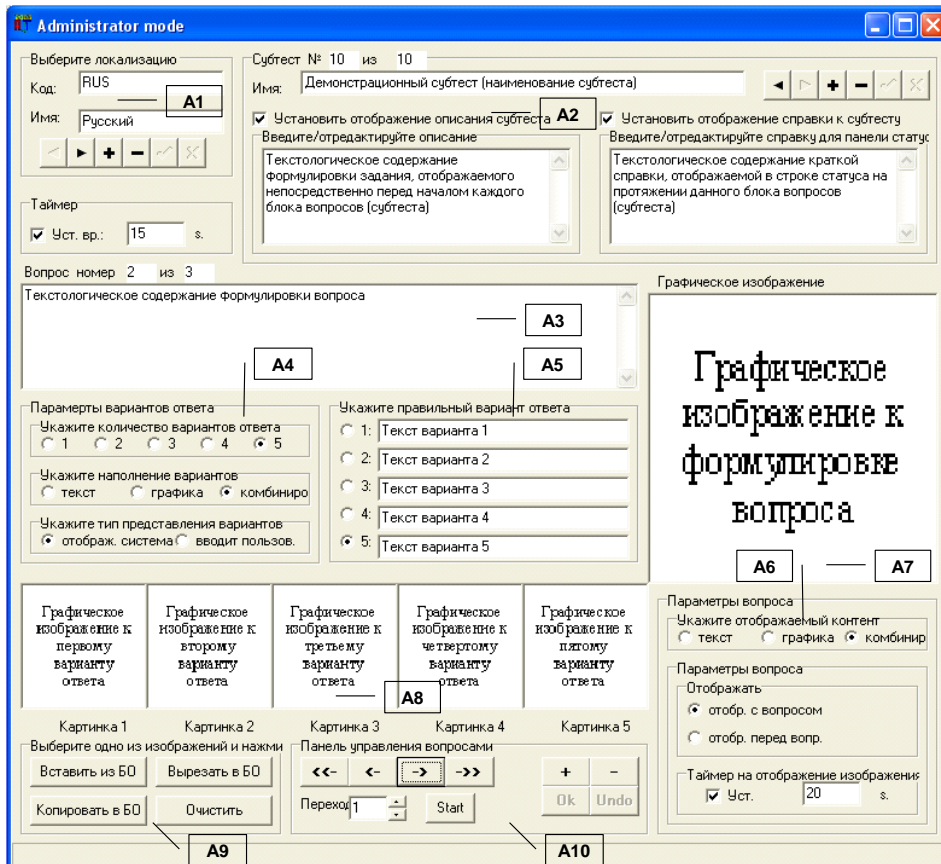
The given mode provides the capability of setting of the content of tests, the parameters of the method of estimation and the viewing of the results of testing.

The database of tests of the individual features of personality of the subjects of training is available in the mode of administration of the applied diagnostic module, that allows to bring new or modify the existing tests, intended for the realization of the automated diagnostics of the nominal values of parameters of the cognitive model of the subject of training.

In pic. A11.7 presents directly the expanded structure of the form of interface of the program in the mode of administration of KB, on which presents (by the method of computer modeling) all elements of interface, which can be displayed in the process of working.



a



b

Picture A11.7. The expanded structure of the window of interface in the mode of administrating of the knowledge base

In the context of the accepted sequence of statement tabl. A11.8 reflects the appointment of the main groups of elements “A1” – “A10” in the mode of administrating.

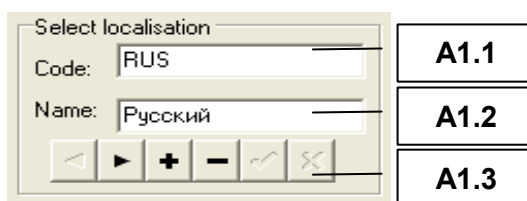
Table A11.8

The appointment of the group of elements of the application in the mode of administrating

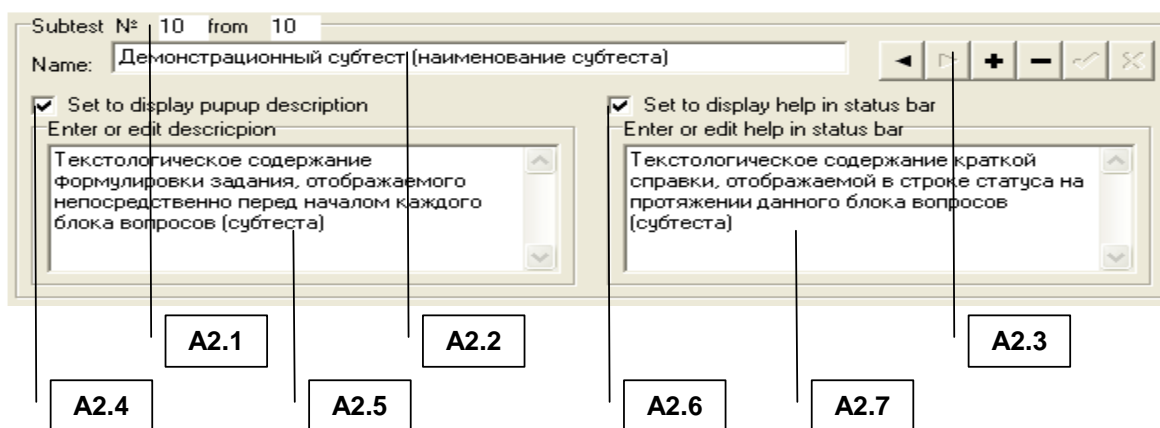
The identifier of element	The name	The appointment
“A1”	The selector of the localization of methods	Allows to the user to select (to set) the localization of the method of research (test)
“A2”	The selector of the block of questions (subtest)	Allows to set the parameters and to select the block of questions (subtest), subject to modification
“A3”	The indicator of question	Provides the recording and displaying of the textual content of question, and also the number of question by order and the total quantity of questions
“A4”	The selector of parameters of the variant of answer	Allows to specify the quantity of the variant of answer, the type of displayed content and the view of presentation of each variant of answer in the question
“A5”	The indicator of textual content of the variants of answer	Provides the recording and displaying of the textual content for the set quantity of the variants of answer, the selecting of the correct variant(s) of answer
“A6”	The selector of the parameters of question	Allows to specify the type of displaying of the content of question, the sequence of displaying and the interval of time of displaying
“A7”	The indicator of the graphical accompanying of the formulation of question	Allows to download and display the graphical image, accompanying the formulation of question
“A8”	The indicator of graphical accompanying of the formulations of the variants of answer	Allows to download and display the graphical images, accompanying the formulation of the variants of answer
“A9”	The field of control by the graphical objects (images)	Provides the inserting from the clipboard, the cutting and copying into the clipboard, and also the cleaning of the field of graphical object (the deleting of graphical image)
“A10”	The control panel of the questions in KB	Provides the switching of questions, the adding or deleting of question, the saving or canceling of changes

Let's consider in more detail the groups of elements presented in pic. A11.7.

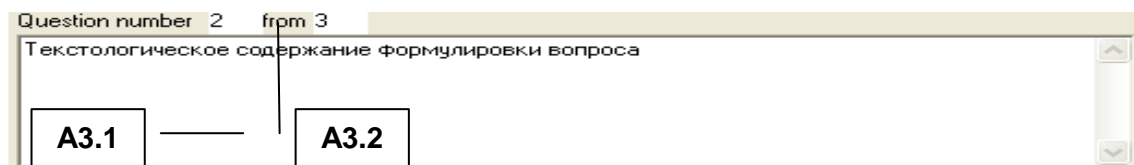
In pic. A11.8 the elements in the composition of following groups are designated by the letters a-k: the selector of the localization of method (“A1”), the selector of the block of questions (subtest) (“A2”), the indicator of question (“A3”), the selector of parameters of the variants of answer (“A4”), the indicator of textual content of the variants of answer (“A5”), the selector of the parameters of question (“A6”), the indicator of graphical accompanying of the formulation of question (“A7”), the indicator of graphical accompanying of the formulation of the variants of answer (“A8”), the field of control of the graphical objects (“A9”) and the control panel of questions in KB (“A10”).



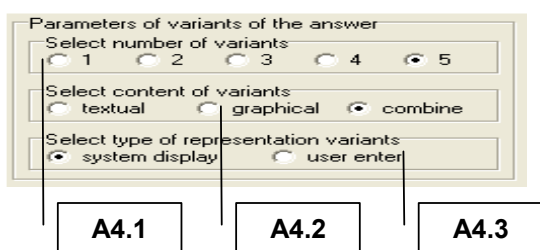
a



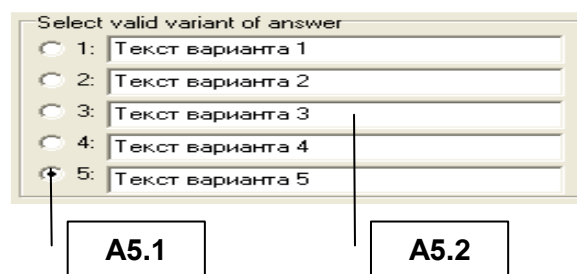
b



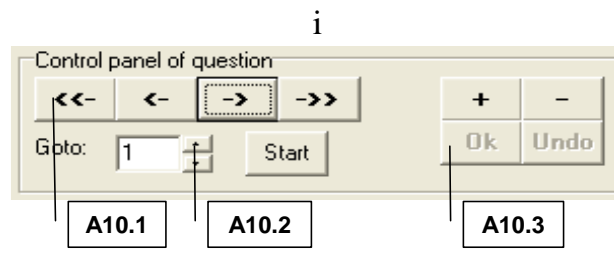
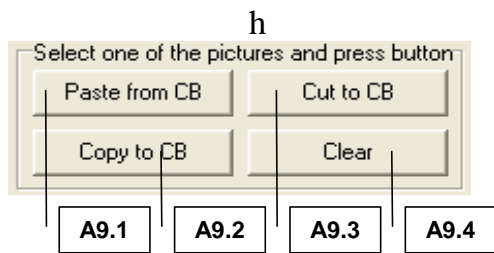
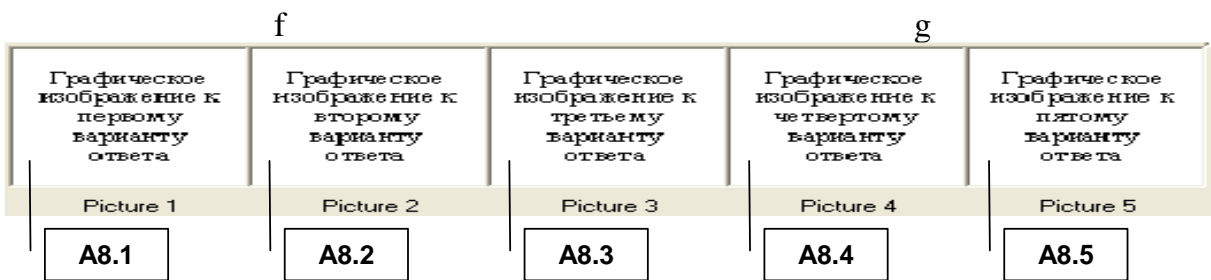
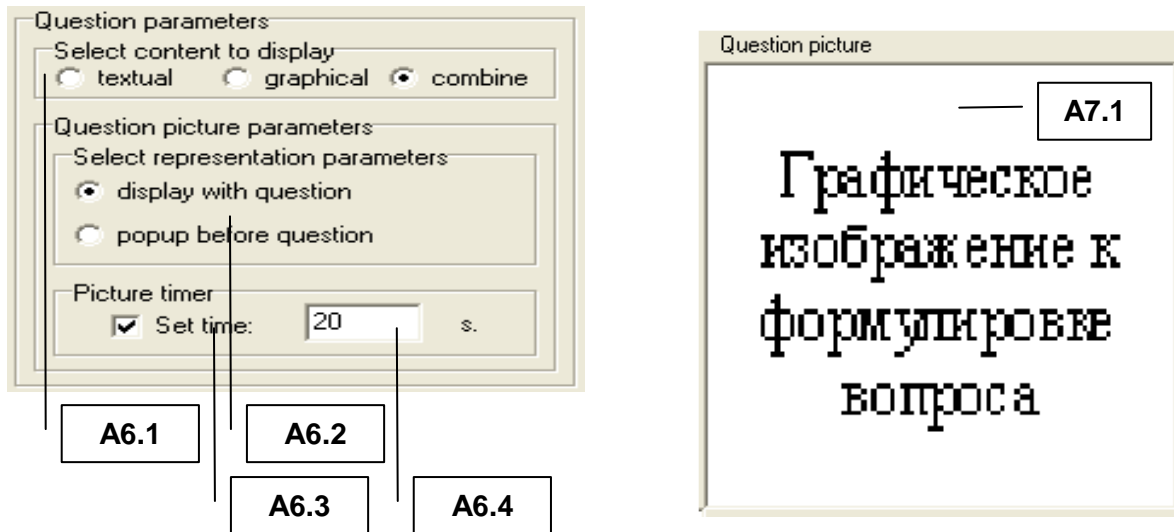
c



d



e



Picture A11.8. The elements of groups “A1” – “A15”

Tabl. A11.9 – A11.18 reflect the name and appointment of the elements of interface in the composition of corresponding groups “A1” – “A10”.

The program toolkit provides the working with using of the several localizations of the method of research in the basis of KB.

In order that to select the localization of the method of research (test) it is necessary to use by the selector of the localization of method (the group of elements “A1”), the appointment of the elements of interface is presented in tabl. A11.9.

Table A11.9

The appointment of the elements of interface of the selector of the localizations of method (“A1”)

The identifier of element	The name	The appointment
“A1.1”	The field of indication	Is intended for the editing and displaying of the code of the method of research
“A1.2”	The field of indication	Is intended for the editing and displaying of the name of localization of the method of research
“A1.3”	The element of control	Allows to carry out the navigation within the limits of the list of the localizations of method, and also to add and to delete their codes and names

The method of research (test) includes a row of subtests, presenting the blocks of questions of the certain type (see the description of the method of research).

The switching between the blocks of questions (subtests) is carried out by means of the selector of the block of questions (the group of elements of the interface “A2”).

Table A11.10

The appointment of the elements of interface of the selector of the block of questions (“A2”)

The identifier of element	The name	The appointment
“A2.1”	The field of indication	Provides the displaying of the number of the current block of questions (subtests) and their total quantity in the method of research
“A2.2”	The field of indication	Is intended for the editing and displaying of the name of the block of questions (subtest) of the method of research (test)
“A2.3”	The element of control	Allows to carry out the navigation within the limits of the list of the blocks of questions (subtests) of the method, and also to add and to remove their parameters
“A2.4”	The selector	The setting of marker activates the displaying of the pop-up window of interface with the description of the block of questions (subtest), the window is displayed in the mode of diagnostics before the beginning of given subtest
“A2.5”	The field of indication	Available only if the marker is set in the selector “A2.4”, provides the displaying of the textual content of the formulation of task, displayed directly before the starting of each block of questions (subtest)
“A2.6”	The selector	The setting of marker activates the capability of displaying of the help information in the status line during the solution of tasks by the user from the given block of questions (subtest)
“A2.7”	The field of indication	Available only if the marker is set in the selector “A2.6”, provides the displaying of the textual content of the formulation of short help, displayed in the status line during the cycle of testing on the given block of questions (subtest)

The textual content of question is displayed in the group “A3”, the elements of interface of which are presented directly in tabl. A11.11.

Table A11.11

The appointment of the elements of interface of the indicator of question (“A3”)

The identifier of element	The name	The appointment
“A3.1”	The field of indication	Is intended for the editing and displaying of textual content of the formulation of question
“A3.2”	The field of indication	Provides the displaying of the number of current question and the total quantity of questions, included into the subtest

In relation to each question can set the parameters of the variants of answer (“A4”), by means of the elements of interface of the program, presented in tabl. A11.12.

Table A11.12

The appointment of the elements of interface of the selector of parameters of the variants of answer (“A4”)

The identifier of element	The name	The appointment
“A4.1”	The selector	Is intended for the setting of the quantity of the variants of answer to the question
“A4.2”	The selector	Provides the setting of the type of content of the variants of answer (only text, only image and combined)
“A4.3”	The selector	Allows to select the type of representation of the variants of answer (the system displays and the user inputs)

The formulations of the variants of answer on each question of subtest is entered by the user by means of the elements of interface of the program, presented in tabl. A11.13.

Table A11.13

The appointment of the elements of interface of the indicator of textual content of the variants of answer (“A5”)

The identifier of element	The name	The appointment
“A5.1”	The selector	Is intended for the setting of the correct variant of answer to the question
“A5.2”	The field of indication	Is intended for the editing and displaying of the textual content of the formulations of the variants of answer to the question

The mode of administrating is intended for the creation of the questions of subtest. Each from the questions of the method of research (test) has a row of parameters, which depend from the number of the certain block of questions (subtest), and also are set by means of the elements of the selector of the parameters of question (“A6”). The description of the elements of the selector of the parameters of question is led in tabl. A11.14.

Table A11.14

The appointment of the elements of interface of the selector of the parameters of question (“A6”)

The identifier of element	The name	The appointment
“A6.1”	The selector	Is intended for the setting of the type of the content of question (text, image and combined)
“A6.2”	The selector	Provides the setting of the variant of representation of the image (display together with the question and display before the question)
“A6.3”	The selector	The setting of marker means the activation of timer, regulating the period of time of the displaying of image
“A6.4”	The field of indication	Available, if the marker is set in the selector “A6.3”, that allows to the user to specify the nominal value of the interval of time

The questions in some subtests provide the displaying of graphical image, accompanying (complementing) the textual content of formulation. This capability is programmatically realized in the indicator of graphical accompanying of the formulation of question (“A7”) (see tabl. A11.15).

Table A11.15

The appointment of the elements of interface of the indicator of graphical accompanying of the formulation of question (“A7”)

The identifier of element	The name	The appointment
“A7.1”	The field of indication	Is intended for the displaying of graphical image, accompanying the formulation of question

The variants of answers in some subtests contain the graphical image, which can be added directly in the indicator of graphical accompanying of the formulations of the variants of answer (“A8”) (see tabl. A11.16).

Table A11.16

The appointment of the elements of interface of the indicator of graphical accompanying of the formulations of the variants of answer (“A8”)

The identifier of element	The name	The appointment
“A8.1” – “A8.5”	The field of indication	Provides the displaying of graphical image, accompanying the formulation of the corresponding variant of question (1-5)

In order that to operate by the graphical images in the indicator of graphical accompanying of the formulation of question (“A7”) and the indicator of graphical accompanying of the formulations of the variants of answer (“A8”) the control panel of graphical objects (“A9”) is served, the description of the elements of interface of which is presented in tabl. A11.17.

Table A11.17

The appointment of the elements of interface of the control panel of graphical objects (“A9”)

The identifier of element	The name	The appointment
“A9.1”	The button	The pressing initiates the inserting of graphical image from the clipboard into the fields “A7.1”, “A8.1” – “A8.5” (the inserting is carried out into the active field)
“A9.2”	The button	The pressing of button by the user initiates the copying of image from the field “A7.1”, “A8.1” – “A8.5” into the clipboard (before the pressing on the button needs to press on the field, containing the copied graphical image)
“A9.3”	The button	The pressing of button by the user initiates the cutting of image from the field “A7.1”, “A8.1” – “A8.5” into the clipboard (before the pressing on the button needs to press on the field, containing the copied graphical image)
“A9.4”	The button	The pressing initiates the cleaning of image, contained in the field “A7.1”, “A8.1” – “A8.5” (before the pressing on the button needs to press on the field, containing the deleted graphical image)

For the navigation with the purpose of the viewing and modifying of parameters within the limits of the block of questions (subtest) of the certain method of research (test) the panel of control by the questions in the database (KB) (“A10”) is served, the appointment of the elements of interface of which is presented in tabl. A11.18.

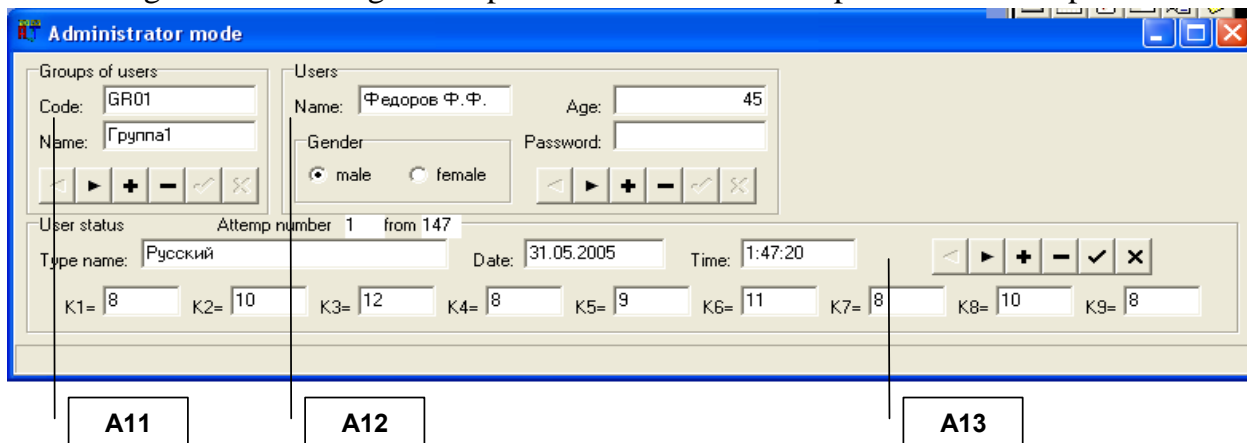
Table A11.18

The appointment of the elements of interface of the control panel by the questions in the knowledge base (“A10”)

The identifier of element	The name	The appointment
“A10.1”	The field of control	The pressing on the buttons allows accordingly to go on the first question, the previous question, the next question and the last question in the subtest
“A10.2”	The field of control	Allows to go on the question with the certain number
“A10.3”	The field of control	The pressing on the buttons initiates accordingly the addition and deletion of question, the saving of changes and the cancellation of made changes

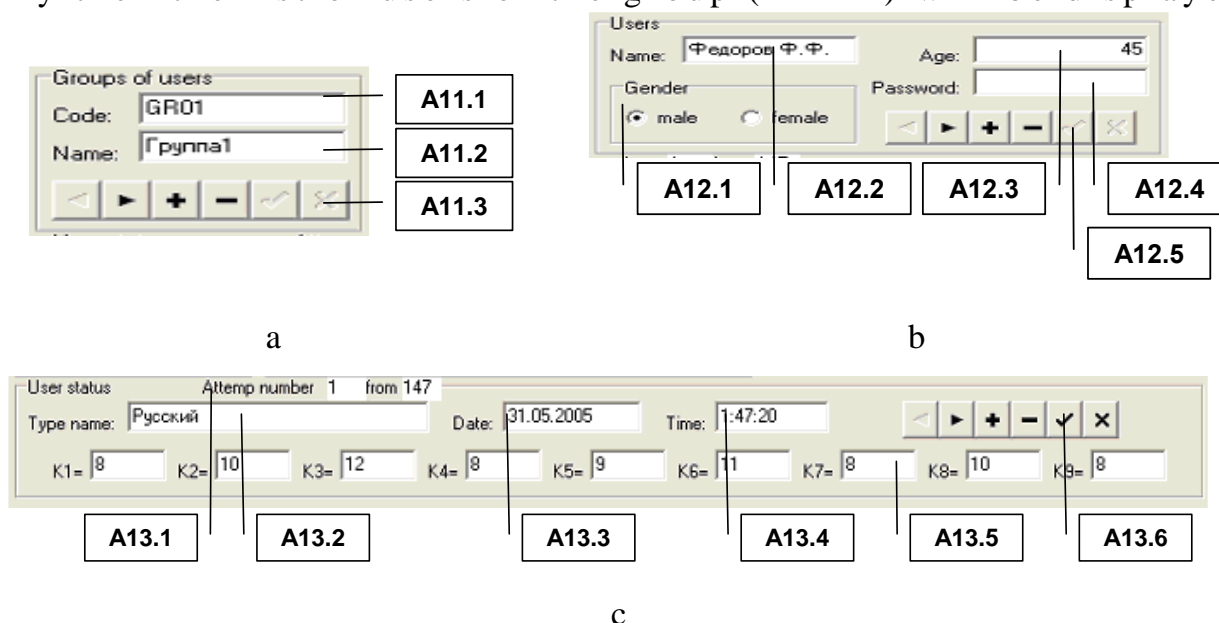
The conception of development provides the documenting of status in the process of diagnostics of the final user (the examinee). For this the special database was developed and the procedure of registration was introduced.

The realized structure of database in the basis of the program toolkit provides the minimum necessary actions over the data (see the infological scheme of KB and DB). Directly yhe groups of the elements of interface of the program (“A11” – “A13”), providing the viewing of a posteriori data are presented in pic. A11.9.



Picture A11.9. The form of interface of the program in the mode of administrating of the database with the results of diagnostics

For the support of automated research and the realization of the procedure of registration of the examinees in the mode of administrating it is necessary in advance to set the parameters of the group of users (“A11”) and their L.F.P. (“A12”). At the viewing of a posteriori results of testing (pic. A11.10) it is necessary in the beginning to select the group of users (“A11”), only then the list of users of the group (“A12”) will be displayed.



Picture A11.10. The elements of form of the interface of program in in the mode of administrating of the database with the results of diagnostics

Before the beginning of automated research it is necessary to input the parameters of the groups of examinees by means of the indicator of group “A11”, the appointment of the elements of interface of which is presented in tabl. A11.19.

Table A11.19

The appointment of the elements of interface of the indicator of the groups of users (“A11”)

The identifier of element	The name	The appointment
“A11.1”	The field of indication	Is intended for the editing and displaying of the code of the group of examinees
“A11.2”	The field of indication	Is intended for the editing and displaying of the name of the group of examinees
“A11.3”	The field of indication	Allows to carry out the navigation within the limits of the list of the groups of examinees, and also to add and remove their codes and names

At the stage of registration also provides the input of parameters of the examinee, which are available for the viewing and editing in the mode of administrating by means of the group of elements “A12” (tabl. A11.20). At the selecting of certain user in the group of elements “A12” displays his a posteriori results of research (the grouping by the number of attempts) in “A13”.

Table A11.20

The appointment of the elements of interface of the indicator of the parameters of users (“A12”)

The identifier of element	The name	The appointment
“A12.1”	The selector	Is intended for the displaying and editing of the gender of examinee
“A12.2”	The field of indication	Is intended for the editing and displaying of L.F.P. of examinee
“A12.3”	The field of indication	Is intended for the displaying and editing of the age of examinee
“A12.4”	The field of indication	Is intended for the displaying and editing of the password of examinee
“A12.5”	The element of control	Allows to carry out the navigation within the limits of the list of examinees, and also to modify their parameters (L.F.P., gender, age and password)

In the process of diagnostics of the certain user the following information is formed: the name of the method of research, the date and time of passing of the test, the coefficients “K1” – “K9” (correspond to the numbers of subtests). In the mode of administrating all fields of indication of a posteriori results of research have the capability of editing (“A13”). In the process of the procedure of diagnostics at the examinee (the subject of training) does not have the possibility to make changes into the various information fields, but such possibility is available for the user in the mode of administrating. The appointment of the group of elements of the interface “A13” is presented in tabl. A11.21.

Table A11.21

The appointment of the elements of interface of the indicator of the results of examinee (“A13”)

The identifier of element	The name	The appointment
“A13.1”	The indicator of the quantity of attempts	Is intended for the displaying of the number of displayed attempt and the total quantity of attempts of the passing of test by the examinee
“A13.2”	The field of indication	Is intended for the displaying of the localization of the method of research, at the help of which the research of examinee was carried out
“A13.3”	The field of indication	Is intended for the displaying of the date of passing of the research by the examinee
“A13.4”	The field of indication	Is intended for the displaying of the time of passing of the research by the examinee
“A13.5”	The field of indication	Is intended for the displaying of the nominal values of coefficients, scored by the examinee by the results of passing of the research with the using of corresponding subtests (1-9)
“A13.6”	The element of control	Allows to carry out the navigation within the limits of the attempts of examinee

Further it is proposed to consider the constructing of a sequence of questions of the subtests (the blocks of questions) of the certain method of research (test) with the using of the program toolkit in the mode of administrating.

The features of the structure of the first block of questions (subtest) “The logical selection (the addition of sentences)”

Each from the tasks is presented the unfinished sentence, in which one word is missing directly. To the examinee (the subject of training) is offered the list from five words. It is necessary to choose that word directly, which, in his opinion, is best of all suited for the addition of sentence. The sentence must be added, that it acquires the correct meaning.

For example: A rabbit most of all similar on... 1) a cat; 2) a squirrel; 3) a hare; 4) a fox; 5) a hedgehog. Among the listed words the examinee must choose the word “hare”.

Thus, the structure of each question of the block of questions (subtest) includes:

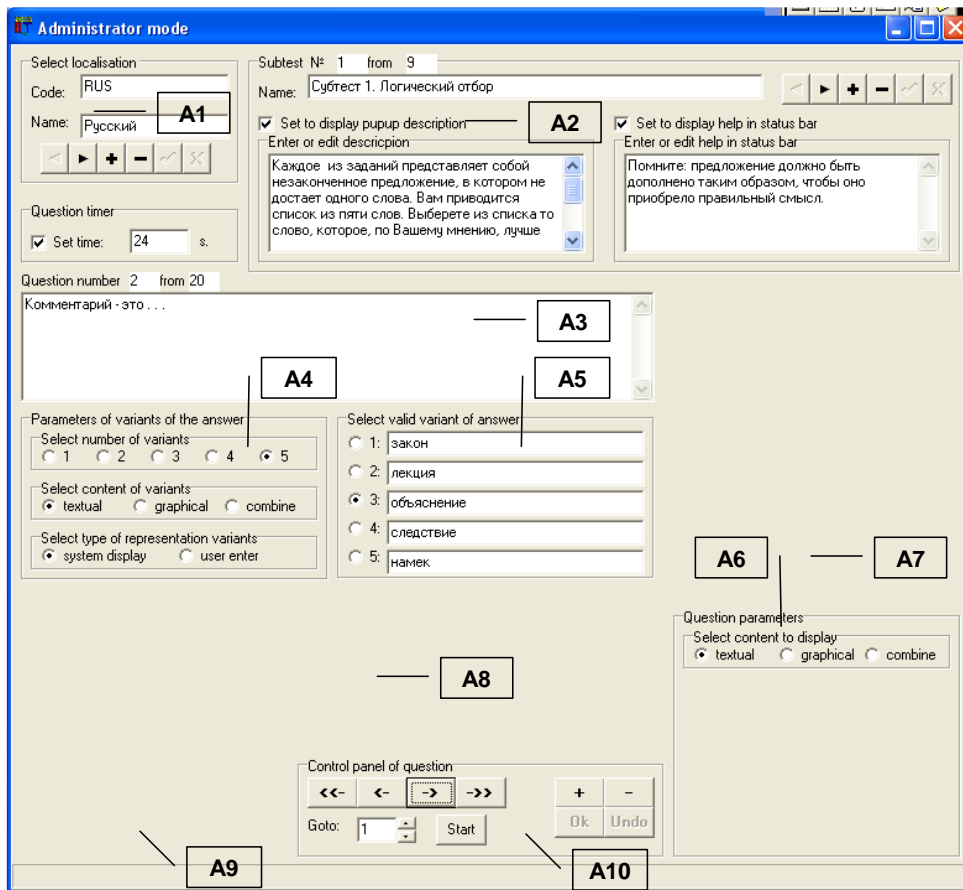
- the textual content of question – the formulation of unfinished sentence;
- the textual content of the variants of answer to the question (with the capability of choosing of the correct variant of answer) – 5 variants of answer (list of possible words, complementing the formulation of sentence).

In order, that to create the new block of questions (subtest) in DB it is necessary to use the selector of the block of questions (“A2”), the appointment of the elements of interface of which was leaded above (pic. A11.8, b): to press the button of adding (“A2.3”); to input the name of the block of questions (“A2.2”); to set the markers of type “check box” (“A2.4” and “A2.6”); then to input the textual content of the formulation of task, displayed directly before the beginning of testing in each block of questions (subtest) of the method of research (test) (“A2.5”); the textual content of short help, displayed in the status line throughout the testing in the given block of questions (subtest) (“A2.7”).

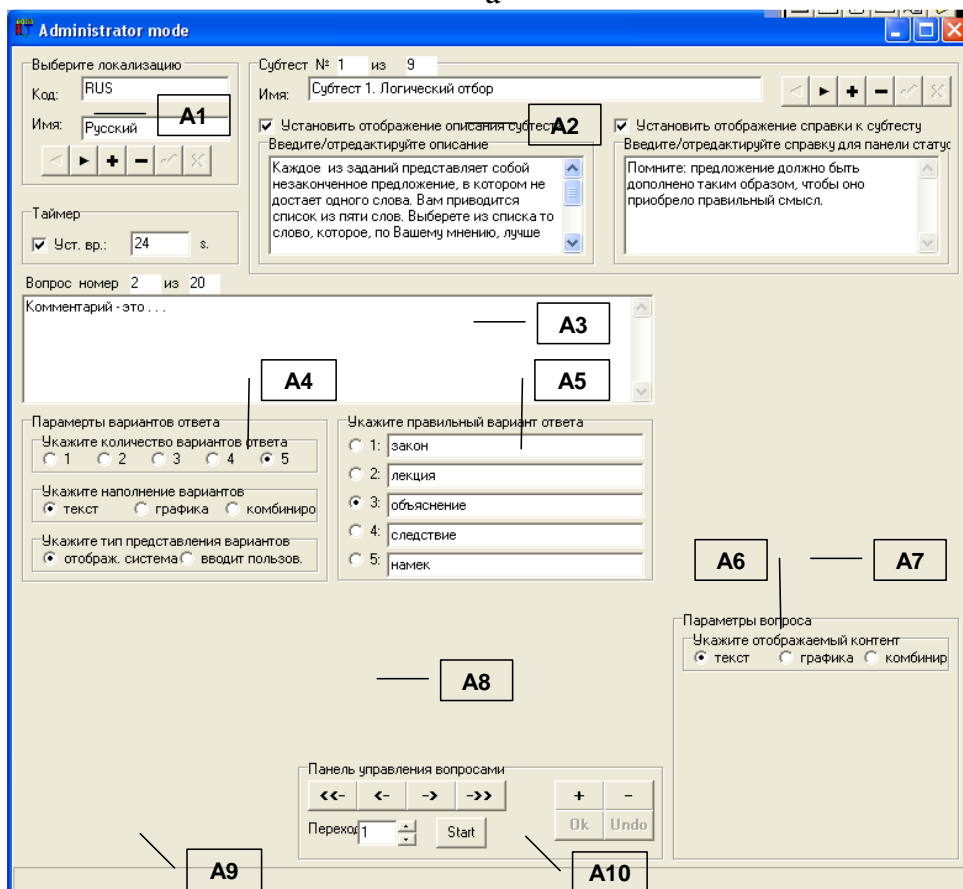
After the setting of parameters of the block of questions (subtest) the selector of the block of questions will take the view, presented in pic. A11.11 (the letter a – the version of inscriptions of the elements of interface in the English language and the letter b – the version of the identifiers of the elements of interface in the Russian language).

Further, by means of the control panel by the questions in KB (“A10”), the appointment of the elements of interface of which was leaded above (pic. A11.8, k): to add the new question of the method of research (test) (“A10.3”); setting in the selector of parameters of the variants of answer (“A4” in pic. A11.8, d): 5 variants of answer (“A4.1”), the textual content of the variants of answer (“A4.2”), displayed by the program system directly (“A4.3”); in the selector of the parameters of question (“A6” in pic. A11.8, f): the textual content of question (“A6.1”); in the indicator of the textual content of the variants of answer (“A5” in pic. A11.8, e): inputting the text of the variants of answer (“A5.2”) and selecting the correct variant of answer (“A5.1”).

The procedure, described directly in the last subparagraph, is repeated until the block of questions (subtest) of KB is fully filled. It should be noted, that at the given combination of parameters the group “A7”, “A8” and “A9” are not displayed. The form of interface of the program is presented directly in pic. A11.11.



a



b

Picture A11.11. The window of interface at the constructing of the first block of questions

The features of the structure of the second block of questions (subtest) “The search of common signs (the exclusion of word)”

To the examinee (the subject of training) is offered a row from five words, four from which can be united into one group by meaning. It is necessary to specify the fifth word, is not entering into this group, that is not referred to that meaning, which is the common for the rest four words.

For example, a row from the following words are leaded: 1) chair; 2) table; 3) pigeon; 4) sofa; 5) wardrobe. All words, except the word “pigeon” designate the subjects of furniture. Accordingly, choose the word “pigeon” directly.

Thus, the structure of each question of the block of questions (subtest) includes:

- the textual content of question – the repetitive formulation of task;
- the textual content of the variants of answer to the question (with the capability of choosing of the correct variant of answer) – the list from five words, among which needs to choose the superfluous.

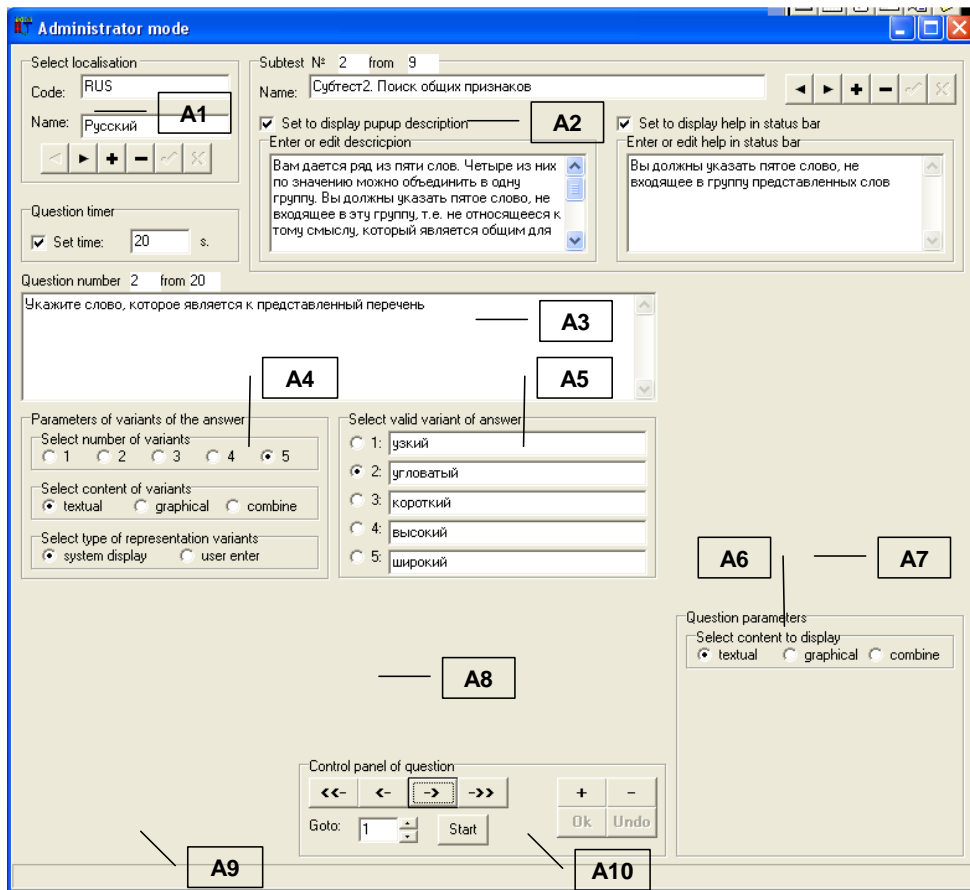
In the given block of questions (subtest) the algorithm of constructing of the questions is similar to the sequence, considered in relation to the first subtest.

In order, that to create the new block of questions (subtest) in KB it is necessary to use the selector of the block of questions (“A2”), the appointment of the elements of interface of which was leaded above (pic. A11.8, b): to press the button of adding (“A2.3”); to input the name of the block of questions (“A2.2”); to set the markers of type “check box” (“A2.4” and “A2.6”); then to input the textual content of the formulation of task (question), displayed directly before the beginning of testing in each block of questions (subtest) of the method of research (test) (“A2.5”); the textual content of short help for the final user, displayed in the status line of program throughout the testing in the given block of questions (subtest) of the method of research (test) (“A2.7”).

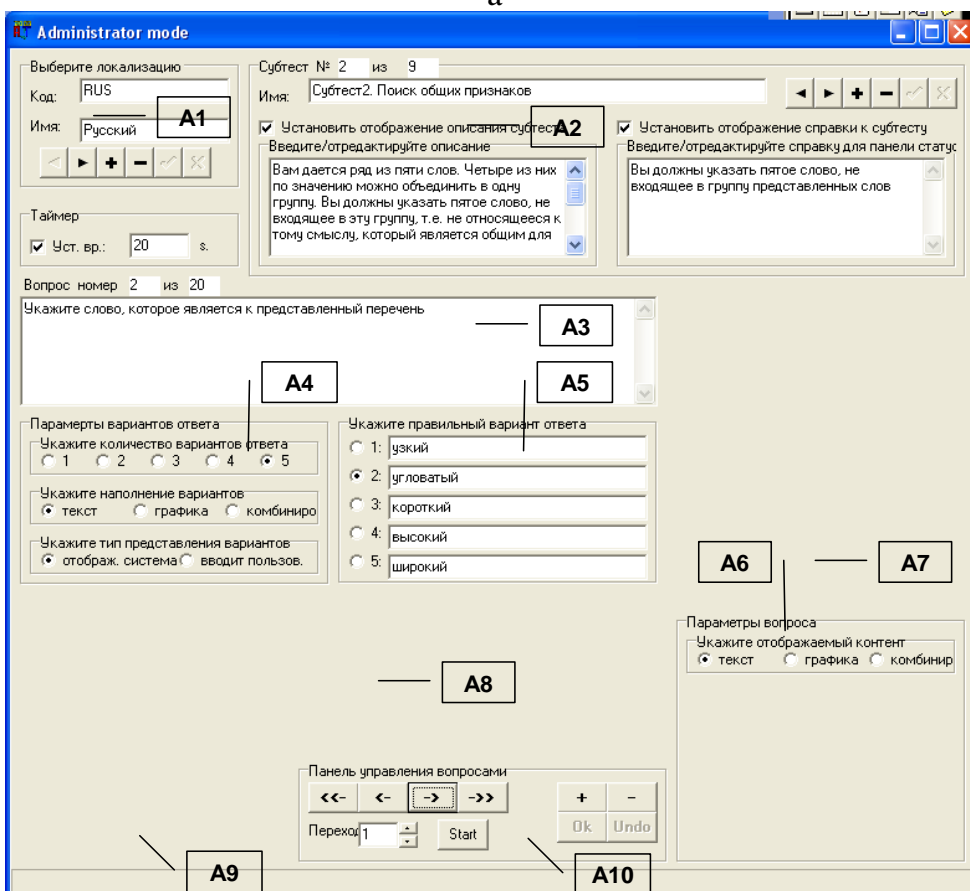
After the setting of parameters of the block of questions (subtest) the selector of the block of questions will take the view, presented in pic. A11.12 (the letter a – the version of inscriptions of the elements of interface in the English language and the letter b – the version of identifiers of the elements of interface in the Russian language).

Further, by means of the control panel by the questions in KB (“A10”), the appointment of the elements of interface of which was leaded above (pic. A11.8, k): to add the new question of the method of research (test) (“A10.3”); setting in the selector of parameters of the variants of answer (“A4” in pic. A11.8, d): 5 variants of answer (“A4.1”), the textual content of the variants of answer (“A4.2”), displayed by the system (“A4.3”); in the selector of the parameters of question (“A6” in pic. A11.8, f): the textual content of question of the method of research (test) (“A6.1”); in the indicator of the textual content of the variants of answer (“A5” in pic. A11.8, e): inputting the text of the variants of answer (“A5.2”) and selecting the correct variant of answer (“A5.1”).

The procedure, described directly in the last subparagraph, is repeated until the complete filling of the block of questions (subtest) of KB. It should be noted, that at the given combination of parameters the group “A7”, “A8” and “A9” are not displayed (in accordance with the method of research). The form of interface of the program is presented directly in pic. A11.12.



a



b

Picture A11.12. The window of interface at the constructing of the second block of questions (subtest)

The features of the structure of the third block of questions (subtest) “The search of verbal analogies”

In each task (question) to the examinee is offered three words. The first and second from them, printed through a colon, are located in the certain connection with each other. After the third word is stand a mark of question. From the five words (was leaded below) the examinee needs to select one, corresponding with the third word also, as the second with the first.

For example: forest:tree, meadow:?: 1) bush; 2) pasture; 3) grass; 4) hay; 5) footpath. In the quality of the logical answer acts the word “grass” directly.

Thus, the structure of each question of the block of questions (subtest) includes:

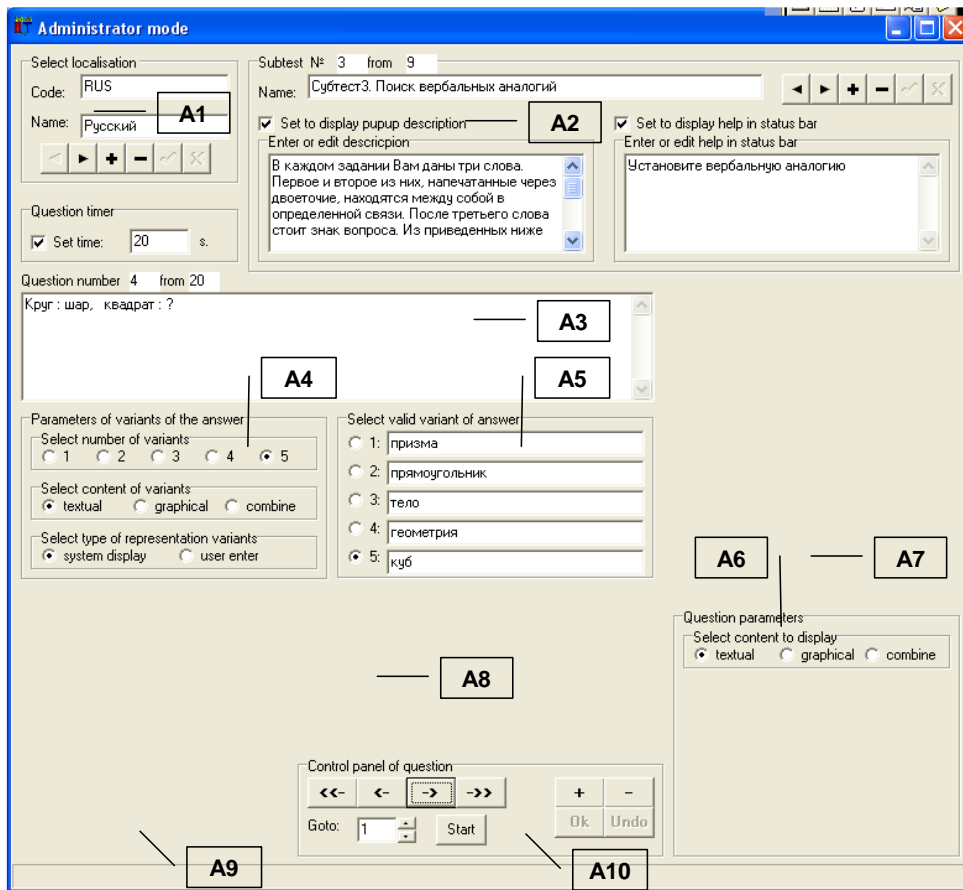
- the textual content of question – two pairs of words: the first,- the full, consisting from two words related by meaning and the second,- the incomplete, consisting from one word;
- the textual content of the variants of answer to the question (with the capability of choosing of the correct variant of answer) – the list from five words, among which one potentially complements the second pair in the task.

In the given block of questions (subtest) the algorithm of constructing of the questions is similar to the sequence, considered in relation to the first subtest.

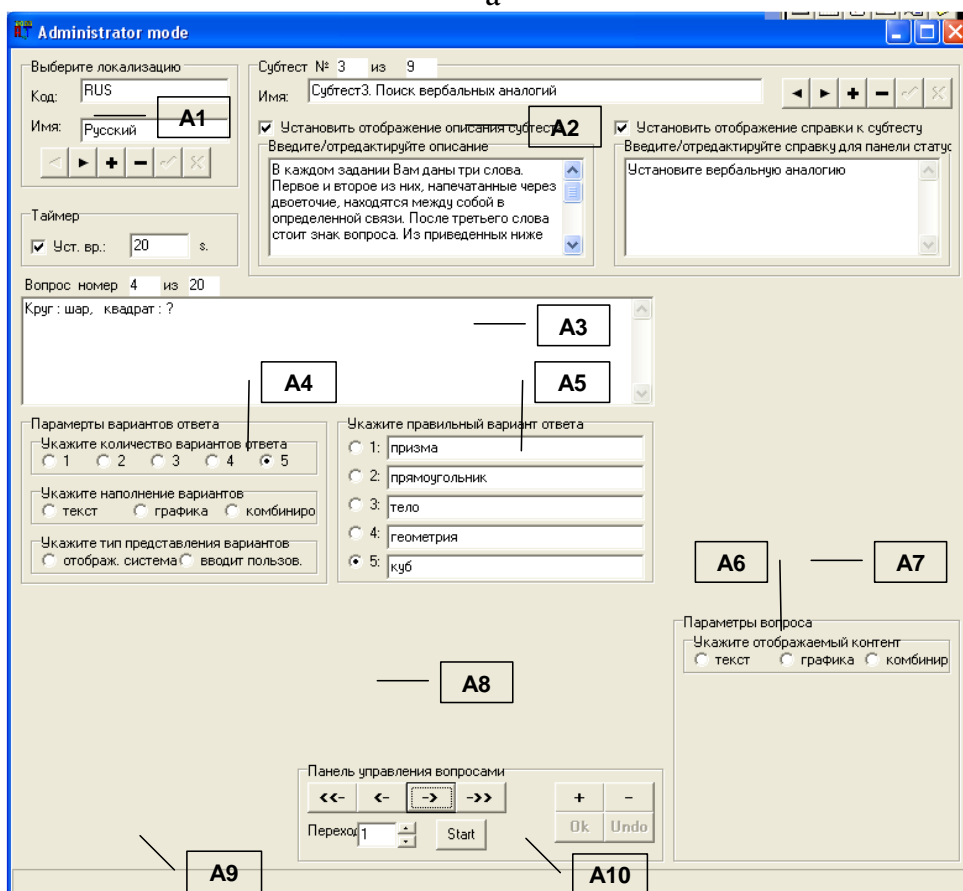
In order, that to create the new block of questions (subtest) in KB it is necessary to use the selector of the block of questions (“A2”), the appointment of the elements of interface of which was leaded above (pic. A11.8, b): to press the button of adding (“A2.3”); to input the name of the block of questions (“A2.2”); to set the markers of type “check box” (“A2.4” and “A2.6”); then to input the textual content of the formulation of task, displayed directly before the beginning of testing in each block of questions (subtest) of the method of research (test) (“A2.5”); the textual content of short help for the final user, displayed in the status line of program throughout the testing in the given block of questions (subtest) of the method of research (test) (“A2.7”).

After the setting of parameters of the block of questions (subtest) the selector of the block of questions will take the view, presented in pic. A11.13 (the letter a – the version of inscriptions of the elements of interface in the English language and the letter b – the version of identifiers of the elements of interface in the Russian language).

Further, by means of the control panel by the questions in KB (“A10”), the appointment of the elements of interface of which was leaded above (pic. A11.8, k): to add the new question of the block of questions (subtest) (“A10.3”); set in the selector of parameters of the variants of answer (“A4” in pic. A11.8, d): 5 variants of answer (“A4.1”), the textual content of the variants of answer (“A4.2”), displayed by the system (“A4.3”); in the selector of the parameters of question (“A6” in pic. A11.8, f): the textual content of question of the block of questions (subtest) (“A6.1”); in the indicator of the textual content of the variants of answer (“A5” in pic. A11.8, e): inputting the text of the variants of answer (“A5.2”) and selecting the correct variant of answer (“A5.1”). The procedure, described directly in the last subparagraph, is repeated until the complete filling of the block of questions (subtest) of KB. It should be noted, that at the given combination of parameters the group “A7”, “A8” and “A9” are not displayed (according to the method of research). The form of interface of the program is presented directly in pic. A11.13.



a



b

Picture A11.13. The window of interface at the constructing of the third block of questions (subtest)

The features of the structure of the fourth block of questions (subtest) “The classification of concepts”

In each task (question) to the examinee is offered two words. It is necessary to determine directly, that the common in their meanings. Then to write that word or phrase, designating the general meaning, which the examinee found in the two proposed words, then to confirm the choice. For example: wheat-oats: The word, designating the general meaning of the given words – “cereals”.

Thus, the structure of each question of the block of questions (subtest) includes:

- the textual content of question – the formulation of question (2 words);
- the textual content of the variants of answer (inputting by the examinee) – the word, which unites the listed words in the formulation of question.

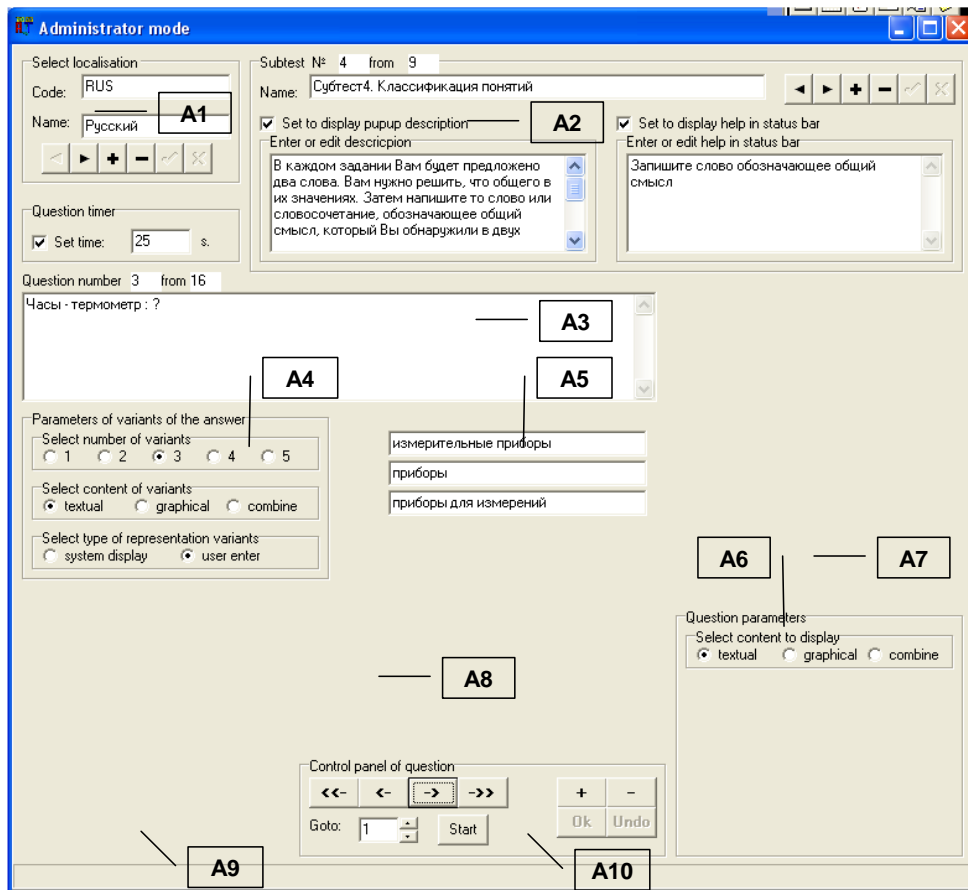
In the given subtest the algorithm of constructing of the questions has insignificant differences (as according to the method of research: in the mode of diagnostics the user must input the variants of answer independently, and in the previous subtests they must be displayed automatically by the system and the user needs to choose the correct variant), but in general similar to the sequence, considered in relation to the first subtest.

In order, that to create the new block of questions (subtest) in KB it is necessary to use the selector of the block of questions (“A2”), the appointment of the elements of interface of which is leaded above (pic. A11.8, b): to press the button of adding (“A2.3”); to input the name of the block of questions (“A2.2”); to set the markers of type “check box” (“A2.4” and “A2.6”); then to input the textual content of the formulation of task, displayed directly before the beginning of testing in each subtest (“A2.5”); the textual content of short help for the final user, displayed in the status line of program throughout the testing in the given block of questions (subtest) of the method of research (test) (“A2.7”).

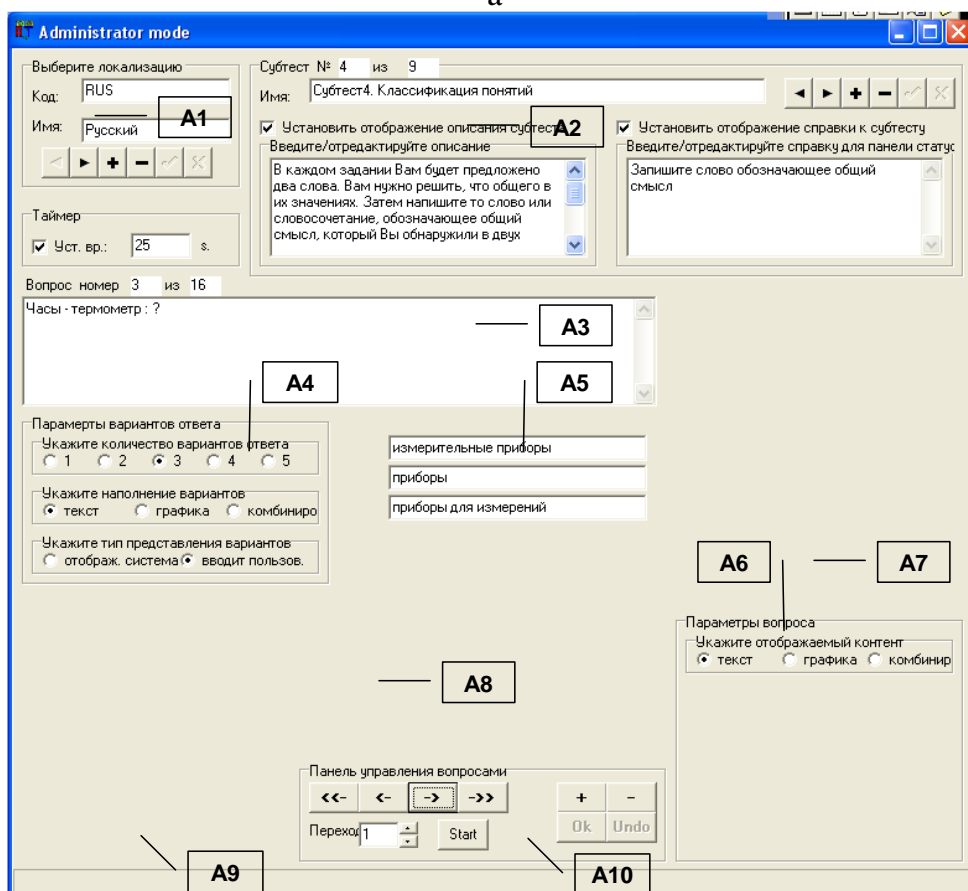
After the setting of parameters of the block of questions (subtest) the selector of the block of questions will take the view, presented in pic. A11.14 (the letter a – the version of inscriptions of the elements of interface in the English language and the letter b – the version of identifiers of the elements of interface in the Russian language).

Further, by means of the control panel by the questions in KB (A10), the appointment of the elements of interface of which was leaded above (pic. A11.8, k): to add the new question of the block of questions (subtest) (“A10.3”); set in the selector of parameters of the variants of answer (“A4” in pic. A11.8, d): 1-5 variants of answer (“A4.1”), the textual content of the variants of answer (“A4.2”), inputting by the user (“A4.3”); in the selector of the parameters of question (“A6” in pic. A11.8, f): the textual content of question of the block of questions (subtest) (“A6.1”); in the indicator of textual content of the variants of answer (“A5” in pic. A11.8, e): inputting the text of the variants of answer (“A5.2”) and selecting the correct variant of answer (“A5.1”).

The procedure, described directly in the last subparagraph, is repeated until the complete filling of the block of questions (subtest) of KB. It should be noted, that at the given combination of parameters the group “A7”, “A8” and “A9” are not displayed directly (according to the method of research). The form of interface of the program is presented directly in pic. A11.14.



a



b

Picture A11.14. The window of interface at the constructing of the fourth block of questions (subtest)

The features of the structure of the fifth block of questions (subtest) “The arithmetical tasks”

To the examinee are offered the formulations of arithmetical tasks, to be resolved. It is proposed to write the numerical result of solving of the arithmetical task.

Thus, the structure of each question of the block of questions (subtest) includes:

- the textual content of question of the block of questions (subtest) – the formulation of task (question) on the arithmetical counting;
- the textual content of the variants of answer (inputting by the examinee) – the solving of arithmetical task in the view of number.

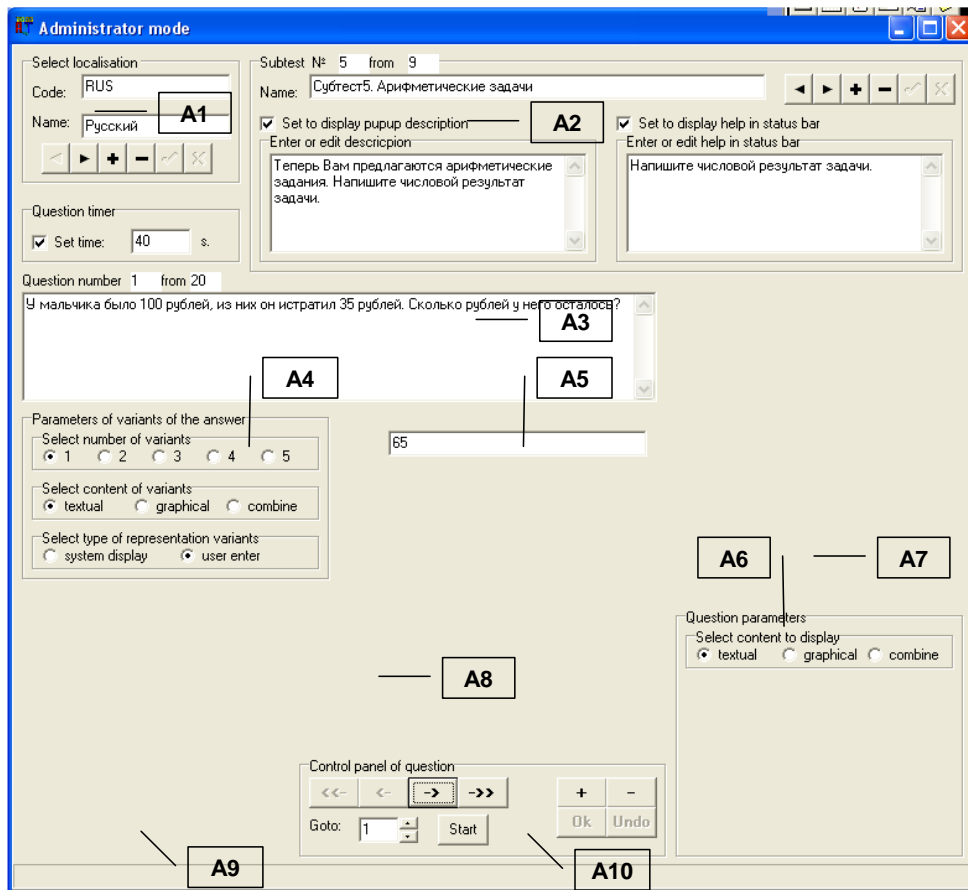
In the given block of questions (subtest) the algorithm of constructing of the questions has insignificant differences (as according to the method of research: in the mode of diagnostics the user must input the variant of answer independently), but in general it is similar to the sequence, considered in relation to the first subtest.

In order, that to create the new block of questions (subtest) in KB it is necessary to use the selector of the block of questions (“A2”), the appointment of elements of which was leaded above (pic. A11.8, b): to press the button of adding (“A2.3”); to input the name of the block of questions (“A2.2”); to set the markers of type “check box” (“A2.4” and “A2.6”); then to input the textual content of the formulation of task, displayed directly before the beginning of testing in each block of questions (subtest) of the method of research (test) (“A2.5”) and the textual content of short help for the final user, displayed in the status line throughout the testing in the given block of questions (subtest) of the method of research (test) (“A2.7”).

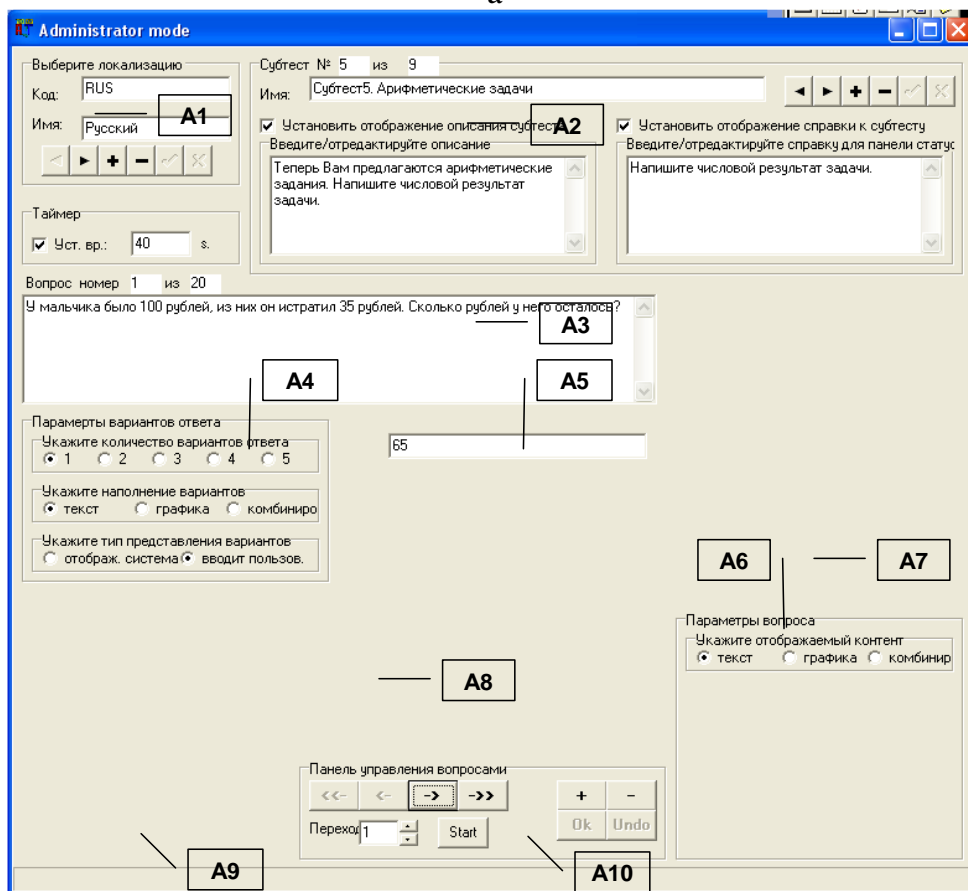
After the setting of parameters of the block of questions (subtest) the selector of the block of questions will take the view, presented in pic. A11.15 (the letter a – the version of inscriptions of the elements of interface in the English language and the letter b – the version of identifiers of the elements of interface in the Russian language).

Further, by means of the control panel by the questions in KB (“A10”), the appointment of the elements of interface of which was leaded above (pic. A11.8, k): to add the new question of the block of questions (subtest) (“A10.3”); set in the selector of parameters of the variants of answer (“A4” in pic. A11.8, d): 1 variant of answer (“A4.1”), the textual content of the variants of answer (“A4.2”), inputting by the user (“A4.3”); in the selector of the parameters of question (“A6” in pic. A11.8, f): the textual content of question of the block of questions (subtest) (“A6.1”); in the indicator of the textual content of the variants of answer (“A5” in pic. A11.8, e): inputting the text of the variants of answer (“A5.2”) and selecting the correct variant of answer (“A5.1”).

The procedure, described directly in the last subparagraph, is repeated until the complete filling of the block of questions (subtest) of KB. It should be noted, that at the given combination of parameters the group “A7”, “A8” and “A9” are not displayed (in accordance with the method of research). The form of interface of the program is presented directly in pic. A11.15.



a



b

Picture A11.15. The window of interface at the constructing of the fifth block of questions (subtest)

The features of the structure of the sixth block of questions (subtest) “The number rows”

Each task consists from a row of numbers, which are located in a certain order. To the examinee needs to reveal the regularity, by which a row is built, and to find the number, continuing a row in accordance with this regularity.

For example: 2, 4, 6, 8, 10, 12, 14, ?

In a numerical row each number is 2 more, than the previous. Therefore (directly), the next number will be 16. To the examinee needs to write the result and to confirm the answer.

Thus, the structure of each question of the block of questions (subtest) includes:

- the textual content of question of the block of questions (subtest) – the formulation of task, including a numerical sequence;
- the textual content of the variants of answer (inputting by the examinee) – the nominal value of number, complementing the presented sequence.

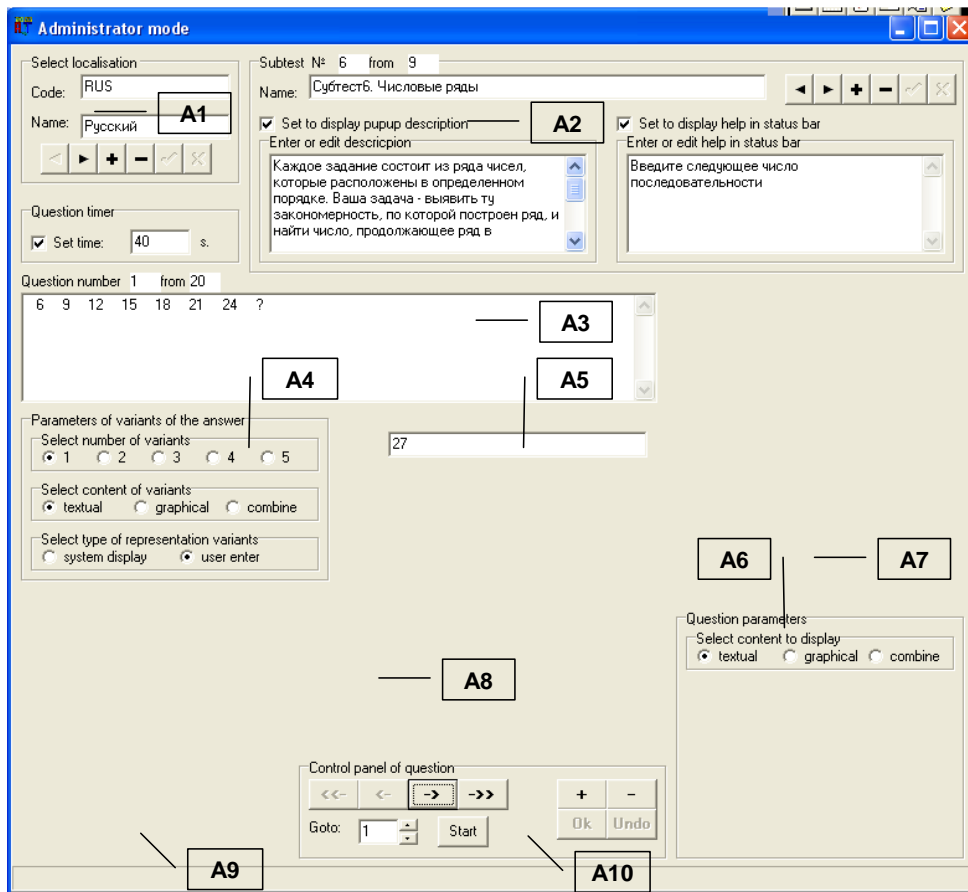
In the given block of questions (subtest) the algorithm of constructing of the questions is similar to the sequence, considered in relation to the previous subtest.

In order, that to create the new block of questions (subtest) in KB it is necessary to use the selector of the block of questions (“A2”), the appointment of elements of which was leaded above (pic. A11.8, b): to press the button of adding (“A2.3”); to input the name of the block of questions (“A2.2”); to set the markers of type “check box” (“A2.4” and “A2.6”); then to input the textual content of the formulation of task, displayed directly before the beginning of testing in each block of questions (subtest) of the method of research (test) (“A2.5”) and the textual content of short help, displayed in the status line during the testing on the given block of questions (subtest) (“A2.7”).

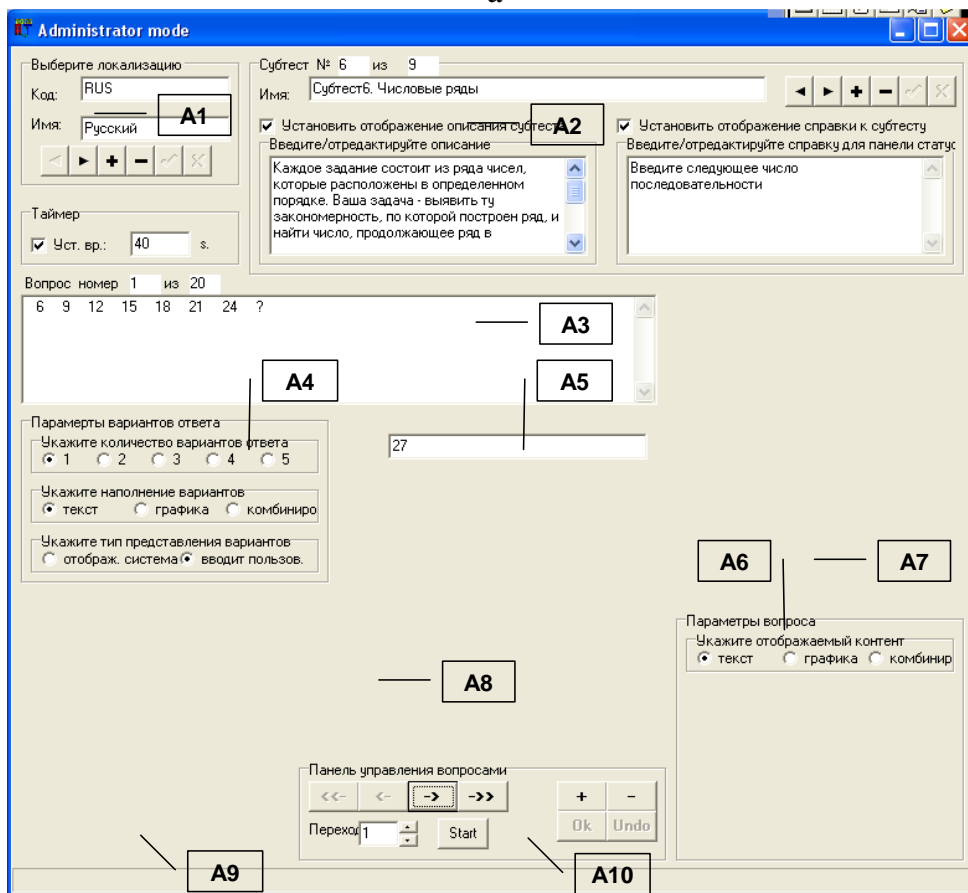
After the setting of parameters of the block of questions (subtest) the selector of the block of questions will take the view, presented in pic. A11.16 (the letter a – the version of inscriptions of the elements of interface in the English language and the letter b – the version of identifiers of the elements of interface in the Russian language).

Further, by means of the control panel by the questions in KB (“A10”), the appointment of the elements of interface of which was lead above (pic. A11.8, k): to add the new question of the block of questions (subtest) (“A10.3”); to set in the selector of parameters of the variants of answer (“A4” in pic. A11.8, d): 1 variant of answer (“A4.1”), the textual content of the variants of answer (“A4.2”), input by the user (“A4.3”); in the selector of the parameters of question (“A6” in pic. A11.8, f): the textual content of question of the block of questions (subtest) (“A6.1”); in the indicator of textual content of the variants of answer (“A5” in pic. A11.8, e): input the text of variants of answer (“A5.2”) and select the correct variant of answer (“A5.1”).

The procedure, described directly in the last subparagraph, is repeated until to the block of questions (subtest) is fully filled. It should be noted, that at the given combination of parameters the groups “A7”, “A8” and “A9” are not displayed (in accordance with the method of research). The form of interface of the program is presented directly in pic. A11.16.



a



b

Picture A11.16. The window of interface at the constructing of the sixth block of questions (subtest)

The features of the structure of the seventh block of questions (subtest) “Mnemonics and memory”

For the performing of tasks to the examinee will first needs to remember the group of words (displaying in the form of table in the course of limited interval of time – 3 minutes). Then to the examinee is asked the questions, with the help of which the degree of knowledge of words is revealed.

Thus, in the beginning of diagnostics the structure of the first question looks:

- the graphical image (the table with the list of words) – the words, grouped by the thematic groups directly.
- Then, the structure of each subsequent question of the block of questions (subtest) includes:
- the textual content of question – the formulation of question, including the reference to the first letter of the previously submitted words;
 - the textual content of the variants of answer (inputted by the examinee) – the list of thematic groups, in relation to which the examinee must make a choice (the affiliation of word to the thematic group is taken into account).

In the given block of questions (subtest) the algorithm of constructing of the questions has minor differences (as according to the method of research: in the mode of diagnostics at first needs to display the graphical image with the table of words, intended for the memorization by the examinee), but in general similar to the sequence considered in relation to the first subtest.

In order, that to create the new block of questions (subtest) in KB it is necessary to use the selector of the block of questions (“A2”), the appointment of the elements of which was lead above (pic. A11.8, b): to press the button of adding (“A2.3”); to input the name of the block of questions (“A2.2”); to set the markers of type “check box” (“A2.4” and “A2.6”); then to input the textual content of the formulation of task, displayed directly before the beginning of testing on each block of questions (subtest) of the method of research (test) (“A2.5”) and the textual content of the short help, displayed in the status line in the course of testing on the given block of questions (subtest) (“A2.7”).

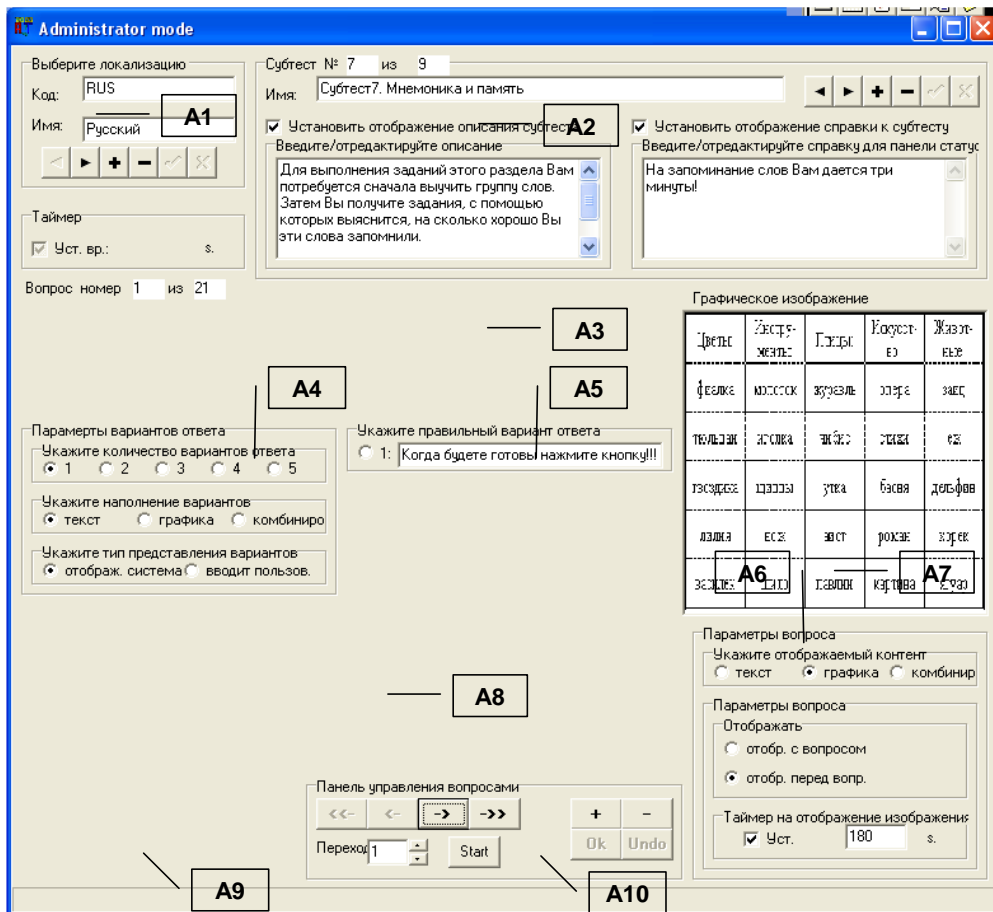
After the setting of parameters of the block of questions (subtest), the selector of the block of questions will take the view, presented in pic. A11.17.

For the displaying of table use the first question

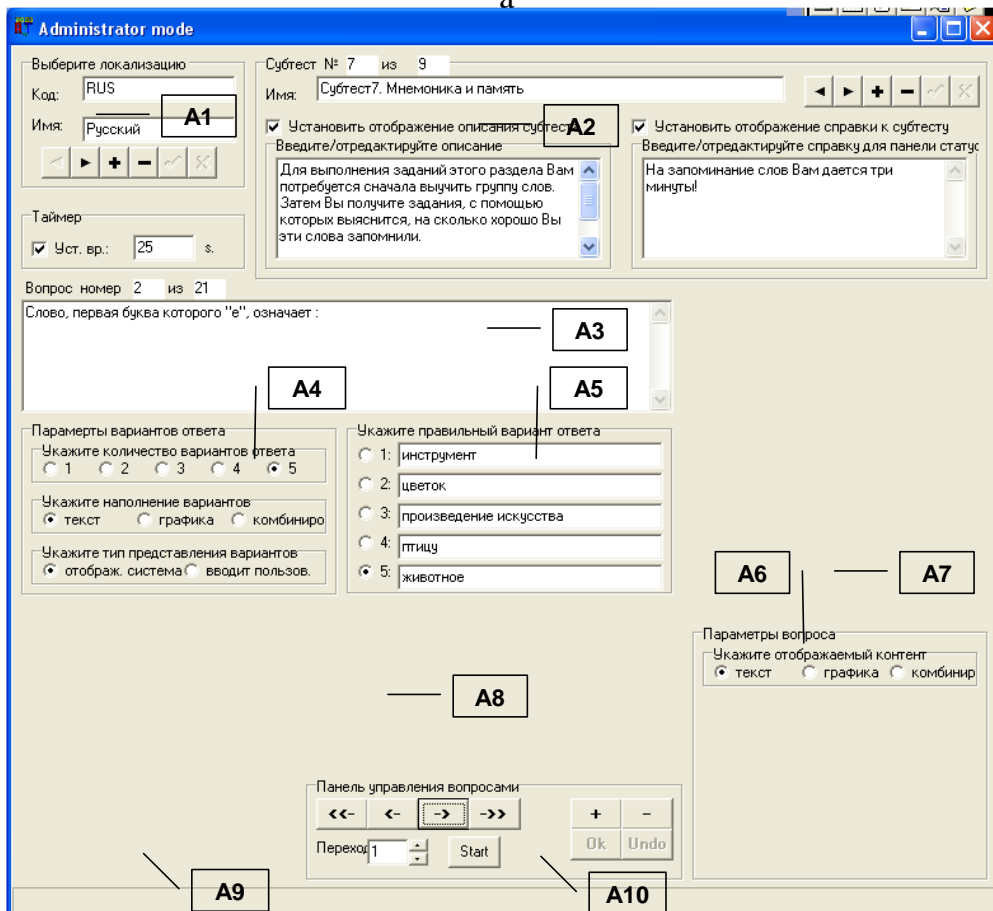
For the displaying the table the first question is used and by means of the control panel of questions in KB (“A10”), the appointment of the elements of which was lead above (pic. A11.8, k): to add of new question of the block of questions (subtest) (“A10.3”); set in the selector of parameters of the variants of answer (“A4” in pic. A11.8, d): 1 variant of answer (“A4.1”), the textual content of the variant of answer (“A4.2”), displayed by the system (“A4.3”); in the selector of parameter of question (“A6”) in pic. A11.8, f): the graphical content of question (“A6.1”), display before the question (“A6.2”), to set the timer on the displaying of image (“A6.3”) and to input the nominal value of the interval of time of 180 sec. (“A6.4”). The result of research (diagnostics) is depicted directly in pic. A11.17, a.

Further, for all subsequent questions in this subtest by means of the control panel of question of BD (“A10”): to add the new question of the block of questions (subtest) (“A10.3”); to set in the selector of parameters of the variants of answer (“A4” in pic. A11.8, d): 5 variants of answer (“A4.1”), the textual content of the variant of answer (“A4.2”), displayed by the system (“A4.3”); in the selector of the parameter of question (“A6” in pic. A11.8, f): the textual content of question of the block of questions (subtest) (“A6.1”); in the indicator of textual content of the variants of answer (“A5” in pic. A11.8, e): the inputting of the text of the variants of answer (“A5.2”) and the selecting of the correct variant of answer (“A5.1”).

The procedure, described directly in the last paragraph, is repeated until the block of questions (subtest) of KB is fully filled. It should be noted, that at the given combination of parameters the groups “A8” and “A9” are not displayed (in accordance with the method of research). The form of interface of the program is presented directly in pic. A11.17, b.



a



b

Picture A11.17. The window of interface at the constructing of the seventh block of questions (subtest)

The features of the structure of the eighth block of questions (subtest) “Flat figures”

In each task one figure is offered to the examinee, divided on the several parts, which are arbitrary in any order. It is necessary to mentally connect the parts and, then, the figure, which turns out, to be found in a row of presented figures.

Thus, the structure of each question of the block of questions (subtest) includes:

- the graphical image (accompanying the formulation of question) – the flat figure, divided on the several parts directly;
- the graphical image (accompanying the formulation of the variants of answer) – with the capability of selection) – 5 graphical images with the flat figures, one of which corresponds to the initial figure directly.

In the given block of questions the algorithm of constructing of questions has minor differences (according to the method of research: in the mode of diagnostics of the formulation of question and the variants of answer include directly the graphical image), but in general similar to the sequence, considered in relation to the first subtest.

In order, that to create the new block of questions (subtest) in KB, it is necessary to use the selector of the block of questions (“A2”), the appointment of elements of which was lead above (pic. A11.8, b): to press the button of addition (“A2.3”); to input the name of the block of questions (“A2.2”); to set the markers of type “check box” (“A2.4” and “A2.6”); then to input the textual content of the formulation of task, displayed directly before the beginning of testing on each block of questions (subtest) of the method of research (test) (“A2.5”) and the textual content of the short help, displayed in the status line during the testing on the given block of questions (subtest) (“A2.7”).

After the setting of parameters of the block of questions (subtest) the selector of the block of questions will take the view, presented in pic. A11.18 (the letter a – the version of inscriptions of the elements of interface in the English language and the letter b – the version of identifiers of the elements of interface in the Russian language).

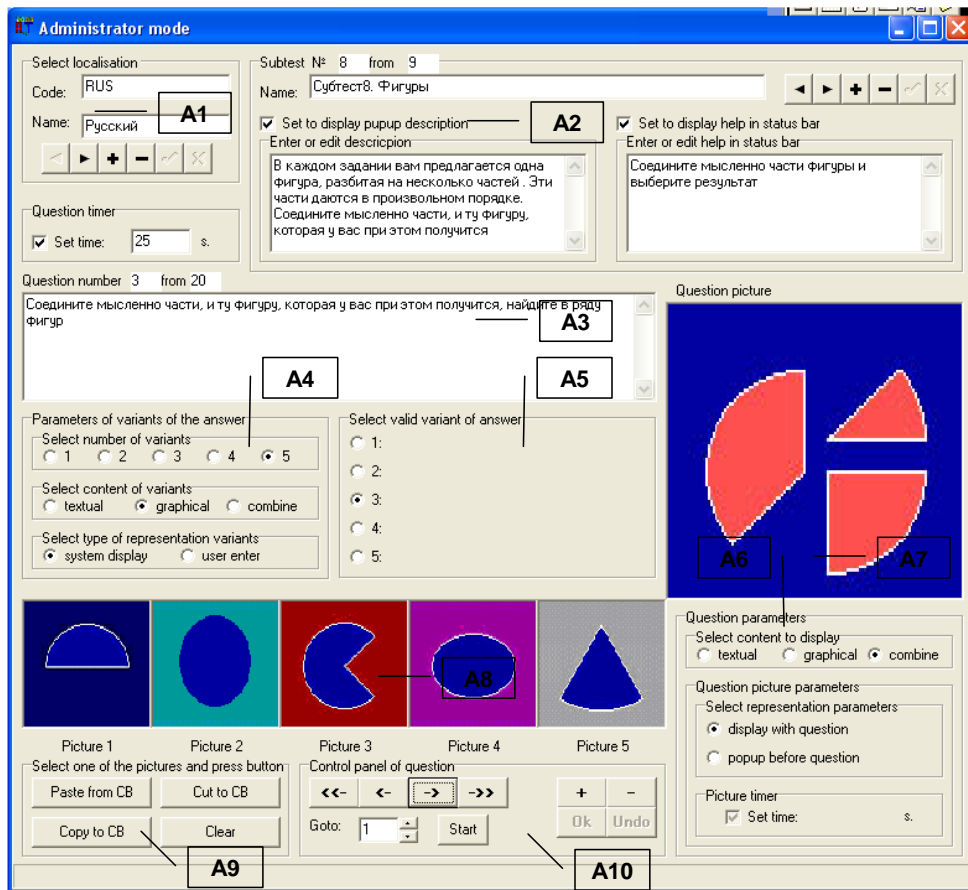
Further, by means of the control panel of questions in KB (“A10”), the appointment of the elements of which was lead above (pic. A11.8, k): to add the new question of the block of questions (subtest) (“A10.3”); set in the selector of parameters of the variants of answer (“A4” in pic. A11.8, d): 5 variants of answer (“A4.1”), the graphical content of the variants of answer (“A4.2”), displayed by the system (“A4.3”); in the selector of the parameters of question (“A6” in pic. A11.8, f): the combined content of question (“A6.1”), to display with the question (“A6.2”); in the indicator of textual content of the variants of answer (“A5” in pic. A11.8, e): only the correct variant of answer (“A5.1”) is selected and the fields (“A5.2”) are not displayed.

For the adding of previously prepared graphical images it is necessary to perform the following sequence of actions directly:

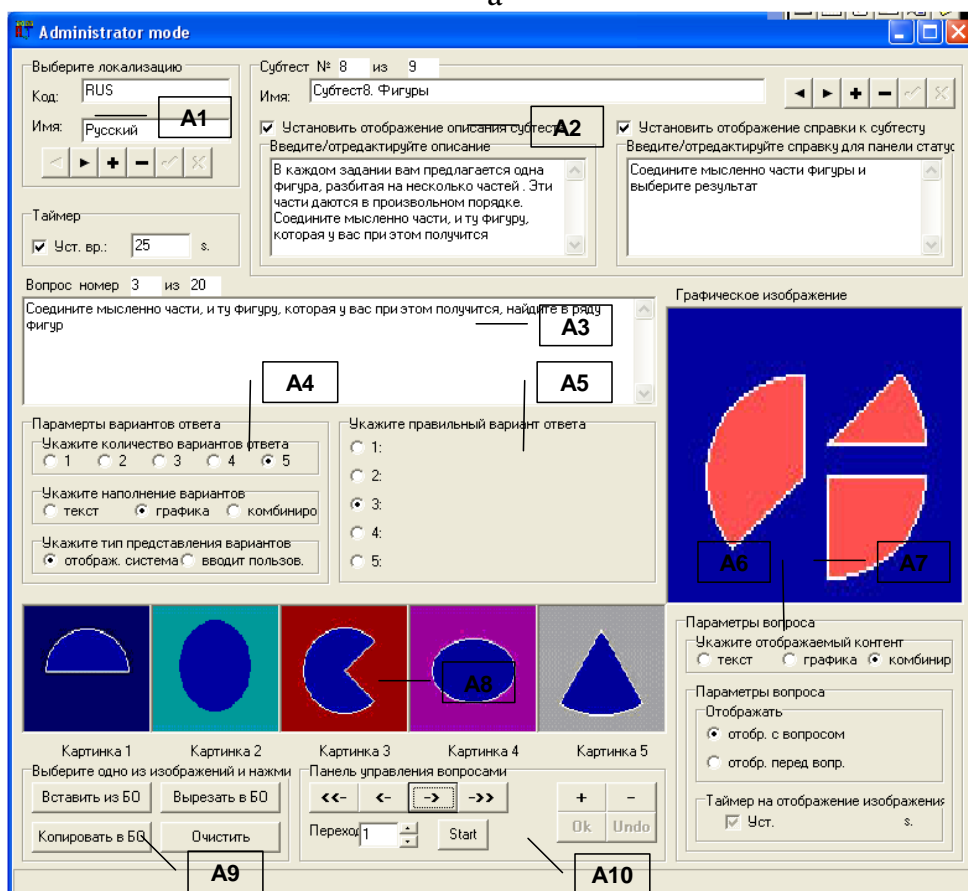
- 1) for the adding of graphical image accompanying the formulation of question: to place the image into the clipboard; to press by the mouse in the indicator of graphical accompanying of the formulation of question (“A7.1”); to press the button “The inserting from the clipboard” (“A9.1”).
- 2) for the adding of graphical images to the variants of answer: to press by the manipulator on the corresponding field (“A8.1” – “A8.5”); to press the button “The inserting from the clipboard” (“A9.1”).

The procedure, described directly in the last two subparagraphs, is repeated until to the complete filling of the block of questions (subtest) of KB.

The form of interface of the program is presented directly in pic. A11.18.



a



b

Picture A11.18. The window of interface at the constructing of the eighth block of questions (subtest)

The features of the structure of the ninth block of questions (subtest) “Cubes”

The proposed to the examinee a row of figures consists from the five cubes. The cubes are located so, that from the six faces at each cube the examinee sees only three. One from these five cubes is also proposed, overturned in an arbitrary view.

The solution of task is coming down to the determination among the five cubes the one, which corresponds to the given separately cube.

Thus, the structure of each question of the block of questions (subtest) includes:

- the graphical image (accompanying the formulation of question) – the graphical image of cube (as the volumetric geometrical figure);
- the graphical image (accompanying the formulation of the variants of answer with the capability of choice) – 5 graphical images of cubes.

In order, that to create the new block of questions (subtest) in KB it is necessary to use the selector of the block of questions (“A2”), the appointment of the elements of which was lead above (pic. A11.8, b): to press the button of addition (“A2.3”); to input the name of the block of questions (“A2.2”); to set the markers of type “check box” (“A2.4” and “A2.6”); then to input the textual content of the formulation of task, displayed directly before the beginning of testing on each block of questions (subtest) of the method of research (test) (“A2.5”) and the textual content of the short help, displayed in the status line during the testing on the given block of questions (subtest) (“A2.7”).

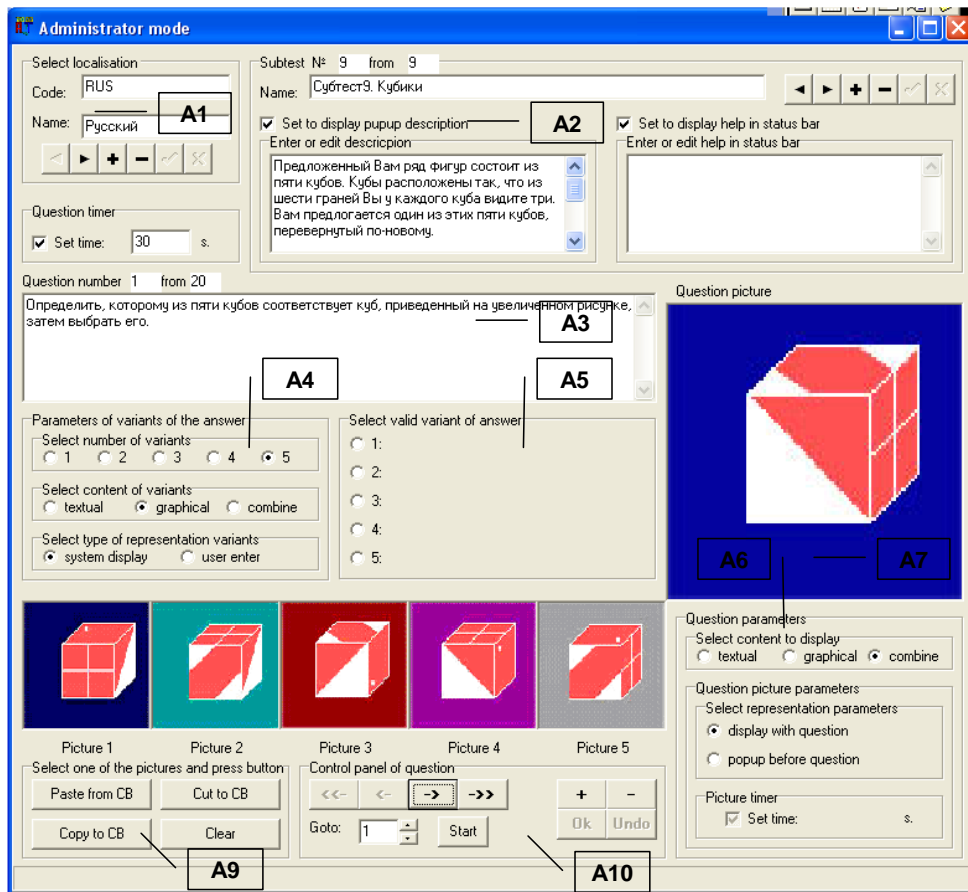
Directly after the setting of parameters of the block of questions (subtest) the selector of the block of questions (subtest) will take the view, presented in pic. A11.19 (the letter a – the version of inscriptions of the elements of interface in the English language and the letter b – the version of identifiers of the elements of interface in the Russian language).

Further, by means of the control panel of questions in KB (“A10”), the appointment of the elements of which was lead above (pic. A11.8, k): to add the new question of the block of questions (subtest) (“A10.3”); to set in the selector of parameters of the variants of answer (“A4” in pic. A11.8, d): 5 variants of answer (“A4.1”), the graphical content of the variants of answer (“A4.2”), displayed by the system (“A4.3”); in the selector of the parameters of question (“A6” in pic. A11.8, f): the combined content of question (“A6.1”), display with the question (“A6.2”); in the indicator of the textual content of the variants of answer (“A5” in pic. A11.8, e): only the correct variant of answer (“A5.1”) is selected and the fields (“A5.2”) are not displayed.

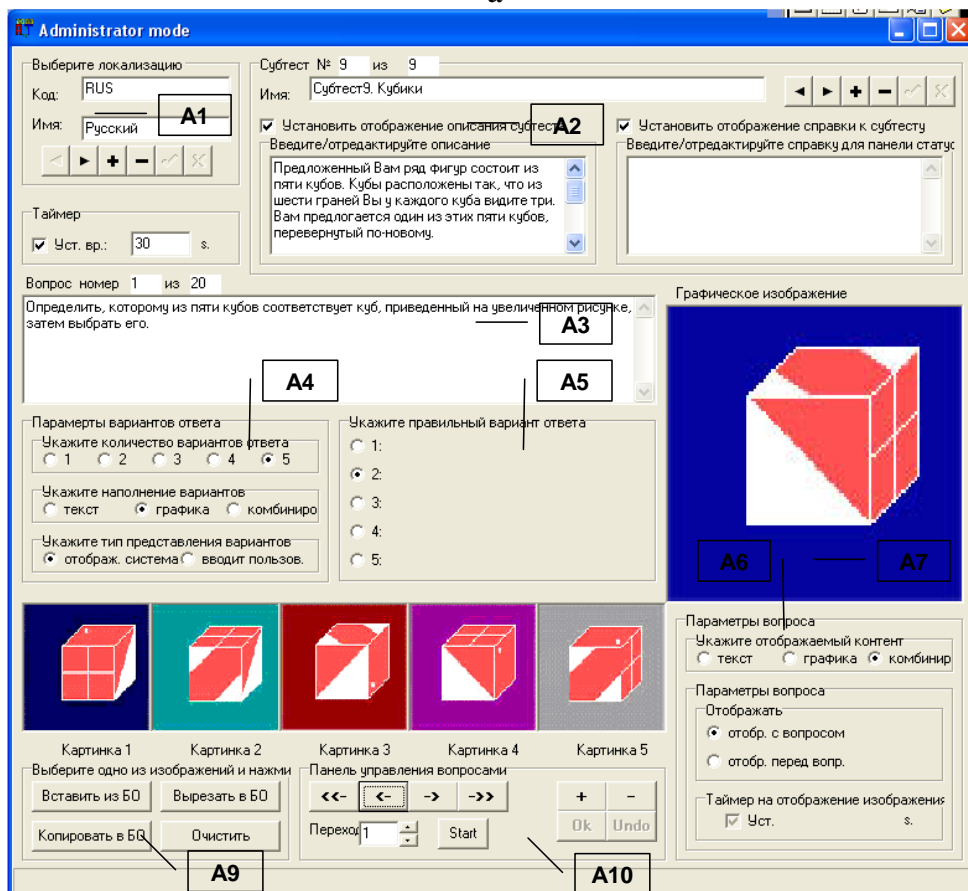
For the adding of the previously prepared graphical images it is necessary to perform a sequence of actions directly:

- 1) for the adding of graphical image accompanying the formulation of question: to place the image into the clipboard; to press by the manipulator on the indicator of graphical accompanying of the formulation of question (“A7.1”); to press the button “The pasting from the clipboard” (“A9.1”);
- 2) for the adding of graphical images to the variants of answer: to press by the manipulator on the corresponding field (“A8.1” – “A8.5”); to press the button “The inserting from the clipboard” (“A9.1”).

The procedure, described directly in the last two subparagraphs, is repeated until to the complete filling of the block of questions (subtest) in KB. The form of interface of the program is presented directly in pic. A11.19.



a



b

Picture A11.19. The window of interface at the constructing of the ninth block of questions (subtest)

A11.1.4.2. The diagnostic mode

It is used for the carrying out of automated research (diagnostics) of the level of convergent intellectual abilities of the examinee.

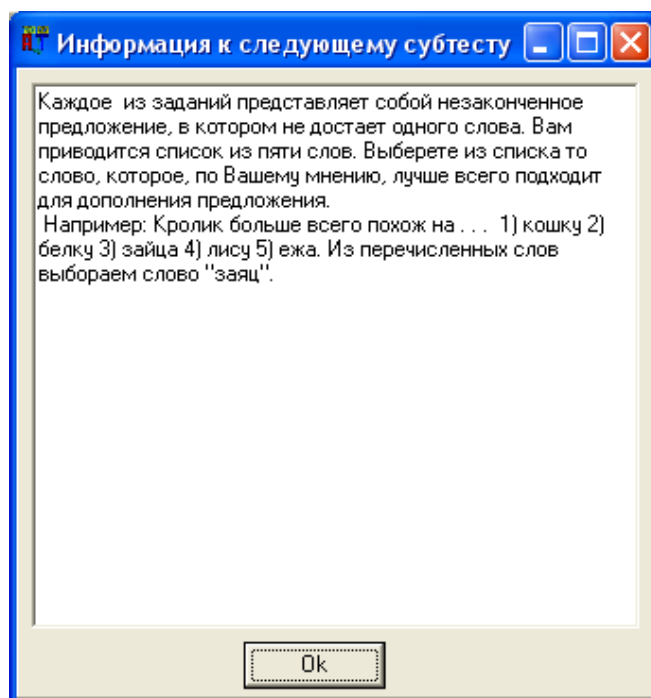
Preliminary in the mode of administrating it is necessary to set the parameters of databases and knowledge base with taking into account the parameters of the blocks of questions (subtests), on the basis of which the testing (diagnostics) of examinees will be carried out.

The entering into the mode of diagnostics is carried out directly from the main window of application, presented in pic. A11.1. For the transition into the mode of testing (diagnostics) it is necessary to use the button "Testing" (the element "M3.2" in pic. A11.6).

After the transition into the mode of diagnostics its characteristic window of interface is displayed, the content of which depends directly from the number of the block of questions (as each subtest has the various structure of the elements of interface).

Further it is proposed to consider the features of the structure of elements in the windows of interface at the working of examinee with using of the various subtests (the blocks of questions).

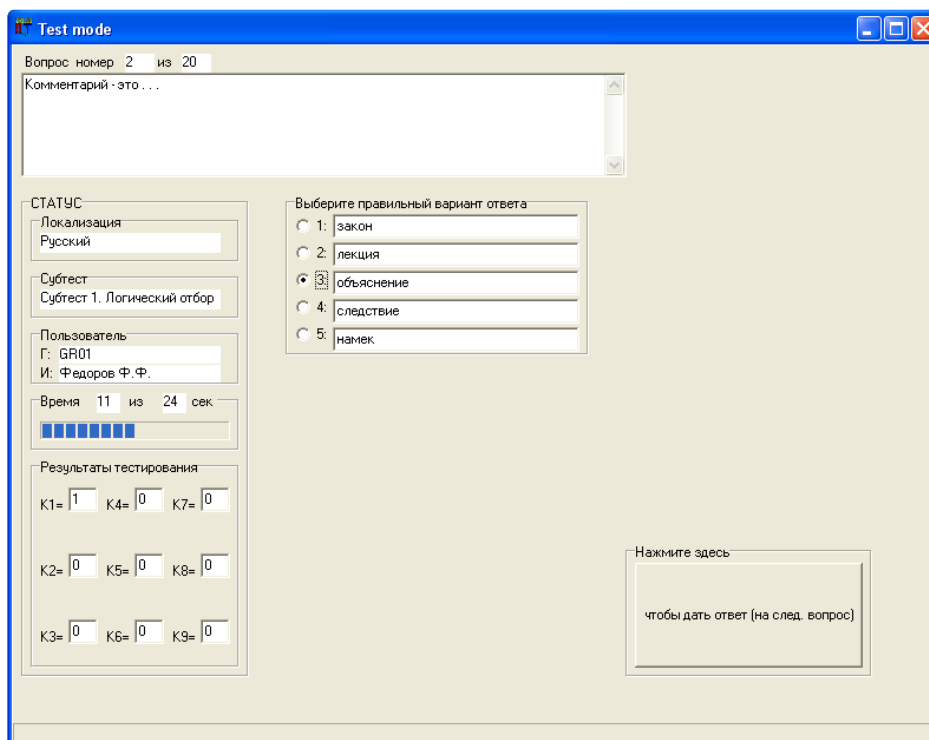
In particular, before the beginning of carrying out of the testing on the first block of questions (subtest) the user is displayed the window (pic. A11.20) with the task (the textual content of the formulation of task of the method of research is inputting in the mode of administrating in the element of interface "A2.5").



Picture A11.20. The window of interface, containing the information necessary for the performing of the first block of questions (subtest)

In fact of the familiarization with the task (question) to the subtest (the block of questions) and the readiness to begin to its execution directly, the final user (the subject of training) needs to press the button “Ok”. The pressing initiates directly the opening of the main window of interface.

In the main window of interface of the program display (pic. A11.21): the name of localization of the method of research; the name of the block of questions (subtest); the group and L.F.P. of examinee; the interval of time to the response of answer, the results of testing on the subtests, representing a set of coefficients (K1-K9).

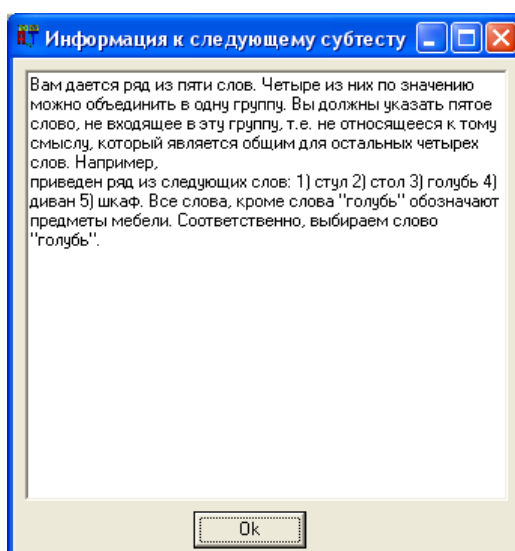


Picture A11.21. The main window of interface in the mode of diagnostics of the examinee with using of the first block of questions (subtest) “The logical selection (the addition of sentences)”

To the examinee needs to select the variant of answer and to press the button, to go to the next question of the block of questions (subtest). If the user does not have time to answer in the course of the allotted interval of time, then automatically carries out the transition to the next question.

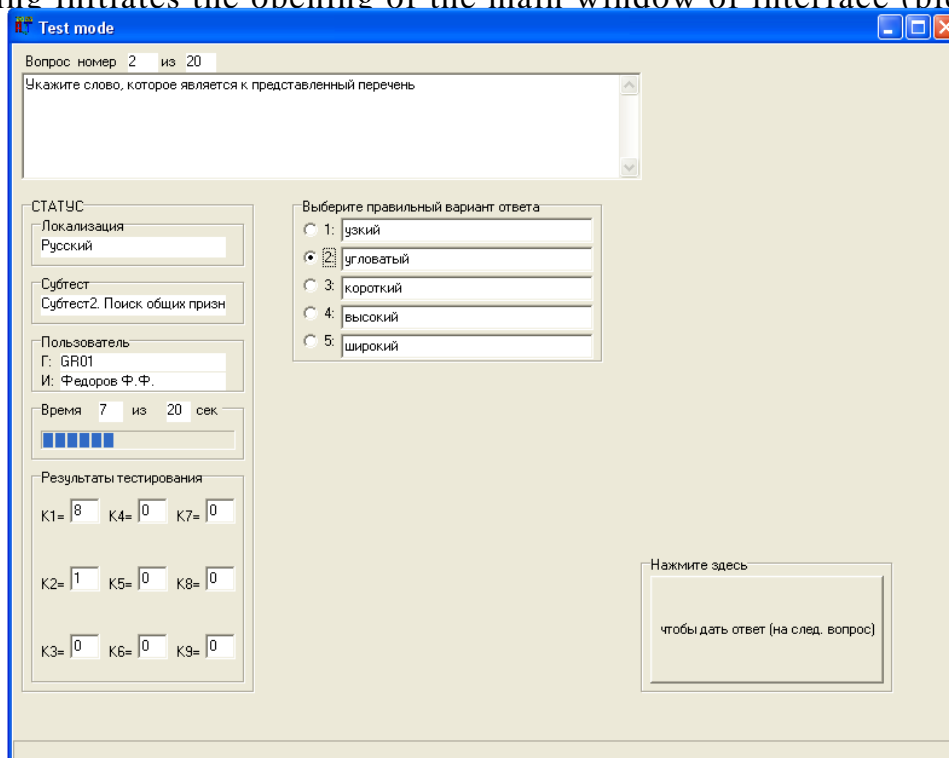
At the completion of the cycle of testing by the first block of questions carries out the transition to the second block of questions (subtest).

Before the beginning of carrying out of the testing on the second block of questions (subtest) to the examinee is displayed the window (pic. A11.22) with the task (the textual content of the formulation of task of the method of research is inputted in the mode of administrating in the element of interface “A2.5”).



Picture A11.22. The window of interface, containing the information of necessary for the execution of the second block of questions (subtest)

In fact of familiarization with the task to the subtest (the block of questions) and the readiness to begin to its execution, the examinee needs to press the button “Ok”. The pressing initiates the opening of the main window of interface (pic. A11.23).



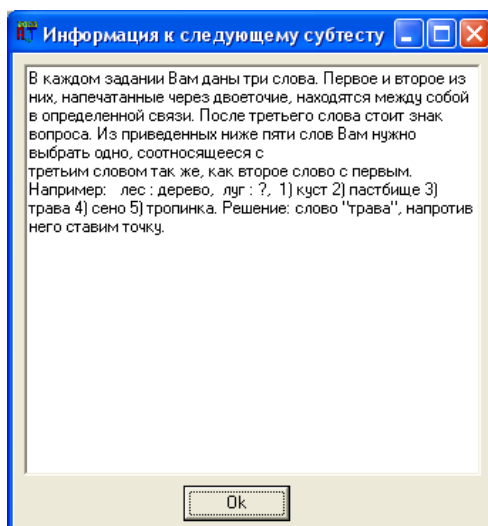
Picture A11.23. The main window of interface in the mode of diagnostics of the examinee with using of the second of block of questions (subtest)

“The finding of general signs”

To the examinee needs to select the variant of answer and to press the button, then to go to the next question of the block of questions (subtest). If the user does not have to answer in the course of the allotted interval of time, then automatically carries out the transition to the next question.

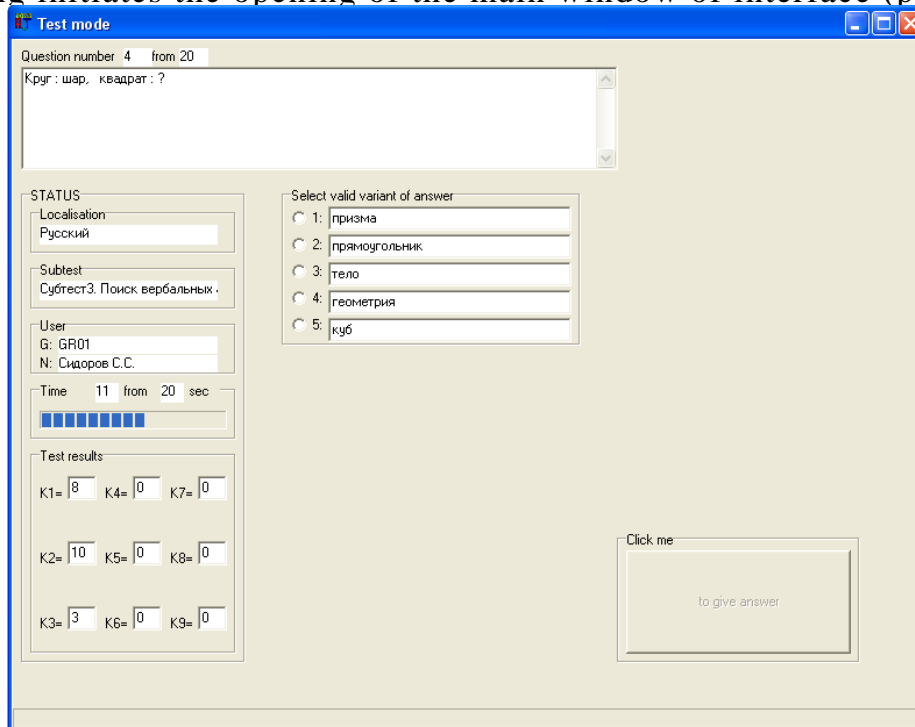
At the completion of the cycle of testing by the second block of questions carries out the transition to the third block of questions (subtest).

Before the beginning of carrying out of the testing on the third block of questions (subtest) to the user is displayed the window (pic. A11.24) with the task (the textual content of the formulation of task of the method of research is inputted in the mode of administrating in the element of interface “A2.5”).



Picture A11.24. The window of interface, containing the information necessary for the performing of the third block of questions (subtest)

In fact of familiarization with the task to the subtest (the block of question) and the readiness to begin to its execution, the user needs to press the button “Ok”. The pressing initiates the opening of the main window of interface (pic. A11.25).



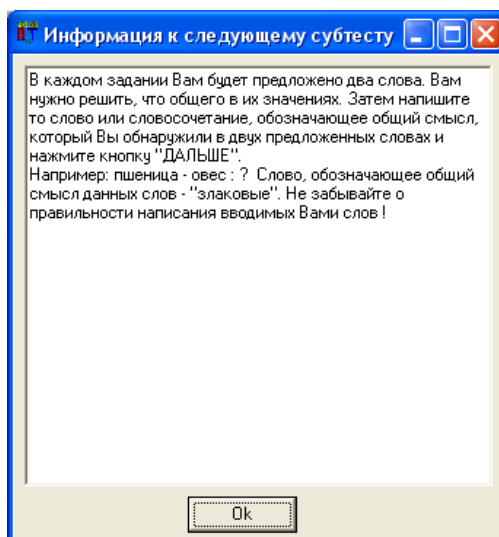
Picture A11.25. The main window of interface in the mode of diagnostics of the examinee with using of the third block of questions (subtest)

“The searching of verbal analogies”

To the examinee needs to select the variant of answer and to press the button, then to go to the next question of the block of questions (subtest). If the user does not have time to answer in the course of the allotted interval of time, then automatically carries out the transition to the next question.

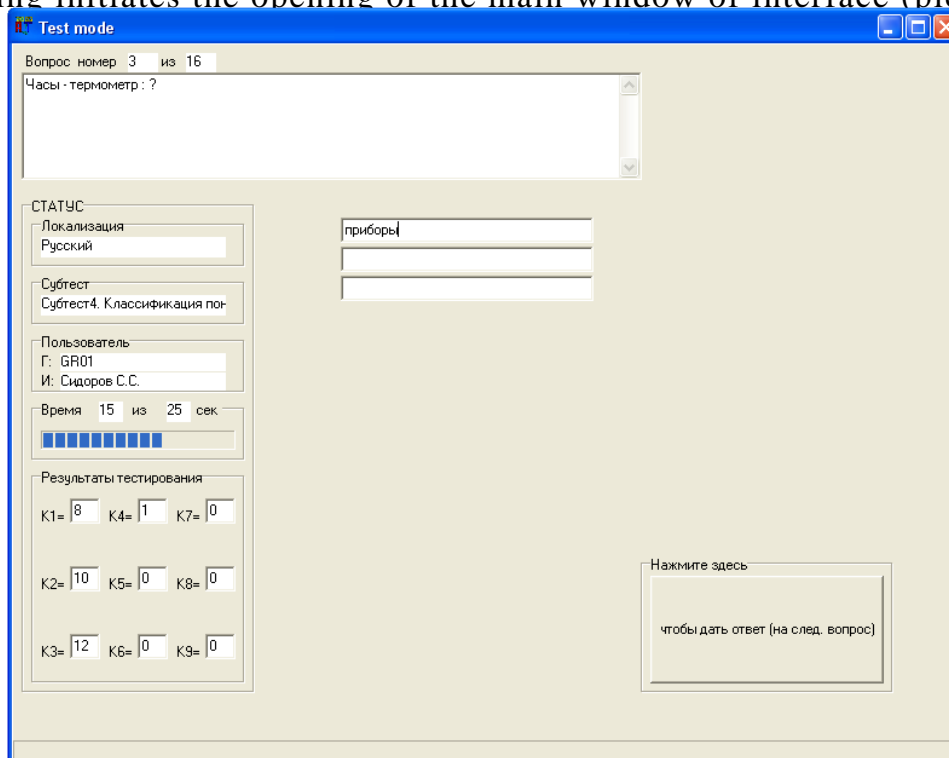
At the completion of the cycle of testing by the third block of questions carries out the transition to the fourth block of questions (subtest).

Before the beginning of carrying out of the testing on the fourth block of questions (subtest) to the user is displayed the window (pic. A11.26) with the task (the textual content of the formulation of task of the method of research is inputting in the mode of administrating in the element of interface “A2.5”).



Picture A11.26. The window of interface, containing the information necessary for the performing of the fourth block of questions (subtest)

In fact of familiarization with the task to the subtest (the block of question) and the readiness to begin its execution, the user needs to press the button “Ok”. The pressing initiates the opening of the main window of interface (pic. A11.27).

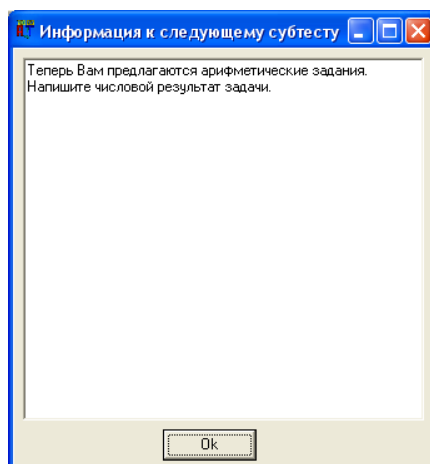


Picture A11.27. The main window of interface in the mode of diagnostics of the examinee with using of the fourth block of questions (subtest)
“The classification of concepts”

To the examinee needs to select the variant of answer option and to press the button, then to go to the next question of the block of questions (subtest) of the method of research. If the user does not have time to answer in the context of the allotted interval of time, then automatically carries out the transition to the next question.

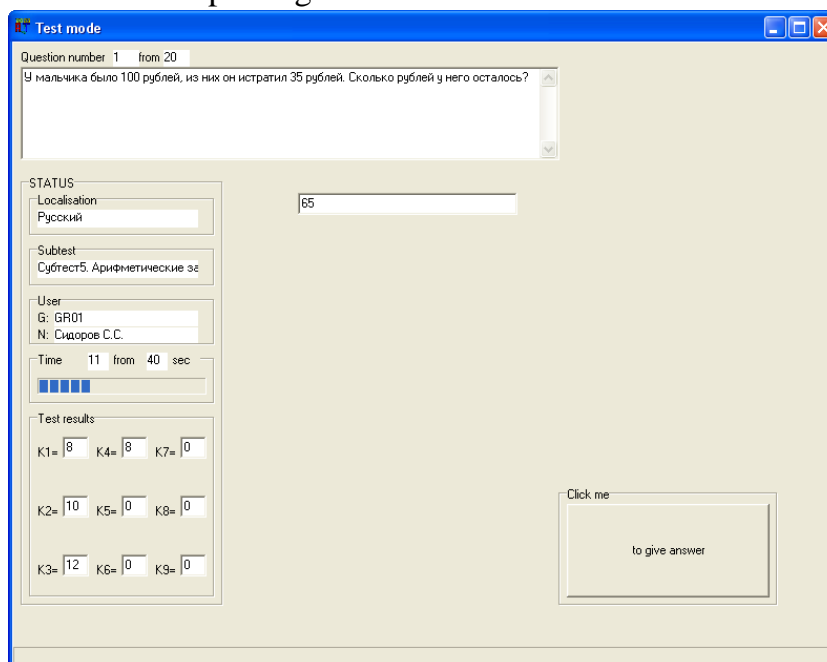
At the completion of the cycle of testing by the fourth block of questions carries out the transition to the fifth block of questions (subtest).

Before the beginning of carrying of the testing by the fifth block of questions (subtest) to the user is displayed the window (pic. A11.28) with the task (the textual content of the formulation of task of the method of research is inputted in the mode of administrating in the element of interface “A2.5”).



Picture A11.28. The window of interface, containing the information necessary for the performing of the fifth block of questions (subtest)

In fact of familiarization with the task to the subtest (the block of questions) and the readiness to begin to its execution, to the user needs to press the button “Ok”. The pressing initiates the opening of the main window of interface (pic. A11.29).

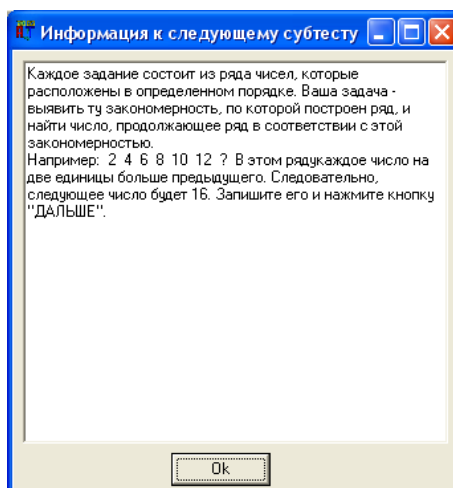


Picture A11.29. The main window of interface in the mode of diagnostics of the examinee with using of the fifth block of questions (subtest) “Arithmetic tasks”

The examinee needs to select the variant of answer and to press the button, then to go to the next question of the block of questions (subtest) of the method of research. If the user does not have time to answer in the course of the allotted interval of time, then automatically carries out the transition to the next question.

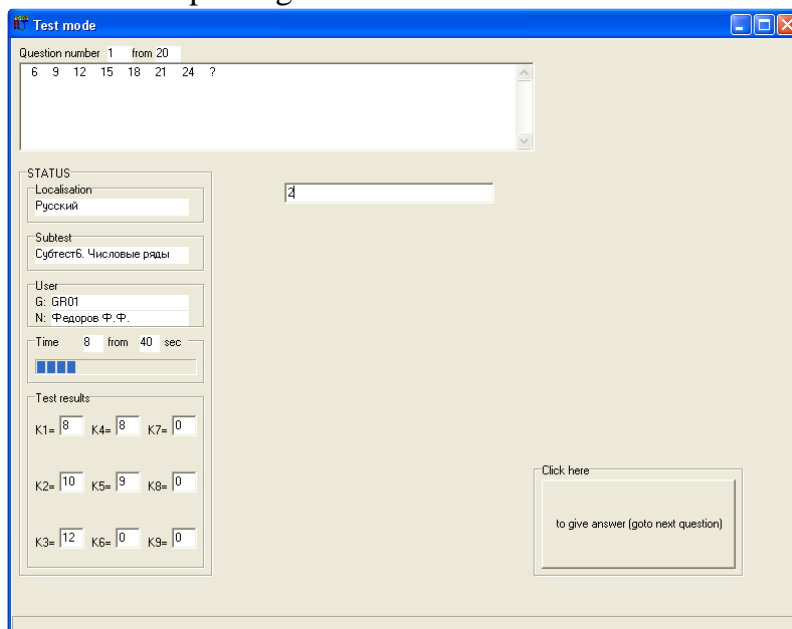
At the completion of the cycle of testing by the fifth block of questions carries out the transition to the sixth block of questions (subtest).

Before the beginning of carrying out of the testing on the sixth block of questions (subtest) the user is displayed the window (pic. A11.30) with the task (the textual content of the formulation of task of the method of research is inputted in the mode of administrating in the element of interface “A2.5”).



Picture A11.30. The window of interface, containing the information necessary for the performing of the sixth block of questions (subtest)

In fact of familiarization with the task to the subtest (the block of questions) and the readiness to begin to its execution, the user needs to press the button “Ok”. The pressing initiates the opening of the main window of interface (pic. A11.31).

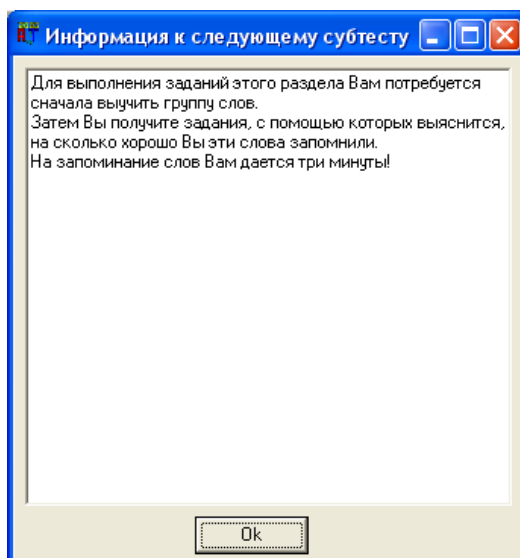


Picture A11.31. The main window of interface in the mode of diagnostics of the examinee with using of the sixth block of questions (subtest) “The number series”

To the examinee needs to select the variant of answer and to press the button, then to go to the next question of the block of questions (subtest) of the method of research. If the user does not have time to answer in the course of the allotted interval of time, then automatically carries out the transition to the next question.

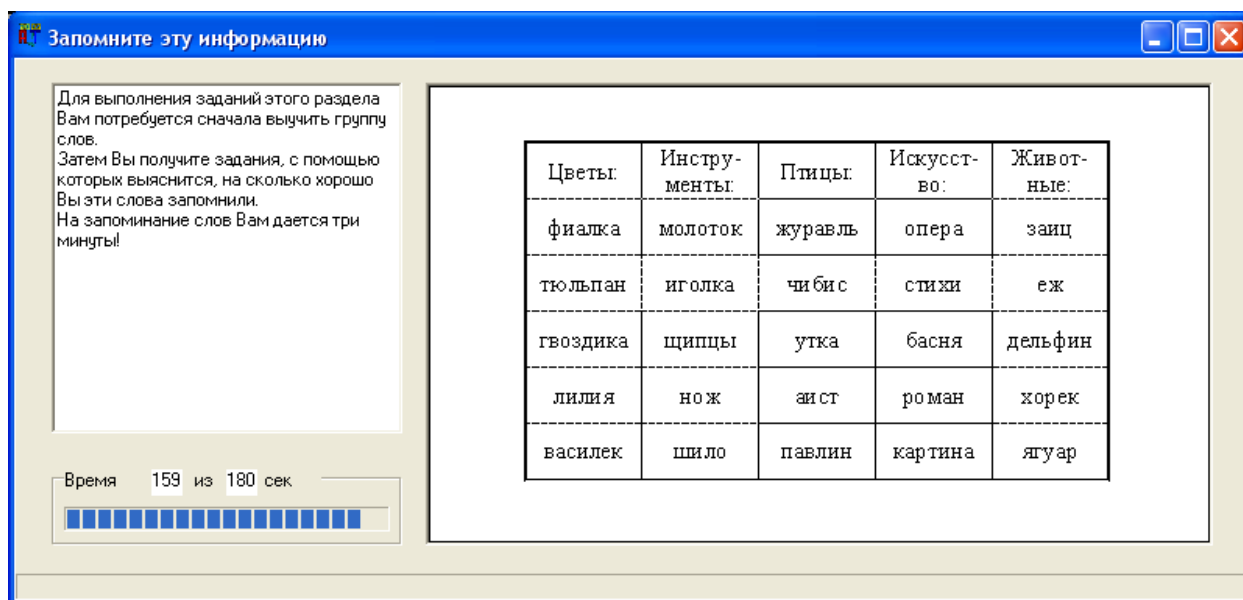
At the completion of the cycle of testing on the sixth block of questions carries out the transition to the seventh block of questions (subtest).

Before the inputting of carrying out of the testing on the seventh block of questions (subtest) the user is displayed the window (pic. A11.32) with the task (the textual content of the formation of task of the method of research is inputted in the mode of administrating in the element of interface “A2.5”).



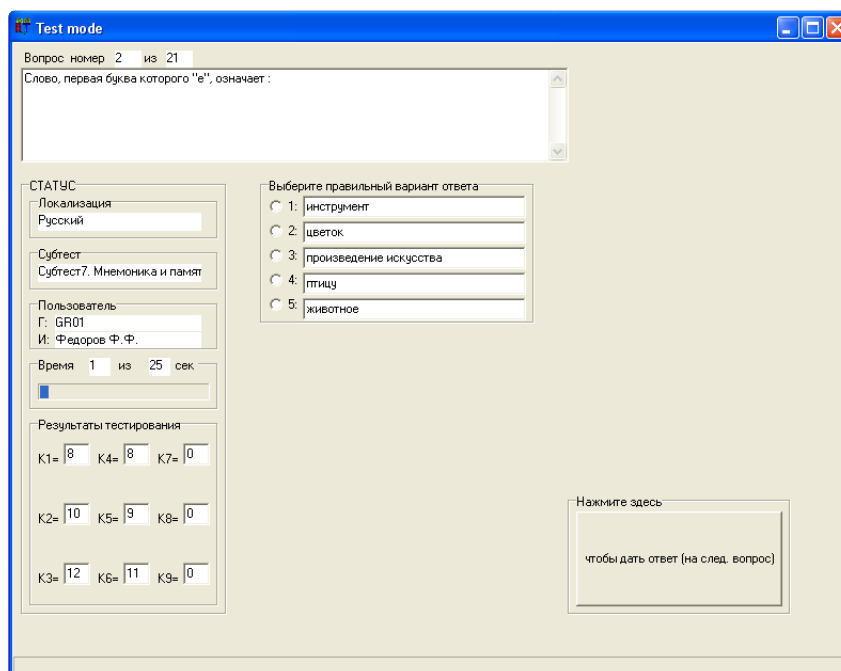
Picture A11.32. The window of interface, containing the information necessary for the performing of the seventh block of questions (subtest)

In form of familiarization with the task to the subtest (the block of questions) and the readiness to begin to its execution directly, to the final user needs to press the button “Ok”. The pressing initiates the opening of the main window of interface (pic. A11.33).



Picture A11.33. The window of interface, containing the information for the remembering

After the completion of the certain interval of time, allotted on the visual representation of information to the examinee with the purpose of its remembering, is carried out the transition to the main part of the seventh block of questions (pic. A11.34).



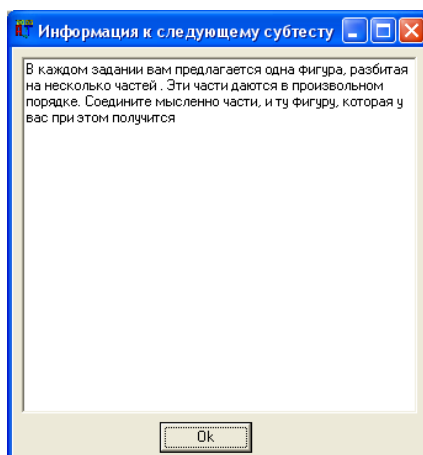
Picture A11.34. The main window of interface in the mode of diagnostics of the examinee with using of the seventh block of questions (subtest)

“Mnemonics and memory”

To the examinee needs to select the variant of answer and to press the button, then to go to the next question of the block of questions (subtest) of the method of research. If the user does not have time to answer in the course of the allotted interval of time, then automatically carries out the transition to the next question.

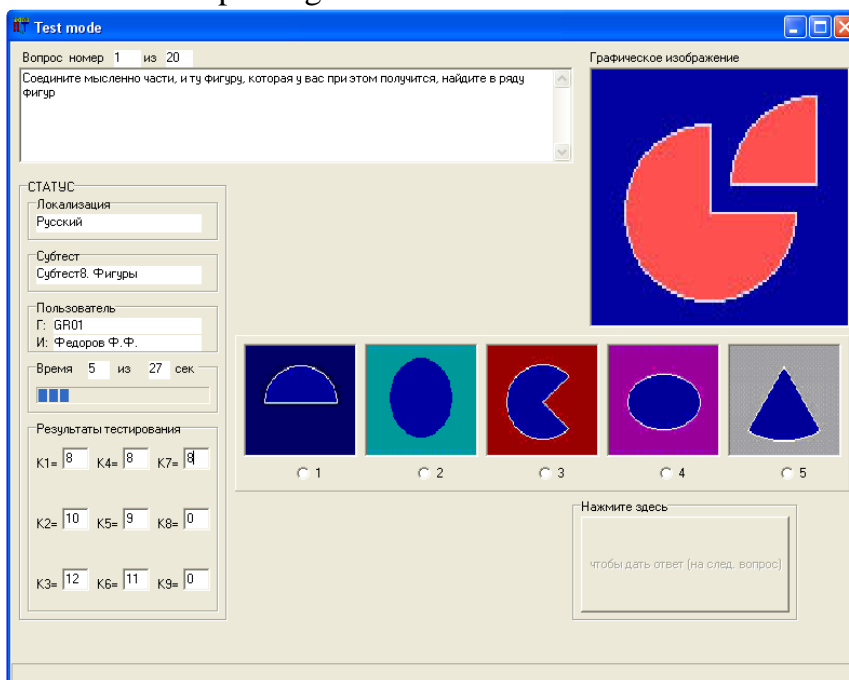
At the completion of the cycle of testing on the seventh block of questions carries out the transition to the eighth block of questions (subtest).

Before the beginning of carrying out of the testing on the eighth block of questions (subtest) the user is displayed the window (pic. A11.35) with the task (the textual content of the formulation of task of the method of research is inputted in the mode of administrating in the element of interface “A2.5”).



Picture A11.35. The window of interface, containing the information necessary for the performing of the eighth block of questions (subtest)

In fact of familiarization with the task to the subtest (the block of questions) and the readiness to begin to its execution, to the user needs to press the button “Ok”. The pressing initiates the opening of the main window of interface (pic. A11.36).

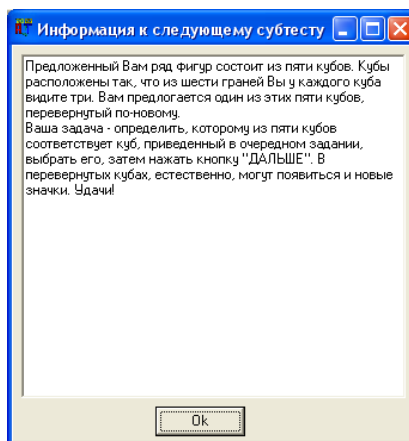


Picture A11.36. The main window of interface in the mode of diagnostics of the examinee with using of the eighth block of questions (subtest)

To the examinee needs to select the variant of answer and to press the button, then to go to the next question of the block of questions (subtest) of the method of research. If the user does not have time to answer in the course of the allotted interval of time, then automatically carries out the transition to the next question.

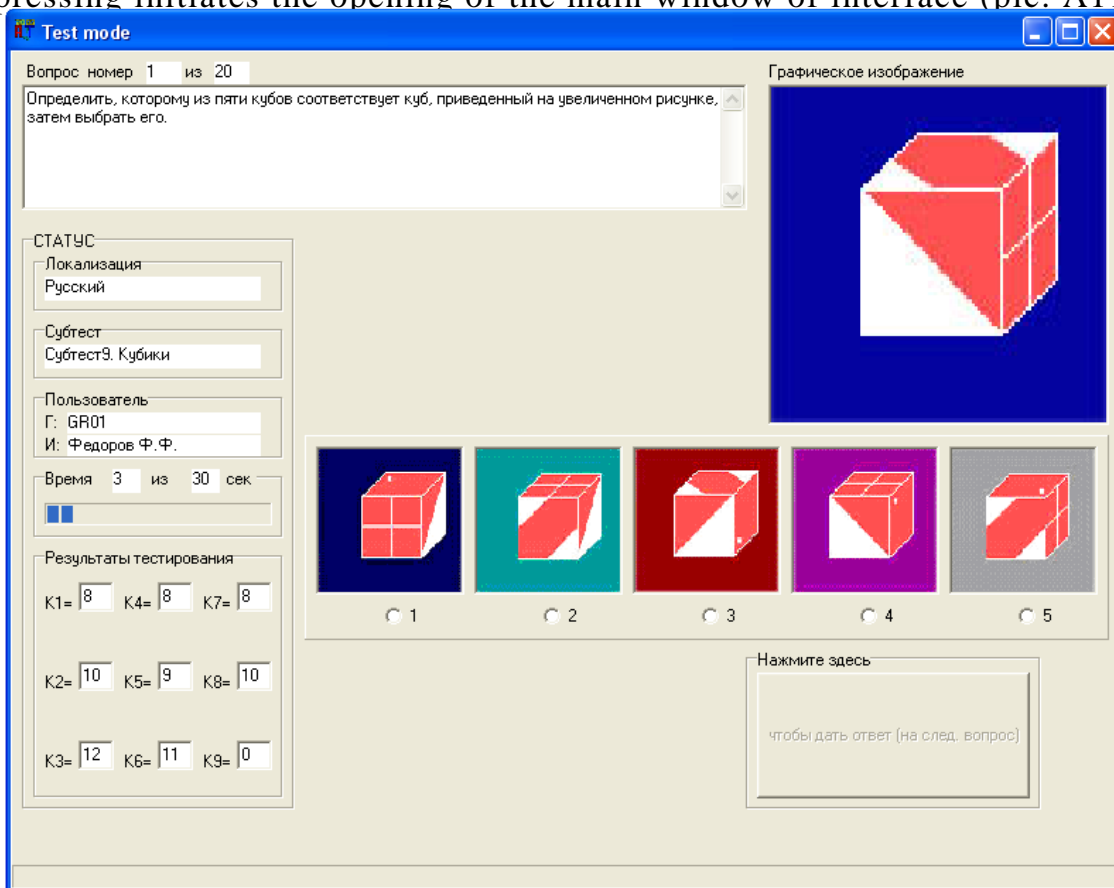
At the completion of the cycle of testing on the eighth block of questions carries out the transition to the ninth block of questions (subtest).

Before the beginning of carrying of the testing on the ninth block of questions (subtest), the user is displayed the window (pic. A11.37) with the task (the textual content of the formulation of task of the method of research is inputted in the mode of administrating in the element of interface “A2.5”).



Picture A11.37. The window of interface, containing the information necessary for the performing of the ninth block of questions (subtest)

In fact of familiarization with the task to the block of questions (subtest) and the readiness to begin to its execution, to the user needs to press the button “Ok”. The pressing initiates the opening of the main window of interface (pic. A11.38).



Picture A11.38. The main window of interface in the mode of diagnostics of the examinee with using of the ninth block of questions (subtest)

The examinee needs to select the variant of answer and to press the button, then to go to the next question of the block of questions (subtest) of the method of research. If the user does not have time to answer in the course of the allotted interval of time, then automatically carries out the transition to the next question.

At the moment of completion of the cycle of testing a set of coefficients (K1-K9) is formed on the ninth block of questions, which characterize the vector of convergent intellectual abilities of the examinee.

After the completion of the cycle of testing to the examinee need to close the window of interface, which corresponds to the mode of diagnostics, and then to close the main window of application.

Appendix 12 (mandatory).
**The results of statistical processing of a posteriori data
of research of the automated training environment
with the properties of adaptation based on the cognitive models
by means of the cognitive modeling technology
for the system analysis
of the information-educational environment for 2006-2008 y.**

The purpose of the dissertation research is the increasing in the efficiency of functioning of the information-educational environment of the automated (distance) training due to the means of realization of the individually-oriented formation of knowledge of the trainee with using of the adaptive generation of educational influences based on the parametrical cognitive models block.

The plan of automated experiment is oriented on the achievement of purpose, the confirming of the hypothesis of dissertation research, and also the reliability of the obtained scientific results and the adequacy of the proposed principles, the cognitive models, the cognitive modeling technology, methodical, brainware and software in the process of research.

The plan of experiment provides the research of the vectors of parameters, included into the portraits of the cognitive model of the subject of training, respectively includes:

- the primary diagnostics (identification) of the considered parameters with using of a set of applied methods – is carried out by means of the applied diagnostic module, the practical use of which provides the automation of routine operations and significantly reduces the performance of the program of experimental researches;
- the preliminary statistical processing of a posteriori data of experiment – it is achieved due to the means of formation of the samples for the subsequent statistical processing of data;
- the statistical analysis of formed samples – the revealing statistical regularities with the using of various methods.

At the stage of primary diagnostics the program of experimental researches included the automated diagnostics of the nominal values of the vectors of parameters of the physiological, psychological and linguistic portraits of the cognitive model of the subject of training (the structure of the cognitive model is presented in the section 4 of dissertation).

The physiological portrait of the cognitive model of the subject of training is formed on the scientific basis of the physiology of sensory systems (analyzers). The diagnostics of parameters of the physiological portrait provides the using of the method of interviewing and a row of applied methods, realized in the basis of the applied diagnostic module, allowing to reveal directly the presence / absence of the various anomalies of the visual and acoustical sensory systems:

- the anomalies of refraction – the method of questionnaire and interviewing (the interviewing of certain examinee with the purpose of revealing astigmatism, myopia or hypermetropia of the visual sensory system);
- the anomalies of perception – the method of research of Sivtsev D.A. (acuity of vision), the method of research of “the perimeter of Forster K.F.R.” (field of vision);
- the anomalies of color-perception – the method of research of Rabkin E.B. (the revealing of achromates, abnormal trichromates and dichromates: achromats, protanopes, deuteranopes and tritanopes);
- the anomalies of acoustical sensory system, caused by the violations of functions of the external, middle and internal ear (not considered in the given work).

The diagnostics of the nominal values of parameters of the psychological portrait provides the using of a row of the applied methods of research, realized in the basis of the applied diagnostic module, allowing to reveal the level of development of the key parameters, characterizing the features of mental activity of the psychophysiological construct of the head brain of examinee at the processing of incoming information:

- the convergent intellectual abilities – the method of research of Amthauer R. in the adaptation of Galkina T.V., "The institute of psychology of "RAS"" (the revealing of the level of development of the verbal intellect, the abilities to reasoning, the analytical thinking, the combinatorial abilities, the deductive and inductive thinking, mnemonics and memory, the planar and volumetric thinking);
- the divergent intellectual abilities – the method of research of Mednik S.A. and Torrens E.P. in the adaptation of Alekseeva L.G. and Galkina T.V., "The institute of psychology" of "RAS" (the revealing of the level of development of the verbal creativity: the index of associativity, the index of originality and the index of uniqueness and the index of selectivity; the revealing of the level of development of the figurative creativity: the index of associativity, the index of originality, the index of uniqueness and the index of selectivity);
- the bipolar cognitive styles (not measured) – the method of research of Vitkin G.A., Kagan J. and others the revealing of the level of bipolar indicators: field-dependence and field-independence, impulsivity and reflexivity, rigidity and flexibility, concretization and abstraction, cognitive simplicity and cognitive difficulty, categorical narrowness and categorical wideness);
- learning-ability (not directly measured) – the revealing of predisposition to the implicit or explicit learning-ability of examinee based on the ratio of indicators, characterizing the level of development of the convergent and divergent intellectual abilities, and also academic-performance in the disciplines of secondary (general) education.

The diagnostics of the nominal values of parameters of the linguistic portrait provides the using of a row of special methods of research, realized in the basis of the applied diagnostic module, allowing to reveal the level of development of key parameters, characterizing the linguistic abilities of the subject of training in the process of understanding of the content of presented information:

- the level of proficiency in the language of statement of the material – the method of research of “The Colchester educational centre (Great Britain) for the English language;
- the level of proficiency in the dictionary of terms – the method of research is proposed by the teacher-author of methodical support in the discipline;
- the level of proficiency in the elements of interface of the means of training – the method of research is offered by the technical specialist, carrying out the accompanying of the automated means of training (at distance).

The registration of a posteriori data of the automated testing (diagnostics) of the values of each vector of parameters of the cognitive model of the examinee (the subject of training) was carried out in parallel into the database of the complex of programs and on the specially developed cards, that allows subsequently made it possible to reveal by the comparing of the values of indicators the correctness of functioning of the algorithms and procedures, realizing the various methods of research of the parameters in the basis of the applied diagnostic module.

In the course of the procedure of automated testing of the contingent of trainees a posteriori data was accumulated in the context of the several experimental groups.

At the stage of preliminary statistical processing of a posteriori data a row of samples is formed, reflecting the nominal values of parameters of the physiological, psychological and linguistic portraits of the cognitive model of the several experimental groups of examinees. The automation of the process of statistical processing and analysis of a posteriori data was achieved due to the using of the computer programs “MS Excel”, “SPSS” and “Statistica”.

The formation of tables and graphs of the distribution of frequencies and did not allow to reveal the significant heterogeneities in the distribution of the nominal values of parameters, therefore was a need of the additional statistical analysis. As one from the most important requirements is compliance to the normal law of distribution of the nominal values of parameters, then there was a need of the corresponding checking with using of the graphical (the quartile graphs and the graphs of accumulated frequencies), the analytical (asymmetry and excess) and criterion (the criterion λ - Kolmogorov-Smirnov) methods.

At the calculating of critical values for the asymmetry and excess (tabl. A12.1), the formulas recommended by Pustyl'nik E.I. were used:

$$A_{kp} = 3\sqrt{\frac{6(n-1)}{(n+1)(n+3)}} \text{ and } E_{kp} = 5\sqrt{\frac{24n(n-2)(n-3)}{(n+1)^2(n+3)(n+5)}}, \text{ where } n - \text{the volume of the analyzed sample of data.}$$

The error of representativeness of these indicators is respectively $m_A = \sqrt{\frac{6}{n}}$ and $m_E = 2\sqrt{\frac{6}{n}}$.

The comparison of the empirical (see the descriptive statistics for each sample) and critical values allows to talk with the sufficient certainty about the correspondence of distribution of the values to the normal law (on the condition $t_A = \frac{|A_{эмн}|}{m_A} \geq 3$ and $t_E = \frac{|E_{эмн}|}{m_E} \geq 3$).

In order, that to exclude (“to filter”) the abnormal values (“emissions”) of the researched parameters it is necessary to note the characteristic feature of the normal distribution: 95.44% of nominal values are located in the interval $\bar{x} \pm 2\sigma$, that allows to calculate the lower and upper threshold values for the statistical analysis of each sample of a posteriori data. To illustrated presentation deviation of values in the samples from their average z-transformation directly based on $z_i = \frac{x_i - \bar{x}}{\sigma_x}$ is used.

The procedure of linear standardization made it possible to convert the initial values and to select the optimal scale for their presentation (comparation).

**The errors of representativeness and the critical values of asymmetry and excess
for the primary statistical analysis of a posteriori data**

The indicator / group	The experimental group of examinees			
	the first	the second	the third	the fourth
The volume of sample	20	21	25	18
The error of representativeness of asymmetry (m_A)	0,548	0,535	0,49	0,577
The critical value of asymmetry (A_{cr})	1,458	1,43	1,334	1,517
The error of representativity of excess (m_E)	1,095	1,069	0,98	1,155
The critical value of excess ($E_{\kappa p}$)	3,805	3,777	3,656	3,856

In the subsequent tables the preliminary results of research of the vectors of parameters of the physiological portrait of 1-4 experimental groups of examinees (the subjects of training) and their descriptive statistics is presented, which allow to make the conclusion about the absence of the brightly expressed anomalies of perception of the polychromatic spectrum of the visual sensory system, and also the statistical homogeneity of the analyzed samples of a posteriori data.

In particular, tabl. A12.2-A12.9 contain the results of research of the color-perception by the method of research of Rabkin E.B. and their descriptive statistics in the groups 1-4 respectively, and in pic. A12.1-A12.4 presents the graphical interpretation of a posteriori data.

Table A12.2

The results of research of the color-perception of trainees in the first group

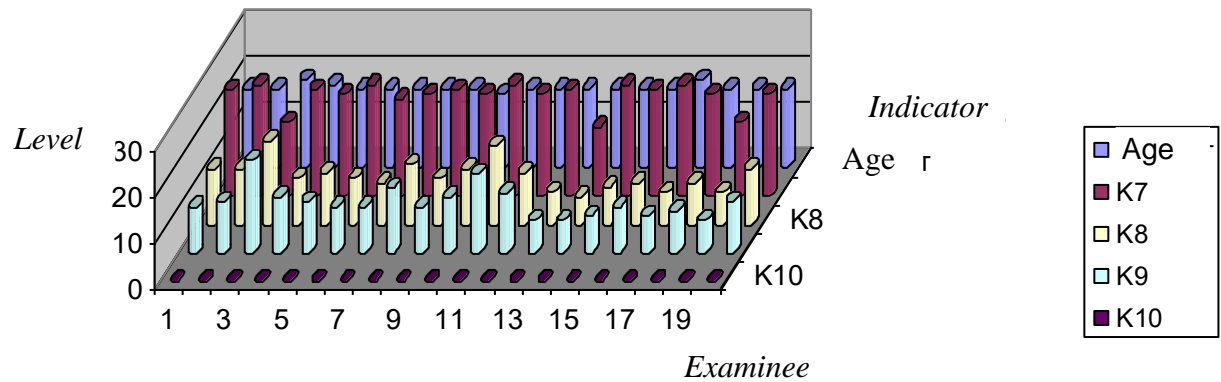
№ of examinee	Age	K_7 trichromasia (achromasia)	K_8 protanopia	K_9 deutanopia	K_{10} tritanopia
1	17	23	12	10	0
2	17	24	12	11	0
3	19	16	18	18	0
4	18	23	10	12	0
5	17	22	11	11	0
6	17	24	10	10	0
7	17	21	9	10	0
8	17	22	13	14	0
9	17	23	10	10	0
10	16	22	12	12	0
11	17	24	17	17	0
12	17	22	11	13	0
13	17	23	7	7	0
14	17	15	6	7	0
15	17	24	8	8	0
16	17	23	9	10	0
17	19	24	7	8	0
18	17	22	9	9	0
19	17	16	7	7	0
20	17	22	12	11	0

Table P12.3

The descriptive statistics of a posteriori data of research of the color-perception in the first group of examinees

The coefficient / The indicator	Age	K_7	K_8	K_9	K_{10}
Average	17,2	21,75	10,5	10,85	0
The standard error	0,156	0,619	0,698	0,737	0
Mediana	17	22,5	10	10	0
Mode	17	22	12	10	0
The standard deviation	0,696	2,77	3,12	3,297	0
The dispersion of sample	0,484	7,671	9,737	10,871	0
Excess	3,703	1,866	0,974	2,188	-
Asymmetry	1,791	-1,71	0,924	1,331	-
Interval	3	9	12	13	0
Minimum	16	15	6	7	0
Maximum	19	24	18	20	0
Sum	344	435	210	217	0
Account	20	20	20	20	20
The level of reliability (95.0%)	0,326	1,296	1,46	1,543	0

The age and anomalies of color-perception of examinees of the first group



Picture A12.1. The diagram, reflecting the age and the anomalies of color-perception of trainees of the first group

Table A12.4

The results of research of the color-perception of trainees in the second group

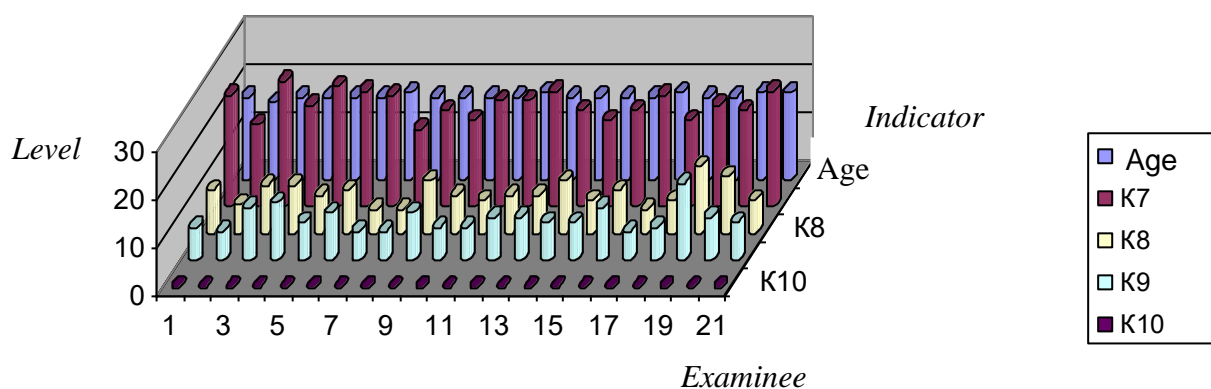
№ of examinee	Age	K_7 trichromasia	K_8 protanopia	K_9 deuteranopia	K_{10} tritanopia
1	17	23	9	7	0
2	16	17	6	6	0
3	17	26	10	11	0
4	17	21	10	12	0
5	17	25	8	8	0
6	17	24	9	10	0
7	18	23	5	6	0
8	17	16	5	6	0
9	17	20	11	10	0
10	17	18	8	7	0
11	17	22	7	7	0
12	18	22	8	9	0
13	17	24	8	9	0
14	17	20	11	8	0
15	17	18	7	8	0
16	17	20	9	11	0
17	18	23	5	6	0
18	17	18	7	7	0
19	17	21	14	16	0
20	18	20	12	9	0
21	18	24	7	8	0

Table A12.5

**The descriptive statistics of a posteriori data of research
of the color-perception in the second group of examinees**

The coefficient / The indicator	Age	K_7	K_8	K_9	K_{10}
Average	17,191	21,191	8,381	8,619	0
The standard error	0,112	0,604	0,519	0,537	0
Median	17	21	8	8	0
Mode	17	20	8	7	0
The standard deviation	0,512	2,768	2,377	2,459	0
The dispersion of sample	0,262	7,662	5,648	6,048	0
Excess	0,603	-0,841	0,124	2,745	-
Asymmetry	0,355	-0,171	0,534	1,425	-
Interval	2	10	9	10	0
Minimum	16	16	5	6	0
Maximum	18	26	14	16	0
Sum	361	445	176	181	0
Account	21	21	21	21	20
The level of reliability (95.0%)	0,233	1,26	1,082	1,119	0

The age and anomalies of color-perception of examinees of the second group



Picture A12.2. The diagram, reflecting the age and the anomalies of color-perception
of trainees of the second group

Table A12.6

The results of research of color-perception of trainees in the third group

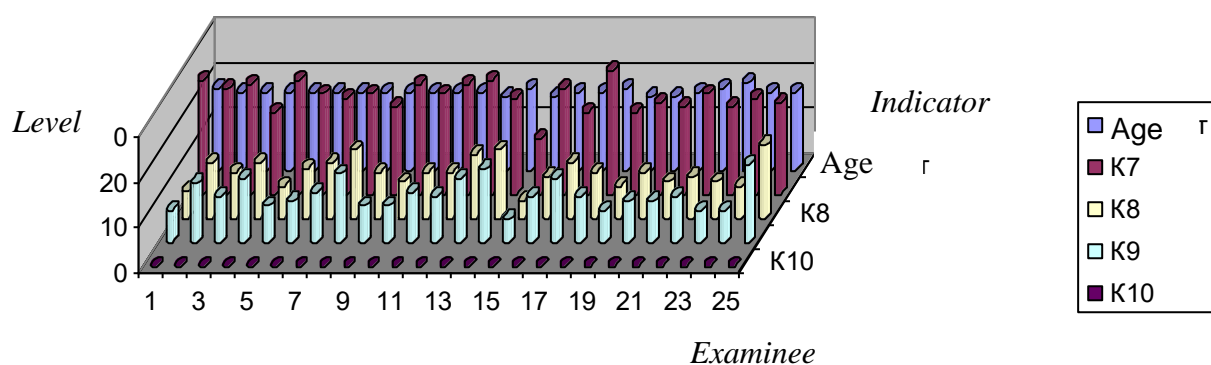
No of examinee	Age	K_7 trichromasia (achromasia)	K_8 protanopia	K_9 deutanopia	K_{10} tritanopia
1	18	25	6	7	0
2	17	23	12	13	0
3	17	24	10	10	0
4	17	18	12	14	0
5	17	25	7	8	0
6	17	22	11	9	0
7	17	21	12	11	0
8	17	22	15	15	0
9	17	19	10	8	0
10	17	24	8	8	0
11	17	22	10	11	0
12	17	24	10	10	0
13	16	25	14	14	0
14	18	21	15	16	0
15	16	12	4	5	0
16	17	23	9	10	0
17	17	18	12	14	0
18	18	27	10	10	0
19	16	18	7	7	0
20	16	20	10	9	0
21	17	19	8	9	0
22	18	22	9	10	0
23	19	19	8	7	0
24	17	21	7	7	0
25	17	20	16	17	0

Table A12.7

The descriptive statistics of a posteriori data of research of the color-perception in the third group of examinees

The coefficient / The indicator	Age	K_7	K_8	K_9	K_{10}
Average	17,08	21,36	10,08	10,36	0
The standard error	0,141	0,635	0,594	0,635	0
Median	17	22	10	10	0
Mode	17	22	10	10	0
The standard deviation	0,702	3,174	2,971	3,174	0
The dispersion of sample	0,493	10,073	8,827	10,073	0
Excess	1,401	1,784	-0,211	-0,549	-
Asymmetry	0,673	-0,835	0,216	0,542	-
Interval	3	15	12	12	0
Minimum	16	12	4	5	0
Maximum	19	27	16	17	0
Sum	427	534	252	259	0
Account	25	25	25	25	25
The level reliability (95.0%)	0,29	1,31	1,226	1,31	0

The age and anomalies of color-perception of examinees of the third group



Picture A12.3. The diagram, reflecting the age and the anomalies of color-perception of trainees of the third group

Table A12.8

The results of research of the color-perception of trainees in the fourth group

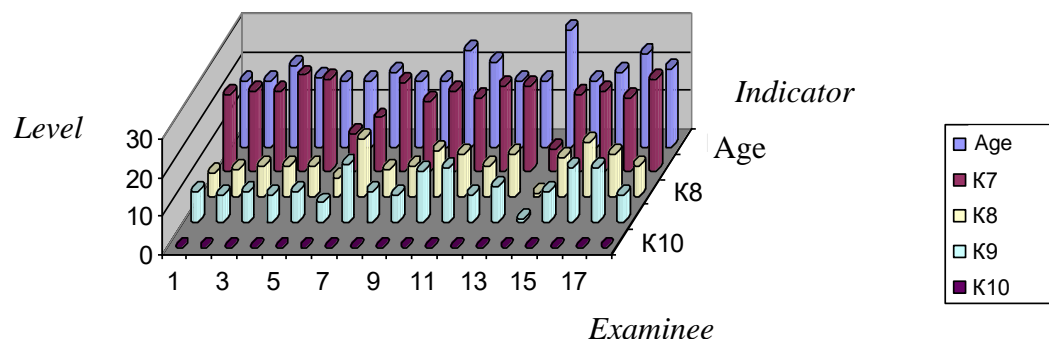
№ of examinee	Age	K_7 trichromasia (achromasia)	K_8 protanopia	K_9 deuteranopia	K_{10} tritanopia
1	17	20	6	8	0
2	17	21	7	7	0
3	21	21	8	8	0
4	18	25	8	7	0
5	17	24	8	8	0
6	17	10	5	5	0
7	19	14	15	15	0
8	17	23	7	8	0
9	17	18	8	7	0
10	25	21	12	13	0
11	22	19	11	14	0
12	17	22	8	7	0
13	17	22	11	9	0
14	59	6	1	1	0
15	17	20	10	8	0
16	19	21	14	14	0
17	24	19	11	14	0
18	20	24	8	7	0

Table A12.9

**The descriptive statistics of a posteriori data of research
of the color-perception in the fourth group of examinees**

The coefficient / The indicator	Age	K_7	K_8	K_9	K_{10}
Average	21,111	19,444	8,778	8,889	0
The standard error	2,309	1,158	0,778	0,87	0
Median	17,5	21	8	8	0
Mode	17	21	8	8	0
The standard deviation	9,797	4,914	3,3	3,692	0
The dispersion of sample	95,987	24,144	10,889	13,634	0
Excess	15,164	2,656	0,891	-0,052	-
Asymmetry	3,786	-1,664	-0,2	0,146	-
Interval	42	19	14	14	0
Minimum	17	6	1	1	0
Maximum	59	25	15	15	0
Sum	380	350	158	160	0
Account	18	18	18	18	18
The level of reliability(95.0%)	4,872	2,444	1,641	1,836	0

The age and anomalies of color-perception of examinees of the fourth group



Picture A12.4. The diagram, reflecting the age and the anomalies of color-perception
of trainees of the fourth group

The preliminary results of research of the vectors of parameters of the psychological portrait of 1-4 groups of examinees and their descriptive statistics are presented further.

Tabl. A12.10-A12.17 contain the results of research of the convergent intellectual abilities by the method of Amthauer R. and their descriptive statistics in the groups 1-4 respectively, and in pic. A12.5-A12.8 the graphical interpretation is presented.

Table A12.10

The results of research of the level of convergent intellectual abilities of trainees of the first group

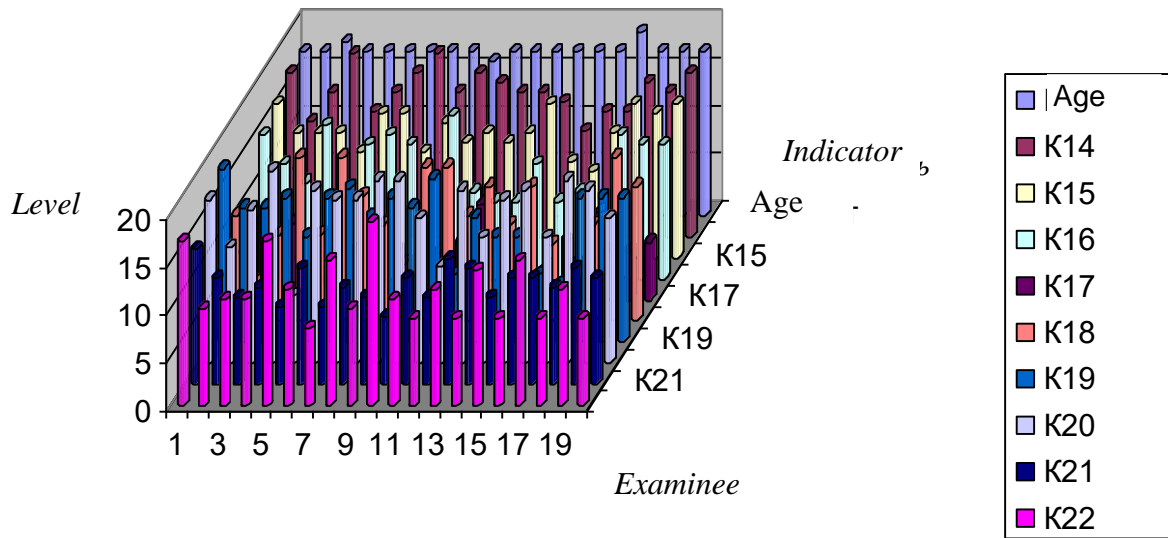
No of examinee		K_{14}	K_{15}	K_{16}	K_{17}	K_{18}	K_{19}	K_{20}	K_{21}	K_{22}
1	17	17	16	15	8	11	18	17	14	17
2	17	12	13	12	4	4	14	12	11	10
3	18	15	13	10	8	9	14	16	9	11
4	17	19	13	16	6	17	15	20	10	11
5	17	13	11	8	4	9	11	7	8	17
6	17	15	15	14	5	17	15	18	12	12
7	17	17	15	15	7	13	16	17	8	8
8	17	19	11	14	5	10	13	17	10	15
9	17	15	14	10	5	6	15	19	9	10
10	16	17	12	17	5	16	14	19	7	19
11	17	16	13	9	6	16	17	15	11	11
12	17	15	12	8	10	11	7	10	9	9
13	17	15	13	8	7	14	13	18	13	12
14	17	14	16	12	4	10	11	13	12	9
15	17	11	10	8	3	14	11	17	9	14
16	17	13	9	9	6	8	7	18	11	9
17	19	13	13	7	4	4	6	13	11	15
18	17	16	16	15	5	10	15	19	10	9
19	17	15	15	14	5	17	15	18	12	12
20	17	17	16	14	6	14	15	15	11	9

Table A12.11

The descriptive statistics of a posteriori data of research of the convergent intellectual abilities of trainees in the first group

The coefficient / The indicator	Age	K_{14}	K_{15}	K_{16}	K_{17}	K_{18}	K_{19}	K_{20}	K_{21}	K_{22}
Average	17,1	15,2	13,3	11,75	5,65	11,5	13,1	15,9	10,35	11,95
The standard error	0,124	0,479	0,465	0,721	0,379	0,928	0,743	0,754	0,399	0,713
Median	17	15	13	12	5	11	14	17	10,5	11
Mode	17	15	13	8	5	17	15	17	11	9
The standard deviation	0,553	2,142	2,08	3,226	1,694	4,149	3,323	3,37	1,785	3,187
The dispersion of sample	0,305	4,59	4,326	10,408	2,871	17,211	11,042	11,358	3,187	10,155
Excess	8,208	-0,287	-0,606	-1,568	0,894	-0,814	0,21	1,223	-0,337	-0,306
Asymmetry	2,164	-0,039	-0,328	-0,001	0,903	-0,297	-0,948	-1,252	0,088	0,842
Interval	3,000	8	7	10	7	13	12	13	7	11
Minimum	16	11	9	7	3	4	6	7	7	8
Maximum	19	19	16	17	10	17	18	20	14	19
Sum	342	304	266	235	113	230	262	318	207	239
Account	20	20	20	20	20	20	20	20	20	20
The level of reliability (95.0%)	0,259	1,00	0,974	1,51	0,793	1,942	1,555	1,577	0,836	1,491

The age and the level of convergent intellectual abilities of trainees of the first group



Picture A12.5. The diagram, reflecting the age and convergent intellectual abilities of trainees of the first group

Table A12.12

The results of research of the level of convergent intellectual abilities of trainees in the second group

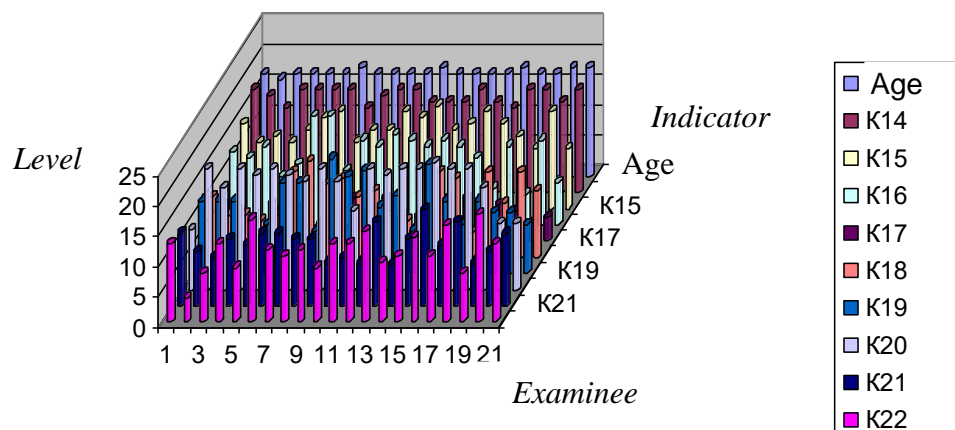
No of examinee	Age	K_{14}	K_{15}	K_{16}	K_{17}	K_{18}	K_{19}	K_{20}	K_{21}	K_{22}
1	17	17	14	12	6	10	12	10	12	13
2	16	16	11	11	5	7	12	20	9	4
3	17	14	12	13	3	7	12	17	8	8
4	17	17	11	8	6	6	9	20	11	13
5	17	17	13	10	2	7	8	19	10	9
6	17	17	15	18	6	14	15	20	12	17
7	18	17	16	18	3	16	15	19	12	12
8	17	14	11	9	3	12	7	18	11	11
9	17	16	13	14	7	13	19	20	11	12
10	17	17	13	13	5	10	16	18	7	9
11	17	17	16	15	7	11	17	13	8	13
12	18	15	15	14	4	7	11	20	7	13
13	17	15	17	13	4	6	13	19	14	15
14	17	15	13	14	4	6	7	20	7	10
15	17	17	14	13	3	14	18	20	11	11
16	17	15	16	11	7	13	12	21	16	14
17	18	14	14	6	4	4	8	20	10	11
18	17	17	12	13	6	14	12	20	14	16
19	17	17	10	5	5	9	10	17	7	8
20	18	15	16	14	3	14	10	11	9	18
21	18	17	10	7	4	11	8	11	12	13

Table A12.13

**The descriptive statistics of a posteriori data of research
of the convergent intellectual abilities of trainees in the second group**

The coefficient/ The indicator	Age	K_{14}	K_{15}	K_{16}	K_{17}	K_{18}	K_{19}	K_{20}	K_{21}	K_{22}
Average	17,191	16	13,429	11,952	4,619	10,048	11,952	17,762	10,381	11,905
The standard error	0,112	0,258	0,466	0,761	0,334	0,764	0,788	0,749	0,558	0,717
Median	17	17	13	13	4	10	12	19	11	12
Mode	17	17	13	13	3	7	12	20	12	13
The standard deviation	0,512	1,183	2,135	3,485	1,532	3,5	3,612	3,434	2,559	3,285
The dispersion	0,262	1,4	4,557	12,148	2,348	12,248	13,048	11,791	6,548	10,791
Excess	0,603	-1,303	-1,104	-0,137	-1,142	-1,308	-0,757	0,703	-0,417	0,541
Asymmetry	0,355	-0,601	-0,045	-0,332	0,166	-0,021	0,415	-1,439	0,34	-0,309
Interval	2	3	7	13	5	12	12	11	9	14
Minimum	16	14	10	5	2	4	7	10	7	4
Maximum	18	17	17	18	7	16	19	21	16	18
Sum	361	336	282	251	97	211	251	373	218	250
Account	21	21	21	21	21	21	21	21	21	21
The reliability (95.0%)	0,233	0,539	0,972	1,587	0,698	1,593	1,644	1,563	1,165	1,495

**The age and the level of convergent intellectual abilities
of trainees of the second group**



Picture A12.6. The diagram, reflecting the age and convergent intellectual abilities of trainees of the second group

Table A12.14

The results of research of the level of convergent intellectual abilities of trainees of the third group

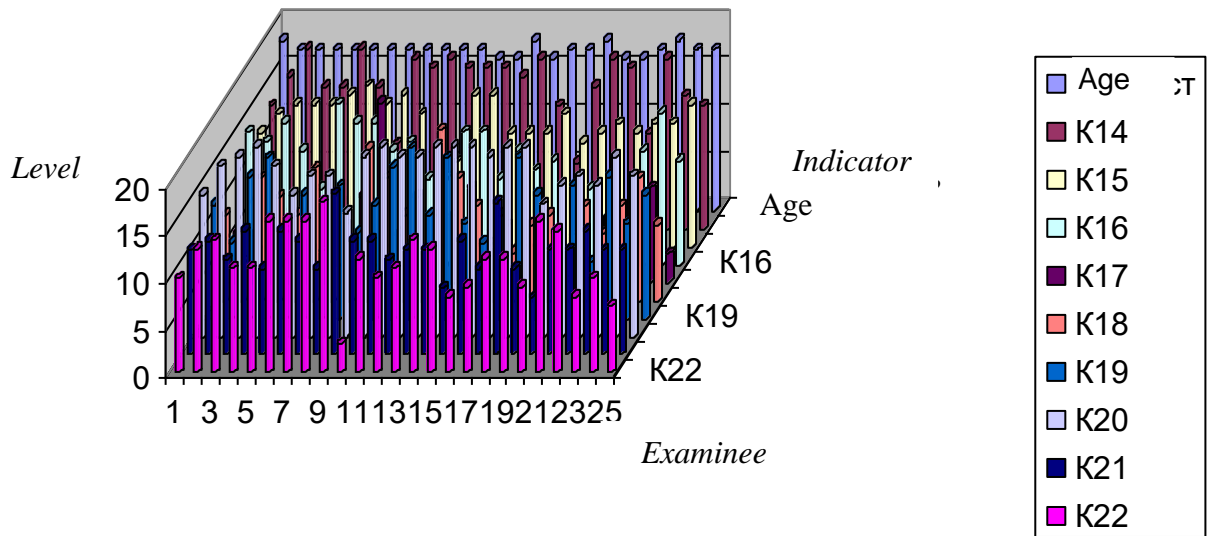
No of examinee	Age	K_{14}	K_{15}	K_{16}	K_{17}	K_{18}	K_{19}	K_{20}	K_{21}	K_{22}
1	18	13	12	14	5	9	12	15	11	10
2	17	16	14	13	5	4	8	18	12	13
3	17	19	15	15	7	13	15	19	10	14
4	17	15	15	12	5	11	17	20	13	11
5	17	15	15	8	4	9	9	18	9	11
6	17	19	16	17	8	14	13	15	13	16
7	17	15	17	15	6	11	7	17	12	16
8	17	9	15	15	9	6	14	17	9	16
9	17	18	16	12	19	16	9	13	17	18
10	17	17	14	13	5	13	12	19	12	3
11	17	18	12	9	9	9	16	20	12	12
12	17	17	9	9	7	5	18	19	10	10
13	16	17	16	14	7	18	11	19	11	11
14	16	17	16	14	10	13	17	20	11	14
15	18	16	12	9	4	10	10	20	7	13
16	16	18	12	12	6	5	8	20	12	8
17	17	13	12	10	4	5	11	19	9	9
18	17	7	14	11	4	8	17	20	16	12
19	18	15	11	3	2	9	13	20	9	12
20	16	18	12	8	2	2	9	14	6	9
21	16	17	13	5	10	10	14	16	11	16
22	17	10	12	4	4	7	6	17	11	15
23	18	18	13	12	5	10	15	16	13	8
24	17	14	13	16	10	13	10	19	11	10
25	17	13	15	11	3	8	13	17	11	7

Table A12.15

The descriptive statistics of a posteriori data of research of the convergent intellectual abilities of trainees in the third group

The coefficient/ The indicator	Age	K_{14}	K_{15}	K_{16}	K_{17}	K_{18}	K_{19}	K_{20}	K_{21}	K_{22}
Average	16,96	15,36	13,64	11,24	6,4	9,52	12,16	17,88	11,12	11,76
The standard error	0,122	0,624	0,391	0,738	0,712	0,775	0,69	0,418	0,477	0,694
Median	17	16	14	12	5	9	12	19	11	12
Mode	17	18	12	12	5	9	17	20	11	16
The standard deviation	0,611	3,121	1,955	3,689	3,559	3,874	3,448	2,088	2,386	3,468
The dispersion of sample	0,373	9,74	3,823	13,607	12,667	15,01	11,89	4,36	5,693	12,023
Excess	0,012	1,14	-0,369	-0,067	5,551	-0,204	-1,039	-0,291	1,311	0,259
Asymmetry	0,015	-1,232	-0,283	-0,678	1,896	0,163	0,025	-0,812	0,326	-0,367
Interval	2	12	8	14	17	16	12	7	11	15
Minimum	16	7	9	3	2	2	6	13	6	3
Maximum	18	19	17	17	19	18	18	20	17	18
Sum	424	384	341	281	160	238	304	447	278	294
Account	25	25	25	25	25	25	25	25	25	25
The level of reliability (95.0%)	0,252	1,288	0,807	1,523	1,47	1,599	1,423	0,862	0,985	1,431

The age and the level of convergent intellectual abilities of trainees of the third group



Picture A12.7. The diagram, reflecting the age and level of convergent intellectual abilities of trainees of the third group

Table A12.16

The results of research of the level of convergent intellectual abilities of trainees in the fourth group

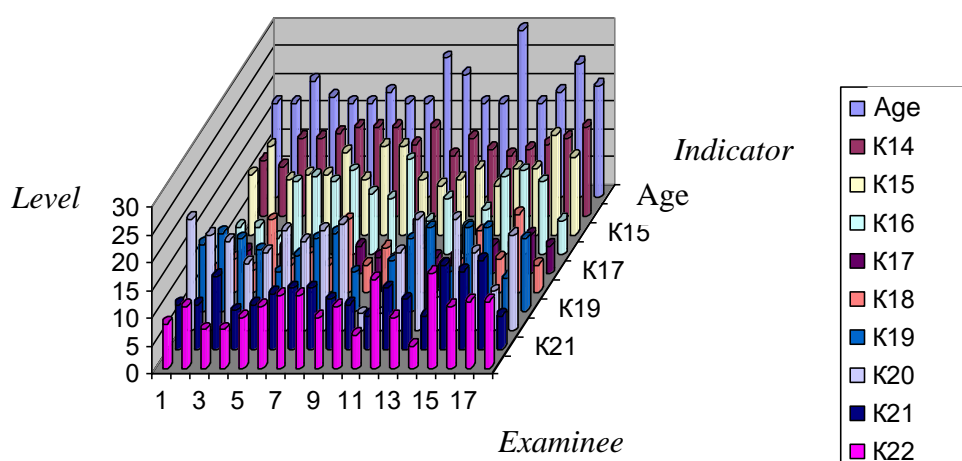
No of examinee	Age	K_{14}	K_{15}	K_{16}	K_{17}	K_{18}	K_{19}	K_{20}	K_{21}	K_{22}
1	17	10	11	5	2	4	12	20	8	8
2	17	9	16	5	4	6	14	17	8	11
3	21	14	10	3	2	4	13	16	13	7
4	18	14	11	13	5	13	11	12	7	7
5	17	15	11	14	4	5	7	14	8	9
6	17	16	15	13	1	7	10	18	10	11
7	19	16	10	15	3	5	13	16	11	13
8	17	16	16	11	5	13	14	18	11	13
9	17	13	16	10	3	5	7	19	9	9
10	25	16	10	17	1	8	5	3	8	11
11	22	11	9	6	9	7	9	3	6	6
12	17	14	10	10	3	8	13	14	11	16
13	17	12	12	5	3	5	15	20	9	9
14	59	11	9	8	2	5	7	6	6	4
15	17	12	12	14	5	11	15	20	15	17
16	19	13	12	15	5	6	15	14	14	11
17	24	14	18	13	7	14	6	7	16	12
18	20	16	14	6	5	5	13	17	6	12

Table P12.17

**The descriptive statistics of a posteriori data of research
of convergent intellectual abilities of trainees in the fourth group**

The coefficient/ The indicator	Age	K_{14}	K_{15}	K_{16}	K_{17}	K_{18}	K_{19}	K_{20}	K_{21}	K_{22}
Average	21,111	13,444	12,333	10,167	3,833	7,277	11,056	14,111	9,778	10,333
The standard error	2,309	0,525	0,657	1,02	0,487	0,77	0,802	1,34	0,73	0,788
Median	17,5	14	11,5	10,5	3,5	6	12,5	16	9	11
Mode	17	16	10	5	5	5	13	20	8	11
The standard deviation	9,797	2,229	2,787	4,328	2,065	3,269	3,404	5,687	3,098	3,343
The dispersion of sample	95,987	4,967	7,765	18,735	4,265	10,683	11,585	32,34	9,595	11,177
Excess	15,164	-0,791	-0,823	-1,392	0,937	-0,104	-1,262	-0,231	-0,529	-0,008
Asymmetry	3,786	-0,455	0,677	-0,172	0,837	1,109	-0,497	-0,985	0,648	0,172
Interval	42	7	9	14	8	10	10	17	10	13
Minimum	17	9	9	3	1	4	5	3	6	4
Maximum	59	16	18	17	9	14	15	20	16	17
Sum	380	242	222	183	69	131	199	254	176	186
Account	18	18	18	18	18	18	18	18	18	18
The level of reliability (95.0%)	4,872	1,108	1,386	2,153	1,027	1,625	1,693	2,828	1,54	1,663

**The age and the level of convergent intellectual abilities
of trainees of the fourth group**



Picture A12.8. The diagram, reflecting the age and the level of convergent intellectual abilities of trainees of the fourth group

Tabl. A12.18-A12.25 contain the results of research of the divergent intellectual abilities by the method of Mednik S.A. and Torrens of E.P. and their descriptive statistics in the groups 1-4 respectively, and in pic. A12.9-P12.12 the graphical interpretation is presented.

Table A12.18

The results of research of the level of divergent intellectual abilities of trainees in the first group

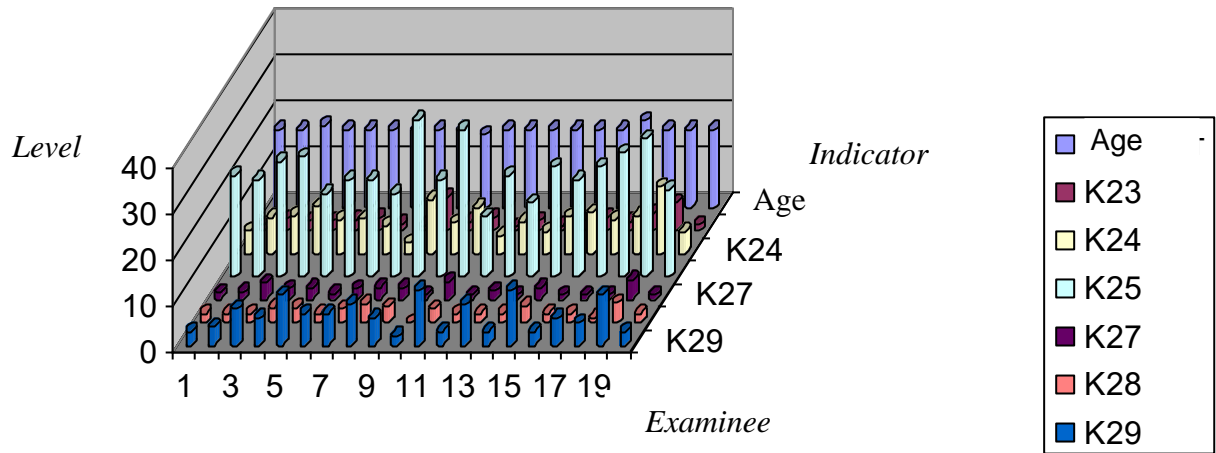
No of examinee	Age	K_{23}	K_{24}	K_{25}	K_{26}	K_{27}	K_{28}	K_{29}	K_{30}
1	17	1,4	5,03	22	0	1,6	2	3	0
2	17	2,65	7,93	21	0	1,7	2	4	0
3	18	2,3	8,31	25	0	3,6	2	8	0
4	17	2,3	10,3	26	0	2,3	3,33	6	0
5	17	2,55	7,45	18	0	2,5	3,33	11	0
6	17	2,9	7,73	21	0	1,3	2	7	0
7	17	1,55	6,25	21	0	2,4	3	7	0
8	17	1,05	2,53	18	0	2,7	4	9	0
9	17	7,29	11,9	34	0	2,6	3,5	6	0
10	16	2,1	6,87	21	0	1	0	2	0
11	17	2,85	10	32	0	4	3,03	12	0
12	17	1	3,95	13	0	1	2	3	0
13	17	2,35	7,08	22	0	1,9	2	9	0
14	17	1,25	4,95	16	0	1	2	3	0
15	17	2,25	8,13	24	0	2,6	3,56	12	0
16	17	3	8,94	21	0	1	2	3	0
17	19	2,15	7,45	24	0	1	2	6	0
18	17	3,85	8,26	27	0	1	1	5	0
19	17	6,25	14,6	46	0	4,3	4,31	11	0
20	17	1,4	4,74	19	0	1	2	3	0

Table A12.19

The descriptive statistics of a posteriori data of research of the divergent intellectual abilities of trainees in the first group

The coefficient/ The indicator	Age	K_{23}	K_{24}	K_{25}	K_{26}	K_{27}	K_{28}	K_{29}	K_{30}
Average	17,100	2,622	7,62	23,55	0	2,025	2,453	6,5	0
The standard error	0,124	0,358	0,622	1,617	0	0,237	0,232	0,738	0
Median	17,000	2,3	7,59	21,5	0	1,8	2	6	0
Mode	17,000	1,4	7,45	21	0	1	2	3	0
The standart deviation	0,553	1,602	2,783	7,229	0	1,059	1,039	3,301	0
The dispersion of sample	0,305	2,567	7,746	52,261	0	1,121	1,08	10,895	0
Excess	8,208	3,837	1,057	4,116	-	-0,279	0,352	-1,142	-
Asymmetry	2,164	1,925	0,568	1,701	-	0,799	-0,232	0,366	-
Interval	3,000	6,29	12,07	33	0	3,3	4,31	10	0
Minimum	16,000	1	2,53	13	0	1	0	2	0
Maximum	19,000	7,29	14,6	46	0	4,3	4,31	12	0
Sum	342	52,44	152,4	471	0	40,5	49,06	130	0
Account	20	20	20	20	20	20	20	20	20
The level of reliability (95.0%)	0,259	0,75	1,303	3,383	0	0,496	0,486	1,545	0

The age and the level of divergent intellectual abilities of trainees of the first group



Picture A12.9. The diagram, reflecting the age and the level of divergent intellectual abilities of trainees of the first group

Table A12.20

The results of research of the level of divergent intellectual abilities of trainees in the second group

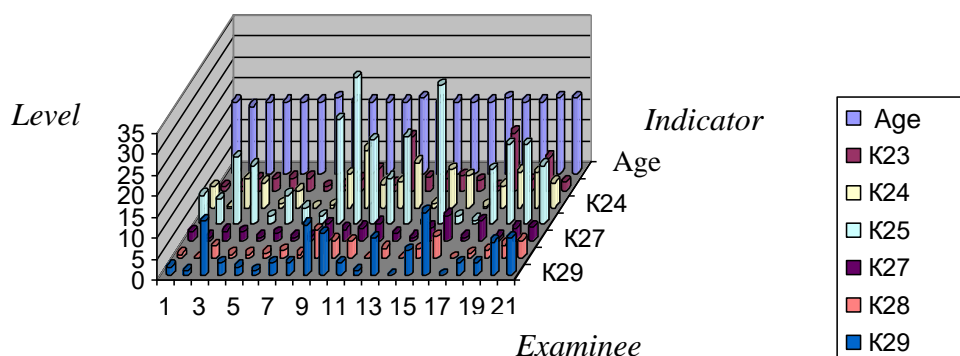
No of examinee	Age	K_{23}	K_{24}	K_{25}	K_{26}	K_{27}	K_{28}	K_{29}	K_{30}
1	17	1	5	7	0	2,3	1	2	0
2	16	1,05	0,12	6	0	1	0	1	0
3	17	2,85	6,87	16	0	2,5	3,02	13	0
4	17	2,7	5,93	14	0	2,2	1	3	0
5	17	2,9	0,87	2	0	1	1	2	0
6	17	3	4	7	0	2	1,3	1	0
7	18	1	0	4	0	1	2	3	0
8	17	1,05	0,5	2	0	1,1	1	3	0
9	17	2,55	7,9	25	0	4,2	6,75	12	0
10	17	4,95	13,7	35	0	2,9	4,25	10	0
11	17	1,5	5,56	20	0	3,2	4,1	3	0
12	18	12,7	6,12	11	0	4,3	0	1	0
13	17	3,15	10,7	21	0	2	2,5	9	0
14	17	2,9	0,97	1	0	1	0	0	0
15	17	3,5	8,92	33	0	3,2	2,25	6	0
16	17	2,4	7,54	2	0	6,16	5,15	15	0
17	18	1	0,37	1	0	1	0	0	0
18	17	13,7	5,12	13	0	4,9	1,2	3	0
19	17	2,4	8,47	19	0	1	2	3	0
20	18	7,75	8,38	19	0	3,2	3,2	8	0
21	18	2,1	5,9	14	0	3,5	4,25	9	0

Table A12.21

**The descriptive statistics of a posteriori data of research
of the divergent intellectual abilities of trainees in the second group**

The coefficient/ The indicator	Age	K_{23}	K_{24}	K_{25}	K_{26}	K_{27}	K_{28}	K_{29}	K_{30}
Average	17,191	3,626	5,378	12,952	0	2,555	2,189	5,095	0
The standard error	0,112	0,773	0,832	2,226	0	0,324	0,409	1	0
Median	17	2,7	5,9	13	0	2,3	2	3	0
Mode	17	1	-	2	0	1	1	3	0
The standard deviation	0,512	3,541	3,811	10,2	0	1,482	1,873	4,582	0
The dispersion	0,262	12,535	14,521	104,05	0	2,197	3,51	20,991	0
Excess	0,603	4,071	-0,438	-0,242	-	0,084	0,121	-0,534	-
Asymmetry	0,355	2,158	0,136	0,678	-	0,766	0,812	0,846	-
Interval	2	12,7	13,7	34	0	5,16	6,75	15	0
Minimum	16	1	0	1	0	1	0	0	0
Maximum	18	13,7	13,7	35	0	6,16	6,75	15	0
Sum	361	76,15	112,94	272	0	53,66	45,97	107	0
Account	21	21	21	21	21	21	21	21	21
The level of reliability (95.0%)	0,233	1,612	1,735	4,643	0	0,675	0,853	2,086	0

**The age and the level of divergent intellectual abilities
of trainees of the second group**



Picture A12.10. The diagram, reflecting the age and the level of divergent intellectual abilities of trainees of the second group

Table A12.22

The results of research of the level of divergent intellectual abilities of trainees of the third group

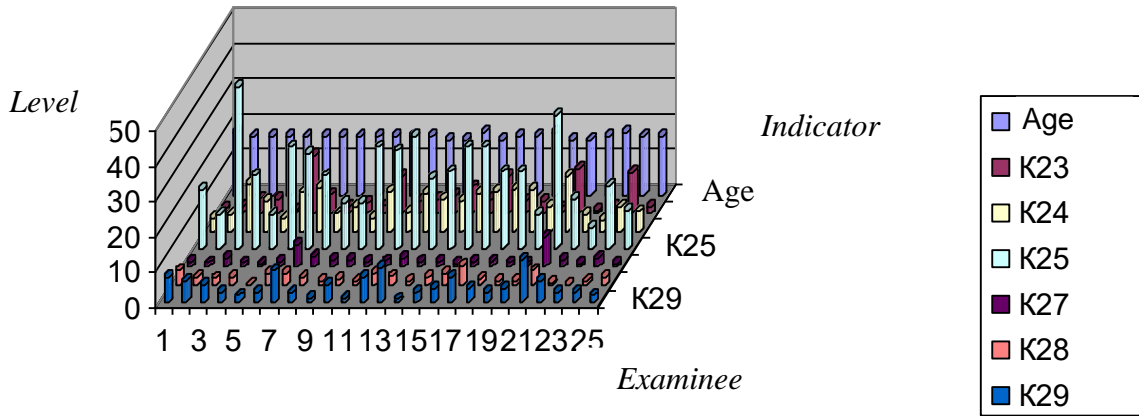
No of examinee	Age	K_{23}	K_{24}	K_{25}	K_{26}	K_{27}	K_{28}	K_{29}	K_{30}
1	18	1,55	3,69	17	0	1,3	4	7	0
2	17	2	5	10	0	1,1	2	6	0
3	17	4,4	13,4	46	0	2,3	1,83	5	0
4	17	4,3	8,66	21	0	1,1	2	3	0
5	17	1	3,66	10	0	1	0	2	0
6	17	16,7	11	29	0	1,3	3	3	0
7	17	5,4	12,2	27	0	6,1	3	9	0
8	17	1,75	5,08	21	0	3	2,2	3	0
9	17	3	7	13	0	2	1	1	0
10	17	2,15	3,59	13	0	2	1,5	5	0
11	17	10,7	11,3	29	0	1,5	1	1	0
12	17	3,55	5,51	28	0	1,7	3,33	7	0
13	16	4,15	10,8	32	0	2,5	2,44	10	0
14	16	5	9	20	0	1,5	1	0,9	0
15	18	7,6	8,46	22	0	1,4	2	3	0
16	16	4,1	10,9	29	0	1	3	4	0
17	17	10,7	11,3	29	0	1,4	5,5	7	0
18	17	3,4	11,7	22	0	1,4	1,5	4	0
19	18	3,4	11,7	22	0	1,1	1	3	0
20	16	1,65	7,16	10	0	1,1	1	4	0
21	16	12,6	15,7	38	0	8,3	4,03	12	0
22	17	1,05	4,71	14	0	2	0,5	6	0
23	18	1,95	3,27	6	0	1	0	3	0
24	17	11,5	6,96	18	0	2,6	1	3	0
25	17	2	5,6	11	0	1	2	2	0

Table A12.23

The descriptive statistics of a posteriori data of research of the divergent intellectual abilities of trainees in the third group

The coefficient/ The indicator	Age	K_{23}	K_{24}	K_{25}	K_{26}	K_{27}	K_{28}	K_{29}	K_{30}
Average	16,96	5,024	8,294	21,48	0	2,028	1,993	4,556	0
The standard error	0,122	0,84	0,71	1,943	0	0,337	0,265	0,573	0
Median	17	3,55	8,46	21	0	1,4	2	4	0
Mode	17	2	11,3	29	0	1,1	1	3	0
The standard deviation	0,611	4,199	3,549	9,713	0	1,684	1,325	2,864	0
The dispersion of sample	0,373	17,629	12,597	94,343	0	2,836	1,756	8,203	0
Excess	0,013	1,239	-1,0403	0,189	-	8,775	0,636	0,625	-
Asymmetry	0,015	1,412	0,1984	0,563	-	2,902	0,777	0,988	-
Interval	2	15,7	12,43	40	0	7,3	5,5	11,1	0
Minimum	16	1	3,27	6	0	1	0	0,9	0
Maximum	18	16,7	15,7	46	0	8,3	5,5	12	0
Sum	424	125,6	207,35	537	0	50,7	49,83	113,9	0
Account	25	25	25	25	25	25	25	25	25
The level of reliability (95.0%)	0,252	1,733	1,465	4,009	0	0,695	0,547	1,182	0

The age and the level of divergent intellectual abilities of trainees of the third group



Picture A12.11. The diagram, reflecting the age and the level of divergent intellectual abilities of trainees of the third group

Table A12.24

The results of research of the level of divergent intellectual abilities of trainees of trainees in the fourth group

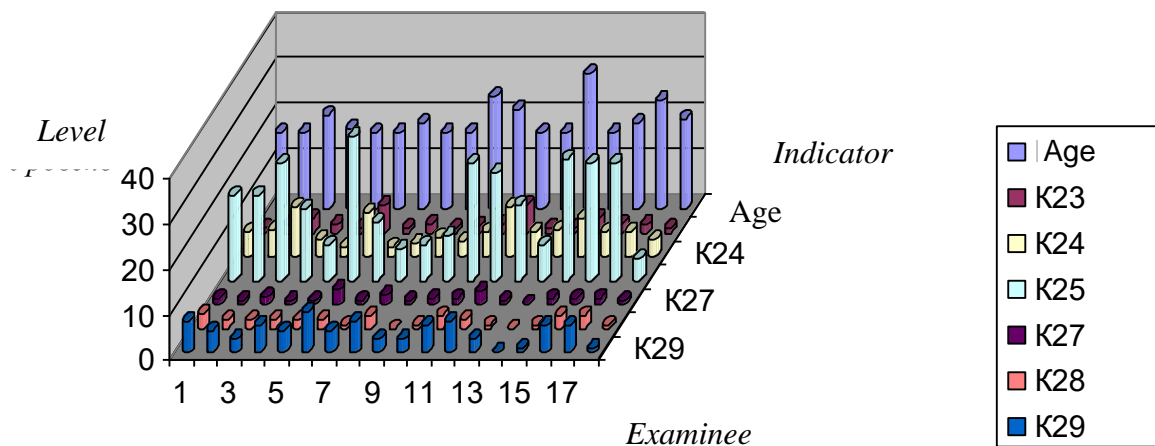
No of examinee	Age	K_{23}	K_{24}	K_{25}	K_{26}	K_{27}	K_{28}	K_{29}	K_{30}
1	17	1,05	5,7	19	0	1,6	3,5	7	0
2	17	1,95	6,09	19	0	1	2	5	0
3	21	3,5	11,2	26	0	1,7	2	3	0
4	18	2	4,07	16	0	1	2	6	0
5	17	1	2,22	8	0	1	2	5	0
6	17	6,1	9,95	32	0	3,5	2,24	9	0
7	19	1	2,39	13	0	1,2	1	5	0
8	17	2,1	3	7	0	2,1	3	7	0
9	17	1,1	4,37	8	0	1	0	3	0
10	25	1,75	3,58	10	0	1,5	1	3	0
11	22	2,05	5,77	26	0	1,6	3	6	0
12	17	6,35	11,2	24	0	3	2,25	7	0
13	17	1	5,59	17	0	1	1	3	0
14	59	1	6,09	8	0	0,2	0	0	0
15	17	3,3	8,46	27	0	1,5	1	1	0
16	19	2,05	5,77	26	0	1,6	3	6	0
17	24	2,03	5,77	26	0	1,6	3	6	0
18	20	1	3,89	5	0	1	1	1	0

Table A12.25

**The descriptive statistics of a posteriori data of research
of the divergent intellectual abilities of trainees in the fourth group**

The coefficient/ The indicator	Age	K_{23}	K_{24}	K_{25}	K_{26}	K_{27}	K_{28}	K_{29}	K_{30}
Average	21,111	2,241	5,839	17,611	0	1,506	1,833	4,611	0
The standard error	2,309	0,385	0,649	2,023	0	0,181	0,248	0,578	0
Median	17,5	1,975	5,735	18	0	1,5	2	5	0
Mode	17	1	5,77	26	0	1	1	3	0
The standard deviation	9,797	1,635	2,752	8,583	0	0,766	1,054	2,453	0
The dispersion of sample	95,987	2,672	7,571	73,663	0	0,586	1,11	6,016	0
Excess	15,164	2,568	-0,078	-1,458	-	2,297	-0,878	-0,595	-
Asymmetry	3,786	1,775	0,815	0,003	-	1,247	-0,229	-0,326	-
Interval	42	5,35	8,98	27	0	3,3	3,5	9	0
Minimum	17	1	2,22	5	0	0,2	0	0	0
Maximum	59	6,35	11,2	32	0	3,5	3,5	9	0
Sum	380	40,33	105,11	317	0	27,1	32,99	83	0
Account	18	18	18	18	18	18	18	18	18
The level of reliability (95.0%)	4,872	0,813	1,368	4,268	0	0,381	0,524	1,22	0

**The age and the level of divergent intellectual abilities
of trainees of the fourth group**



Picture A12.12. The diagram, reflecting the age and the level of divergent intellectual abilities of trainees of the fourth group

The preliminary results of research of the vectors of parameter of the linguistic portrait of the groups 1-4 of examinee and their descriptive statistics are presented further.

Table A12.26-A12.33 contain the results of research of the level of proficiency in language by the method of “The Colchester educational centre” (Great Britain) for the English language, the level of residual knowledge of the trainee without the using of CMT and the level of residual knowledge with the using of CMT (at the presenting of identical material) and their descriptive statistics in the groups 1-4 respectively.

The dynamics of the resultativity of training of 1-4 groups of trainees without the using of CMT (1 and 2 year) and with the using of CMT (3 year) is presented in pic. A12.13-A12.16.

Table A12.26

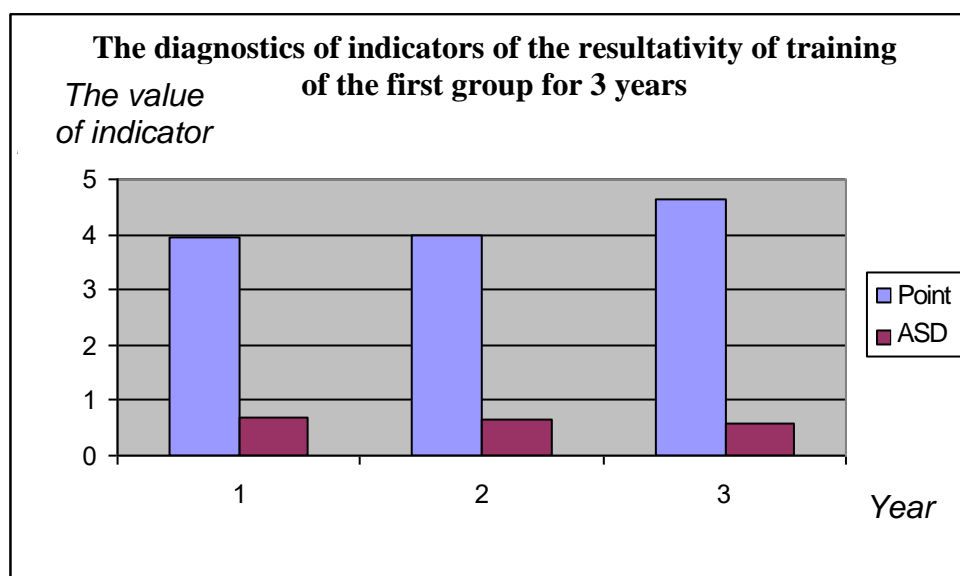
**The results of research of the level of proficiency in language,
the level of residual knowledge of trainees of the first group without the using of CMT
and the level of residual knowledge with using of CMT**

№ of examinee	Age	$K_{45} (corr.)$	$K_{45} (incorr.)$	K_{45}	$Y_1, w/o$ CMT	$Y_2, w/o$ CMT	$Y_3, with$ CMT
1	17	32	48	3	4	3	4
2	17	33	47	3	4	3	4
3	18	49	31	4	5	4	4
4	17	38	42	3	3	5	5
5	17	50	30	4	4	4	5
6	17	66	14	6	5	5	5
7	17	46	34	4	4	4	4
8	17	41	39	4	4	4	5
9	17	30	50	3	3	3	3
10	16	45	35	4	4	4	5
11	17	67	13	6	4	4	5
12	17	33	47	3	4	4	5
13	17	49	31	4	5	5	5
14	17	22	58	2	5	5	5
15	17	45	35	4	4	4	5
16	17	32	48	3	4	4	5
17	19	44	36	4	3	4	5
18	17	63	17	6	3	3	4
19	17	65	15	6	3	4	5
20	17	44	36	4	4	4	5

Table A12.27

**The descriptive statistics of a posteriori data of research
of the level of proficiency in language, the level of residual knowledge of trainees of the first group
without the using of CMT and the level of residual knowledge with the using of CMT**

The coefficient/ The indicator	Age	$K_{45} (corr.)$	$K_{45} (incorr.)$	K_{45}	$Y_1, w/o$ CMT	$Y_2, w/o$ CMT	$Y_3, with$ CMT
Average	17,100	44,7	35,3	4	3,95	4	4,65
The standard error	0,124	2,88	2,88	0,262	0,154	0,145	0,131
Median	17,000	44,5	35,5	4	4	4	5
Mode	17,000	32	48	4	4	4	5
The standard deviation	0,553	12,88	12,88	1,17	0,686	0,649	0,587
The dispersion of sample	0,305	165,905	165,905	1,368	0,471	0,421	0,345
Excess	8,208	-0,546	-0,546	-0,222	-0,63	-0,279	1,636
Asymmetry	2,164	0,357	-0,357	0,658	0,062	0	-1,521
Interval	3,000	45	45	4	2	2	2
Minimum	16,000	22	13	2	3	3	3
Maximum	19,000	67	58	6	5	5	5
Sum	342,000	894	706	80	79	80	93
Account	20,000	20	20	20	20	20	20
The level of reliability (95.0%)	0,259	6,028	6,028	0,548	0,321	0,304	0,275



Picture A12.13. The dynamics of indicators of the resultativity of training of the first group for 3 years

Table A12.28

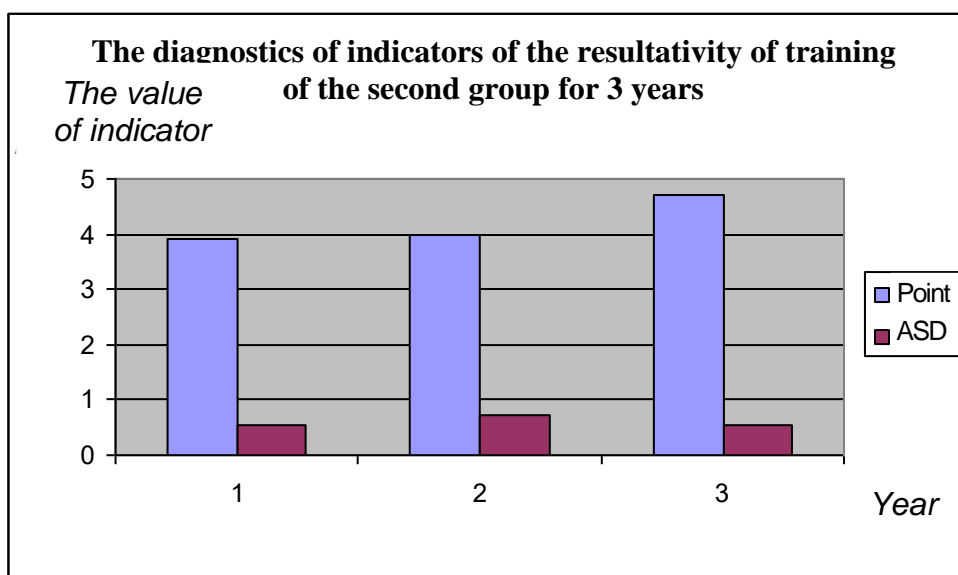
The results of research of the level of proficiency in language, the level of residual knowledge of trainees of the second group without the using of CMT and the level of residual knowledge with the using of CMT

No of examinee	Age	$K_{45} (corr.)$	$K_{45} (incorr.)$	K_{45}	$Y_1, w/o$ CMT	$Y_2, w/o$ CMT	$Y_3, with$ CMT
1	17	61	19	6	4	4	4
2	16	39	41	4	4	4	4
3	17	52	28	5	4	4	5
4	17	35	45	3	4	5	5
5	17	60	20	5	5	5	5
6	17	62	18	6	4	5	5
7	18	52	28	5	4	4	5
8	17	71	9	7	4	4	5
9	17	32	48	3	3	3	4
10	17	45	35	4	3	3	5
11	17	31	49	3	3	3	4
12	18	43	37	4	3	3	5
13	17	56	24	5	4	4	5
14	17	63	17	6	4	5	5
15	17	54	26	5	4	4	5
16	17	50	30	4	5	5	5
17	18	23	57	3	4	4	5
18	17	56	24	5	4	4	5
19	17	55	25	5	4	3	3
20	18	51	29	5	4	4	5
21	18	32	48	3	4	4	5

Table A12.29

The descriptive statistics of a posteriori data of research of the level of proficiency in language, the level of residual knowledge of trainees of the first group without the using of CMT and the level of residual knowledge with the using of CMT

The coefficient/ The indicator	Age	$K_{45} (corr.)$	$K_{45} (incorr.)$	K_{45}	$Y_1, w/o$ CMT	$Y_2, w/o$ CMT	$Y_3, with$ CMT
Average	17,191	48,714	31,286	4,571	3,905	4	4,714
The standard error	0,112	2,769	2,769	0,254	0,118	0,154	0,122
Median	17	52	28	5	4	4	5
Mode	17	52	28	5	4	4	5
The standard deviation	0,512	12,689	12,689	1,165	0,539	0,707	0,561
The dispersion of sample	0,262	161,014	161,014	1,357	0,291	0,5	0,314
Excess	0,603	-0,633	-0,633	-0,631	0,942	-0,807	3,182
Asymmetry	0,355	-0,399	0,399	0,124	-0,114	0	-1,92
Interval	2	48	48	4	2	2	2
Minimum	16	23	9	3	3	3	3
Maximum	18	71	57	7	5	5	5
Sun	361	1023	657	96	82	84	99
Account	21	21	21	21	21	21	21
The level of reliability (95.0%)	0,233	5,776	5,776	0,53	0,245	0,322	0,255



Picture A12.14. The dynamics of indicators of the resultativity of training of the second group for 3 years

Table A12.30

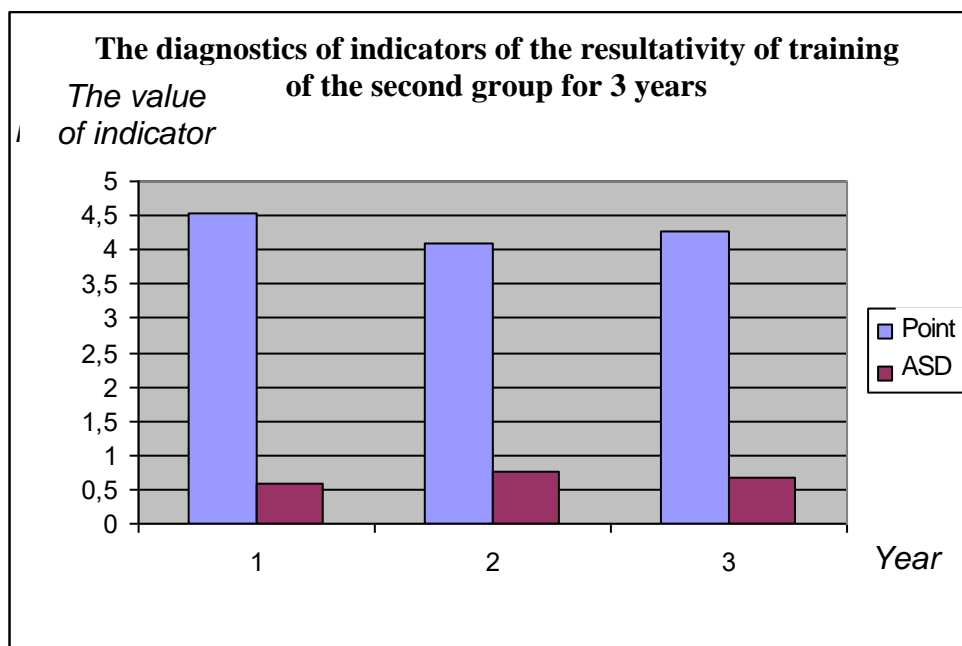
**The results of research of the level of proficiency in language,
the level of residual knowledge of trainees of the third group without the using of CMT
and the level of residual knowledge with the using of CMT**

№ of examinee	Age	$K_{45} (corr.)$	$K_{45} (incorr.)$	K_{45}	$Y_1, w/o$ CMT	$Y_2, w/o$ CMT	$Y_3, with$ CMT
1	18	39	41	4	4	4	4
2	17	64	16	6	5	5	5
3	17	70	10	7	5	5	5
4	17	49	31	4	4	4	5
5	17	38	42	3	5	5	5
6	17	42	38	4	3	3	4
7	17	39	41	4	5	4	4
8	17	32	48	3	4	3	3
9	17	35	45	3	5	4	4
10	17	42	38	4	5	4	4
11	17	44	36	4	4	4	4
12	17	42	38	4	5	4	4
13	16	42	38	4	5	4	4
14	18	56	24	5	4	4	4
15	16	44	36	4	5	5	5
16	17	33	47	3	5	5	5
17	17	56	24	5	5	5	5
18	18	54	26	5	4	3	3
19	16	37	43	3	4	4	5
20	16	49	31	4	5	5	5
21	17	60	20	5	5	4	4
22	18	45	35	4	4	3	3
23	19	39	41	3	5	5	5
24	17	33	47	3	4	3	4
25	17	33	47	3	4	3	4

Table A12.31

**The descriptive statistics of a posteriori data of research
of the level of proficiency in language, the level of residual knowledge of trainees of the third-group
without the using of CMT and the level of residual knowledge with the using of CMT**

The coefficient/ The indicator	Age	$K_{45} (corr.)$	$K_{45} (incorr.)$	K_{45}	Y_1 , w/o CMT	Y_2 , w/o CMT	Y_3 , with CMT
Average	16,96	44,68	35,32	4,04	4,52	4,08	4,28
The standard error	0,122	2,051	2,051	0,204	0,117	0,152	0,136
Median	17	42	38	4	5	4	4
Mode	17	42	38	4	5	4	4
The standard deviation	0,611	10,254	10,254	1,02	0,586	0,759	0,678
The dispersion of sample	0,373	105,143	105,143	1,04	0,343	0,577	0,46
Excess	0,013	0,196	0,196	1,745	-0,322	-1,179	-0,68
Asymmetry	0,015	0,916	-0,916	1,196	-0,759	-0,138	-0,41
Interval	2	38	38	4	2	2	2
Minimum	16	32	10	3	3	3	3
Maximum	18	70	48	7	5	5	5
Sum	424	1117	883	101	113	102	107
Account	25	25	25	25	25	25	25
The level of reliability (95.0%)	0,252	4,233	4,233	0,421	0,242	0,314	0,28



Picture A12.15. The dynamics of indicators of the resultativity of training of the third group for 3 years

Table A12.32

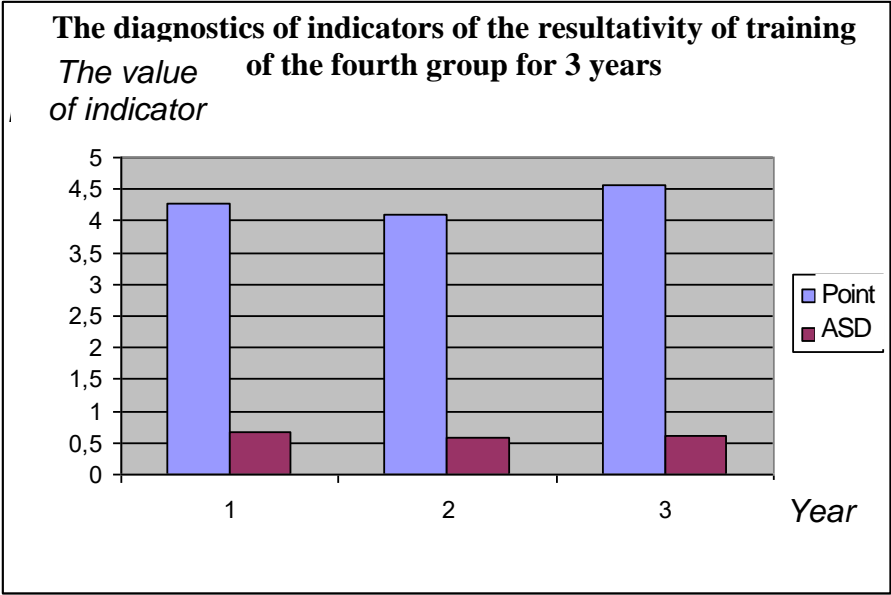
The results of research of the level of proficiency in language, the level of residual knowledge of trainees of the fourth group without the using of CMT and the level of residual knowledge with the using of CMT

No of examinee	Age	$K_{45} (corr.)$	$K_{45} (incorr.)$	K_{45}	$Y_1, w/o$ CMT	$Y_2, w/o$ CMT	$Y_3, with$ CMT
1	17	38	42	3	5	4	4
2	17	37	43	3	3	3	5
3	21	43	37	4	4	4	5
4	18	45	35	4	4	4	5
5	17	50	30	5	4	4	5
6	17	54	26	5	5	4	4
7	19	52	28	5	4	4	4
8	17	55	25	5	5	5	4
9	17	53	27	5	5	5	4
10	25	44	36	4	4	4	5
11	22	49	51	4	4	4	5
12	17	45	35	4	5	5	5
13	17	47	33	4	5	4	4
14	59	35	45	3	3	3	3
15	17	42	38	4	4	4	5
16	19	53	27	5	4	4	5
17	24	55	25	5	5	5	5
18	20	40	40	4	4	4	5

Table P12.33

The descriptive statistics of a posteriori data of research of the level of proficiency in language, the level of residual knowledge of trainees of the fourth group without the using of CMT and the level of residual knowledge with the using of CMT

The coefficient/ The indicator	Age	$K_{45} (corr.)$	$K_{45} (incorr.)$	K_{45}	$Y_1, w/o$ CMT	$Y_2, w/o$ CMT	$Y_3, with$ CMT
Average	21,111	46,5	34,611	4,222	4,278	4,111	4,556
The standard error	2,309	1,528	1,801	0,173	0,158	0,137	0,145
Median	17,5	46	35	4	4	4	5
Mode	17	45	35	4	4	4	5
The standard deviation	9,797	6,483	7,64	0,732	0,669	0,583	0,616
The dispersion	95,987	42,029	58,369	0,536	0,448	0,34	0,379
Excess	15,164	-1,167	-0,552	-0,906	-0,564	0,413	0,387
Asymmetry	3,786	-0,243	0,451	-0,383	-0,382	0,017	-1,085
Interval	42	20	26	2	2	2	2
Minimum	17	35	25	3	3	3	3
Maximum	59	55	51	5	5	5	5
Sum	380	837	623	76	77	74	82
Account	18	18	18	18	18	18	18
The level of reliability (95.0%)	4,872	3,224	3,799	0,364	0,333	0,29	0,306



Picture A12.16. The dynamics of indicators of the resultativity of training of the fourth group for 3 years

At the stage of the statistical analysis of the formed samples the revealing of statistical regularities in the samples of a posteriori data was carried out, characterizing the physiological, psychological and linguistic portraits of the cognitive model of the subject of training and their influence on the resultativity (efficiency) of training by means of the methods of correlation and factor analysis.

At the first step the correlation analysis was carried out with the purpose of formation of the correlation matrixes (tables).

The mutual relationships between the level of development of the convergent intellectual abilities and the level of residual knowledge of trainees of the groups 1-4 are presented directly in tabl. A12.34, A12.36, A12.38 and A12.40.

The mutual relationships between the level of development of the divergent intellectual abilities and the level of residual knowledge of trainees of the groups 1-4 are presented directly in tabl. A12.35, A12.37, A12.39 and A12.41.

Table A12.34

The correlation table, reflecting the character and degree of relationship between the level of development of the convergent intellectual abilities and the level of residual knowledge of trainees of the first group

	K14	K15	K16	K17	K18	K19	K20	K21	K22	Y3
K14	1									
K15	0,34	1								
K16	0,693	0,506	1							
K17	0,412	0,121	0,012	1						
K18	0,45	0,165	0,431	0,146	1					
K19	0,537	0,574	0,641	0,081	0,451	1				
K20	0,448	0,162	0,52	0,012	0,422	0,452	1			
K21	-0,019	0,41	-0,002	0,077	0,053	0,154	0,129	1		
K22	0,04	-0,283	0,06	-0,247	0,082	0,01	-0,064	-0,099	1	
Y3	-0,025	-0,341	-0,132	-0,13	0,465	-0,413	-0,205	0,123	0,243	1

Table A12.35

The correlation table, reflecting the character and degree of relationship between the level of development of the divergent intellectual abilities and the level of residual knowledge of trainees of the first group

	K23	K24	K25	K27	K28	K29	Y3
K23	1						
K24	0,853	1					
K25	0,825	0,885	1				
K27	0,407	0,545	0,671	1			
K28	0,32	0,336	0,426	0,71	1		
K29	0,258	0,389	0,456	0,796	0,694	1	
Y3	-0,446	-0,201	-0,238	-0,112	0,015	0,177	1

Table A12.36

**The correlation table, reflecting the character and degree of relationship
between the level of development of the convergent intellectual abilities
and the level of residual knowledge of trainees of the second group**

	K14	K15	K16	K17	K18	K19	K20	K21	K22	Y3
K14	1									
K15	-0,139	1								
K16	0,121	0,641	1							
K17	0,303	0,052	0,081	1						
K18	0,362	0,231	0,484	0,162	1					
K19	0,386	0,405	0,608	0,403	0,503	1				
K20	-0,172	0,008	0,083	0,029	-0,157	0,1	1			
K21	0,083	0,252	0,053	0,256	0,4	0,094	0,125	1		
K22	0,052	0,541	0,358	0,231	0,462	0,101	-0,224	0,51	1	
Y3	-0,302	0,275	0,249	-0,424	0,033	-0,205	0,249	0,289	0,365	1

Table A12.37

**The correlation table, reflecting the character and degree of relationship
between the level of development of the divergent intellectual abilities
and the level of residual knowledge of trainees of the second group**

	K23	K24	K25	K27	K28	K29	Y3
K23	1						
K24	0,275	1					
K25	0,195	0,845	1				
K27	0,526	0,517	0,305	1			
K28	-0,129	0,602	0,538	0,576	1		
K29	-0,04	0,651	0,455	0,584	0,844	1	
Y3	0,274	-0,076	-0,16	0,158	-0,129	0,128	1

Table A12.38

**The correlation table, reflecting the character and degree of relationship
between the level of development of the convergent intellectual abilities
and the level of residual knowledge of trainees of the third group**

	K14	K15	K16	K17	K18	K19	K20	K21	K22	Y3
K14	1									
K15	0,036	1								
K16	0,123	0,59	1							
K17	0,272	0,345	0,326	1						
K18	0,304	0,598	0,411	0,522	1					
K19	0,014	-0,084	0,082	0,076	0,115	1				
K20	-0,127	-0,195	-0,072	-0,307	-0,018	0,321	1			
K21	-0,051	0,394	0,309	0,509	0,421	0,16	-0,131	1		
K22	-0,061	0,362	0,018	0,531	0,23	-0,08	-0,286	0,19	1	
Y3	0,58	-0,172	-0,111	-0,307	-0,153	-0,127	0,142	-0,356	-0,307	1

Table A12.39

The correlation table, reflecting the character and degree of relationship between the level of development of the divergent intellectual abilities and the level of residual knowledge of trainees of the third group

	K23	K24	K25	K27	K28	K29	Y3
K23	1						
K24	0,596	1					
K25	0,536	0,821	1				
K27	0,33	0,475	0,446	1			
K28	0,403	0,385	0,539	0,339	1		
K29	0,115	0,318	0,438	0,663	0,622	1	
Y3	-0,004	0,069	-0,015	-0,295	0,008	-0,105	1

Table A12.40

The correlation table, reflecting the character and degree of relationship between the level of development of the convergent intellectual abilities and the level of residual knowledge of trainees of the fourth group

	K14	K15	K16	K17	K18	K19	K20	K21	K22	Y3
K14	1									
K15	0,098	1								
K16	0,547	0,039	1							
K17	-0,162	0,184	-0,023	1						
K18	0,232	0,383	0,446	0,46	1					
K19	-0,159	-0,002	-0,292	0,06	-0,07	1				
K20	-0,027	0,335	-0,228	-0,284	-0,214	0,668	1			
K21	0,16	0,316	0,341	0,113	0,39	0,264	0,212	1		
K22	0,342	0,322	0,423	0,051	0,368	0,396	0,36	0,57	1	
Y3	0,11	0,023	0,14	0,447	0,27	0,097	-0,17	0,254	0,333	1

Table A12.41

The correlation table, reflecting the character and degree of relationship between the level of development of the divergent intellectual abilities and the level of residual knowledge of trainees of the fourth group

	K23	K24	K25	K27	K28	K29	Y3
K23	1						
K24	0,815	1					
K25	0,662	0,744	1				
K27	0,872	0,578	0,596	1			
K28	0,251	0,138	0,496	0,497	1		
K29	0,445	0,109	0,434	0,7	0,781	1	
Y3	0,209	0,123	0,322	0,155	0,356	0,113	1

At the second step the regression analysis was carried out of the generalized sample of examinees on all experimental groups with the purpose of realization:

- the revealing of measure and significance of the relationship of dependent variable with a set of independent variables – the calculation of the coefficient of multiple correlation (CMC);
- the determining of the materiality of contribution of each independent variable into the estimation of dependent, and also the dropping out of independent variables (non-essential for prediction) – the calculating of the nominal values of regression coefficients β ;
- the analysis of the accuracy of prediction of the level of residual knowledge of the contingent of trainees and the probable errors of estimation of the dependent variable – the calculating of the coefficient of multiple determination (CMD), allowing to explain the ratio of dispersion of the dependent variable, explained directly by a set of independent variables;
- the estimating (predicting) of unknown nominal values of dependent variable by the known values of independent variables – the recording of regression equation.

The obtained nominal values of $CMC=0,558$ and $CMD=0,312$ indicate, that 31.2% of the dispersion of dependent variable Y (the estimation of the level of residual knowledge) is determined by the nominal values of predictors of the linear regression model.

The results of calculation of the initial β and standardized coefficients (β') of the linear regression model Y are presented in tabl. A12.42. The constant is 4,653.

Then, it is proposed to form the equation, allowing to realize the predicting of estimations of the level of residual knowledge of trainees proceeding from the combination of the values of parameters of the cognitive model, reflecting the individual features of their personality.

Table A12.42

The nominal values of initial β and standardized coefficients β'

The indicator (predictor)	VOZR	K7	K8	K9	K14	K15	K16	K17	K18	K19
The value of initial β -coefficient	-0,006	-0,002	-0,156	0,121	0,064	-0,029	0,006	-0,074	0,025	-0,009
The standardized β -coefficient	-0,017	-0,010	-0,714	0,611	0,247	-0,104	0,034	-0,262	0,159	-0,052

Table A12.43

The nominal values of initial β and standardized coefficients β'

The indicator (predictor)		K21	K22	K23	K24	K25	K27	K28	K29	K45
The value of initial β -coefficient	-0,026	0,001	0,035	0,013	0,009	-0,008	-0,111	-0,008	0,032	0,022
The standardized β -coefficient	-0,147	0,002	0,182	0,052	0,052	-0,113	-0,226	-0,018	0,172	0,037

In the quality of predictors in the obtained linear model of multiple regression K 4 5 , K 7 , K 2 8 , V O Z R , K 2 1 , K 8 , K 1 4 , K 2 3 , K 1 5 , K 1 9 , K 2 2 , K 1 7 , K 1 6 , K 1 8 , K 2 7 , K 2 5 , K 2 0 , K 2 9 , K 2 4 , K 9 are accepted, and the resultativity of training Y acts as the factor (dependent variable).

Then the linear equation of multiple regression takes the following view:
 $Y_3 = 4,653 - 0,006VORZ - 0,002K7 - 0,156K8 + 0,121K9 + 0,064K14 - 0,029K15 + 0,006K16 - 0,074K17 + 0,025K18 - 0,009K19 - 0,026K20 + 0,001K21 + 0,035K22 + 0,013K23 + 0,009K24 - 0,008K25 - 0,111K27 - 0,008K28 + 0,032K29 + 0,022K45$

Taking into account the nominal values of standardized coefficients the initial equation of regression without the loss of generality can be written in the view:
 $Y_3 = 4,653 - 0,006VORZ - 0,156K8 + 0,121K9 + 0,064K14 - 0,029K15 + 0,006K16 - 0,074K17 + 0,025K18 - 0,009K19 - 0,026K20 + 0,035K22 + 0,013K23 + 0,009K24 - 0,008K25 - 0,111K27 + 0,032K29 + 0,022K45$

At the third step the discriminant analysis of the generalized sample of examinees by all experimental groups was carried out with the purpose of realization:

- the determination of statistical significance of the allocation of classes by LRNT;
- the elucidation of contribution of each variable in the course of the discriminant analysis;
- the calculating of distances between the centroids of the allocated classes;
- the visual interpretation of differences between the classes of excellent, good, triplet and twin-students based on a set of the values of parameters of CM of the subject of training and CM of the means of training essential for the analysis;
- the solving of the task of classification with the using of discriminant functions based on a set of obtained nominal values of CM of the subject of training.

For the estimation of the efficiency of prediction of the resultativity of the automated training (at distance) it is necessary to consider directly tabl. A12.44. The table contains indications on the belonging of examinee to the certain group (5 – excellent-students, 4 – good-students and 3 -- triplet-students): actual and predicted.

Table A12.44

The generalized statistics of examinees of the four groups

Case Number	Actual Group	Predicted Group	Highest Group				Second Highest Group			Discriminant Scores	
			P(D>d G=g)		P(G=g D=d)	Squared Mahalanobis Distance to centroid	Group	P(G=g D=d)	Squared Mahalanobis Distance to centroid	Function1	Function2
			p	df							
1	4	4	,383	2	,927	1,922	5	,073	8,282	-2,361	,344
2	4	4	,481	2	,652	1,465	5	,294	4,329	-,856	1,308
3	4	4	,209	2	,895	3,135	5	,080	9,232	-1,885	1,637
4	5	5	,631	2	,956	,920	4	,043	5,858	1,211	-,889
5	5	5	,535	2	,966	1,252	4	,033	6,716	1,386	-,916
6	5	5	,926	2	,909	,153	4	,089	3,536	,782	-,510
7	4	4	,608	2	,710	,995	5	,290	4,060	-1,533	-,734
8	5	5	,252	2	,781	2,754	4	,219	4,029	-,333	-1,789
9	3	4(**)	,641	2	,624	,889	5	,345	3,349	-,798	1,028
10	5	5	,352	2	,978	2,088	4	,019	8,649	1,835	-,695
11	5	4(**)	,877	2	,504	,262	5	,486	1,604	-,590	,418
12	5	5	,629	2	,591	,928	4	,407	,403	-,524	-,319
13	5	5	,711	2	,681	,684	4	,318	,933	-,338	-,602
14	5	4(**)	,311	2	,522	2,339	5	,478	3,790	-1,172	-1,413
15	5	5	,097	2	,955	4,666	3	,034	7,033	2,517	,271
16	5	5	,231	2	,784	2,931	3	,158	1,857	1,439	1,070
17	5	5	,373	2	,969	1,973	4	,023	8,168	1,842	-,241
18	4	4	,868	2	,554	,284	5	,445	1,995	-,969	-,426

The continuation of tabl. A12.44

19	5	5	,780	2	,707	,496	4	,292	,991	-,232	-,533
20	5	4(**)	,756	2	,787	,560	5	,212	4,454	-1,669	-,220
21	4	5(**)	,476	2	,519	1,483	4	,480	,366	-,771	-,455
22	4	4	,393	2	,844	1,867	5	,156	6,515	-2,081	-,724
23	5	5	,938	2	,872	,128	4	,127	2,708	,452	-,678
24	5	5	,999	2	,844	,001	4	,153	2,146	,413	-,298
25	5	5	,846	2	,911	,335	4	,088	3,735	,689	-,842
26	5	5	,752	2	,944	,571	4	,054	5,019	1,101	-,685
27	5	5	,171	2	,956	3,527	4	,043	8,438	,825	-2,158
28	5	5	,253	2	,980	2,747	4	,019	9,336	1,606	-1,497
29	4	4	,597	2	,877	1,032	5	,120	6,277	-1,914	,538
30	5	4(**)	,921	2	,586	,165	5	,413	2,138	-1,023	-,299
31	4	4	,804	2	,741	,436	5	,258	3,815	-1,514	-,302
32	5	5	,592	2	,733	1,047	4	,226	2,126	,337	,698
33	5	5	,906	2	,870	,198	4	,128	2,753	,417	-,764
34	5	4(**)	,462	2	,590	1,543	5	,343	3,900	-,679	1,308
35	5	5	,539	2	,745	1,236	4	,255	2,109	-,287	-1,162
36	5	5	,582	2	,598	1,083	4	,401	,612	-,575	-,553
37	5	5	,812	2	,807	,417	4	,175	2,203	,473	,325
38	5	5	,576	2	,657	1,102	4	,342	1,135	-,480	-,827
39	3	5(**)	,490	2	,943	1,428	4	,040	6,489	1,552	,116
40	5	5	,989	2	,875	,023	4	,121	2,704	,591	-,327
41	5	5	,211	2	,979	3,109	4	,021	9,526	1,471	-1,750
42	4	5(**)	,981	2	,871	,039	4	,127	2,624	,504	-,507
43	5	5	,934	2	,828	,137	4	,171	2,021	,226	-,622
44	5	5	,956	2	,784	,091	4	,213	1,429	,152	-,231
45	5	5	,851	2	,711	,323	4	,286	,872	-,119	-,218
46	5	5	,927	2	,898	,151	4	,097	3,336	,807	-,193
47	4	4	,554	2	,583	1,180	5	,417	3,123	-1,208	-,959
48	4	4	,407	2	,602	1,797	5	,317	4,349	-,715	1,417
49	3	3	,037	2	,781	6,605	4	,204	12,302	-1,448	3,584
50	4	4	,572	2	,858	1,117	5	,141	5,998	-2,007	-,201
51	4	4	,747	2	,703	,582	5	,296	3,584	-1,444	-,511
52	4	4	,965	2	,532	,070	5	,464	1,616	-,736	,164
53	4	4	,739	2	,809	,605	5	,191	4,767	-1,736	-,131
54	4	5(**)	,613	2	,566	,980	4	,430	,257	-,514	-,054
55	4	4	,608	2	,576	,996	5	,386	3,070	-,658	1,046
56	5	5	,371	2	,934	1,984	4	,066	6,021	,652	-1,713
57	5	5	,792	2	,675	,465	4	,322	,672	-,230	-,188
58	5	5	,646	2	,862	,875	4	,106	3,803	,918	,484
59	3	3	,459	2	,967	1,556	5	,030	12,800	1,719	3,021
60	5	5	,386	2	,961	1,905	4	,027	7,798	1,793	-,050
61	5	5	,624	2	,750	,944	4	,250	1,869	-,228	-1,026
62	4	4	,927	2	,733	,151	5	,266	3,450	-1,380	,054
63	3	5(**)	,110	2	,763	4,411	3	,210	2,715	1,959	1,130
64	5	4(**)	,315	2	,695	2,310	5	,305	5,225	-1,639	-1,271

The completion of tabl. A12.44

65	4	4	,748	2	,806	,581	5	,189	4,755	-1,500	,677
66	4	5(**)	,248	2	,486	2,789	4	,432	1,753	-,251	1,201
67	4	5(**)	,411	2	,836	1,778	4	,085	5,079	1,145	,811
68	5	5	,134	2	,422	4,015	4	,371	3,003	-,123	1,603
69	5	5	,143	2	,681	3,884	3	,269	1,459	1,527	1,323
70	5	5	,982	2	,812	,036	4	,184	1,733	,282	-,212
71	5	5	,876	2	,844	,264	4	,155	2,388	,257	-,800
72	4	5(**)	,055	2	,519	5,787	4	,481	4,667	-1,242	-2,040
73	4	5(**)	,506	2	,648	1,362	4	,351	1,317	-,544	-,949
74	4	5(**)	,578	2	,859	1,095	4	,141	3,436	,174	-1,332
75	4	4	,752	2	,493	,571	5	,487	1,868	-,498	,675
76	5	5	,007	2	,996	9,835	3	,002	17,824	3,513	-,945
77	5	5	,459	2	,737	1,556	4	,186	3,043	,546	,923
78	5	5	,675	2	,947	,787	4	,047	5,507	1,324	-,254
79	4	3(**)	,533	2	,511	1,260	4	,309	5,275	-,376	2,318
80	3	3	,050	2	,999	6,001	5	,001	25,087	1,482	4,579
81	5	5	,118	2	,434	4,268	3	,343	,459	,290	1,740
82	5	4(**)	,845	2	,638	,336	5	,349	2,814	-,908	,679
83	5	5	,759	2	,944	,552	4	,054	5,006	1,131	-,591
84	5	5	,338	2	,720	2,167	4	,147	4,073	,751	1,119

(**) misclassified case

Table A12.45

**The results of ANOVA for each discriminant variable
(The tests of equality of group means)**

	Wilks' lambda	F	df1	df2	Sig.
VOZR	,933	2,886	2	81	,062
K7	,973	1,108	2	81	,335
K8	,953	2,018	2	81	,139
K9	,994	,236	2	81	,790
K14	,840	7,727	2	81	,001
K15	,948	2,214	2	81	,116
K16	,951	2,089	2	81	,130
K17	,902	4,376	2	81	,016
K18	,960	1,671	2	81	,194
K19	,939	2,650	2	81	,077
K20	,991	,371	2	81	,691
K21	,985	,609	2	81	,547
K22	,993	,294	2	81	,746
K23	,993	,283	2	81	,754
K24	,991	,371	2	81	,691
K25	,990	,426	2	81	,654
K27	,979	,872	2	81	,422
K28	,989	,468	2	81	,628
K29	,985	,629	2	81	,536
K45	,979	,855	2	81	,429

The discriminant variables for each step are obtained by the step-by-step method. In tabl. A12.46 shows the tolerance, the values of statistics F-deletion and λ – Wilks for each independent variable on each step of the discriminant analysis.

Table A12.46

The indicators of step-by-step comparison (the variables in the analysis)

Step	Index	Tolerance	F to Remove	Wilks' lambda
1	K14	1,000	7,727	
2	K14	,936	7,511	,902
	K17	,936	4,210	,840
3	K14	,921	7,384	,869
	K17	,921	3,299	,793
	K19	,960	1,493	,760
4	K14	,867	5,854	,804
	K17	,816	4,648	,782
	K19	,897	2,223	,739
	K18	,722	1,852	,732
5	K14	,866	5,534	,772
	K17	,803	4,891	,761
	K19	,891	2,343	,716
	K18	,722	1,836	,707
	K7	,974	1,378	,699
6	K14	,859	4,766	,736
	K17	,803	4,802	,737
	K19	,842	1,991	,688
	K18	,722	1,812	,685
	K7	,973	1,424	,678
	VOZR	,914	1,212	,675
7	K14	,859	4,556	,712
	K17	,788	4,909	,717
	K19	,788	2,151	,671
	K18	,721	1,763	,664
	K7	,950	1,742	,664
	VOZR	,909	1,341	,657
	K24	,861	1,152	,654
8	K14	,828	5,292	,698
	K17	,773	4,744	,689
	K19	,787	2,125	,645
	K18	,682	1,491	,635
	K7	,941	1,921	,642
	VOZR	,904	1,074	,628
	K24	,715	2,052	,644
	K29	,750	1,454	,634

The continuation of tabl. A12.46

9	K14	,826	5,290	,678
	K17	,773	4,418	,664
	K19	,786	1,931	,624
	K18	,617	2,084	,626
	K7	,941	1,908	,623
	VOZR	,892	,867	,606
	K24	,712	2,109	,626
	K29	,739	1,557	,617
	K15	,838	1,124	,610
10	K14	,825	5,197	,659
	K17	,755	4,871	,654
	K19	,784	1,699	,603
	K18	,605	1,581	,601
	K7	,941	1,852	,605
	VOZR	,869	,990	,592
	K24	,703	1,854	,605
	K29	,739	1,544	,601
	K15	,810	1,465	,599
	K22	,801	1,024	,592
11	K14	,809	5,408	,648
	K17	,733	3,940	,625
	K19	,783	1,707	,589
	K18	,605	1,518	,586
	K7	,887	1,711	,589
	VOZR	,868	,962	,578
	K24	,693	1,717	,589
	K29	,474	1,776	,590
	K15	,806	1,342	,584
	K22	,706	1,407	,585
	K27	,431	,855	,576
12	K14	,803	5,588	,632
	K17	,684	3,018	,592
	K19	,764	1,383	,567
	K18	,597	1,282	,565
	K7	,887	1,654	,571
	VOZR	,834	,761	,557
	K24	,692	1,622	,571
	K29	,459	2,150	,579
	K15	,806	1,328	,566
	K22	,689	1,587	,570
	K27	,421	1,108	,563
	K8	,836	1,084	,562

The continuation of tabl. A12.46

13	K14	,803	5,492	,575
	K17	,634	4,400	,559
	K19	,762	1,045	,511
	K18	,591	1,558	,518
	K7	,880	1,758	,521
	VOZR	,802	1,075	,512
	K24	,685	1,694	,520
	K29	,440	1,608	,519
	K15	,803	1,437	,517
	K22	,675	2,098	,526
	K27	,420	,923	,509
	K8	,186	4,186	,556
	K9	,182	3,430	,545
14	K14	,800	5,533	,565
	K17	,609	4,195	,546
	K19	,689	1,009	,500
	K18	,591	1,528	,507
	K7	,880	1,729	,510
	VOZR	,569	1,352	,505
	K24	,679	1,466	,507
	K29	,410	,936	,499
	K15	,796	1,459	,506
	K22	,669	1,996	,514
	K27	,413	,737	,496
	K8	,174	4,350	,548
	K9	,173	3,494	,536
	K20	,499	,732	,496
15	K14	,795	5,593	,560
	K17	,598	3,815	,535
	K19	,689	,974	,494
	K18	,581	1,600	,503
	K7	,878	1,757	,505
	VOZR	,547	1,567	,503
	K24	,678	1,501	,502
	K29	,409	,870	,493
	K15	,766	1,130	,496
	K22	,626	2,095	,510
	K27	,411	,726	,491
	K8	,172	4,274	,541
	K9	,172	3,475	,530
	K20	,484	,843	,492
	K21	,730	,377	,486

The continuation of tabl. A12.46

16	K14	,792	5,558	,554
	K17	,578	3,140	,519
	K19	,616	,488	,481
	K18	,577	1,689	,498
	K7	,850	1,387	,494
	VOZR	,543	1,650	,498
	K24	,236	1,462	,495
	K29	,384	,699	,484
	K15	,758	1,234	,492
	K22	,624	2,118	,504
	K27	,385	,845	,486
	K8	,168	4,389	,537
	K9	,166	3,656	,527
	K20	,482	,793	,485
	K21	,720	,449	,480
	K25	,213	,430	,480
17	K14	,787	5,158	,545
	K17	,577	3,093	,515
	K19	,596	,515	,478
	K18	,576	1,665	,495
	K7	,846	1,281	,489
	VOZR	,543	1,606	,494
	K24	,212	1,560	,493
	K29	,343	,890	,483
	K15	,757	1,229	,488
	K22	,619	2,075	,501
	K27	,339	,877	,483
	K8	,168	4,315	,533
	K9	,165	3,620	,523
	K20	,471	,893	,484
	K21	,717	,468	,477
	K25	,211	,392	,476
	K23	,444	,238	,474
18	K14	,775	4,991	,542
	K17	,555	2,650	,508
	K19	,595	,485	,476
	K18	,569	1,510	,491
	K7	,846	1,263	,487
	VOZR	,541	1,533	,491
	K24	,209	1,590	,492
	K29	,334	,848	,481
	K15	,748	1,275	,487
	K22	,616	1,946	,497
	K27	,337	,807	,481
	K8	,167	4,334	,532
	K9	,165	3,569	,521

The completion of tabl. A12.46

	K20	,464	,869	,482
	K21	,717	,470	,476
	K25	,211	,398	,475
	K23	,433	,235	,472
	K45	,833	,124	,471
19	K14	,770	4,987	,541
	K17	,553	2,635	,506
	K19	,552	,562	,475
	K18	,565	1,523	,490
	K7	,846	1,244	,485
	VOZR	,540	1,520	,489
	K24	,208	1,619	,491
	K29	,217	,830	,479
	K15	,747	1,278	,486
	K22	,614	1,941	,496
	K27	,336	,794	,479
	K8	,160	4,028	,527
	K9	,159	3,282	,516
	K20	,445	,925	,481
	K21	,715	,484	,474
	K25	,208	,424	,473
	K23	,423	,273	,471
	K45	,786	,156	,469
	K28	,322	,122	,469
20	K14	,739	4,289	,529
	K17	,538	2,556	,503
	K19	,551	,547	,473
	K18	,524	1,479	,487
	K7	,837	1,287	,484
	VOZR	,537	1,554	,488
	K24	,182	1,115	,482
	K29	,213	,890	,478
	K15	,667	,979	,480
	K22	,612	1,924	,494
	K27	,336	,783	,477
	K8	,149	3,761	,521
	K9	,154	3,157	,512
	K20	,444	,944	,479
	K21	,713	,451	,472
	K25	,199	,347	,470
	K23	,407	,188	,468
	K45	,775	,168	,467
	K28	,311	,163	,467
	K16	,512	,135	,467

λ - Wilkes shows, that on each step the ability of a set of discriminative variables increases (the value λ decreases).

Table A12.47

The pairwise comparison of groups (Wilks' lambda)

Step	Number of Variables of Variables Statistic	Lambda	df1	df2	df3	Exact F			
						Statistic	df1	df2	Sig.
1	1	,840	1	2	81	7,727	2	81,00	,001
2	2	,760	2	2	81	5,889	4	160,00	,000
3	3	,732	3	2	81	4,443	6	158,00	,000
4	4	,699	4	2	81	3,825	8	156,00	,000
5	5	,675	5	2	81	3,347	10	154,00	,001
6	6	,654	6	2	81	2,997	12	152,00	,001
7	7	,634	7	2	81	2,737	14	150,00	,001
8	8	,610	8	2	81	2,589	16	148,00	,001
9	9	,592	9	2	81	2,429	18	146,00	,002
10	10	,576	10	2	81	2,288	20	144,00	,003
11	11	,562	11	2	81	2,153	22	142,00	,004
12	12	,545	12	2	81	2,065	24	140,00	,005
13	13	,496	13	2	81	2,228	26	138,00	,002
14	14	,486	14	2	81	2,113	28	136,00	,003
15	15	,480	15	2	81	1,979	30	134,00	,005
16	16	,474	16	2	81	1,866	32	132,00	,008
17	17	,471	17	2	81	1,750	34	130,00	,014
18	18	,469	18	2	81	1,638	36	128,00	,024
19	19	,467	19	2	81	1,536	38	126,00	,041
20	20	,465	20	2	81	1,446	40	124,00	,065

Table A12.48

The results of the pairwise comparison of formed groups

Step	Y3		3,00	4,00	5,00
1	3,00	F		15,004	13,408
		Sig.		,000	,000
	4,00	F	15,004		,497
		Sig.	,000		,483
	5,00	F	13,408	,497	
		Sig.	,000	,483	
2	3,00	F		7,483	7,296
		Sig.		,001	,001
	4,00	F	7,483		4,257
		Sig.	,001		,018
	5,00	F	7,296	4,257	
		Sig.	,001	,018	

The continuation of tabl. A12.48

3	3,00	F		5,021	4,868
		Sig.		,003	,004
	4,00	F	5,021		3,899
		Sig.	,003		,012
	5,00	F	4,868	3,899	
		Sig.	,004	,012	
4	3,00	F		3,725	3,972
		Sig.		,008	,006
	4,00	F	3,725		3,761
		Sig.	,008		,008
	5,00	F	3,972	3,761	
		Sig.	,006	,008	
5	3,00	F		3,431	3,289
		Sig.		,007	,010
	4,00	F	3,431		3,356
		Sig.	,007		,009
	5,00	F	3,289	3,356	
		Sig.	,010	,009	
6	3,00	F		3,314	3,035
		Sig.		,006	,010
	4,00	F	3,314		2,844
		Sig.	,006		,015
	5,00	F	3,035	2,844	
		Sig.	,010	,015	
7	3,00	F		3,194	2,771
		Sig.		,005	,013
	4,00	F	3,194		2,539
		Sig.	,005		,021
	5,00	F	2,771	2,539	
		Sig.	,013	,021	
8	3,00	F		3,207	2,806
		Sig.		,004	,009
	4,00	F	3,207		2,203
		Sig.	,004		,037
	5,00	F	2,806	2,203	
		Sig.	,009	,037	
9	3,00	F		2,941	2,467
		Sig.		,005	,016
	4,00	F	2,941		2,215
		Sig.	,005		,030
	5,00	F	2,467	2,215	
		Sig.	,016	,030	
10	3,00	F		2,672	2,191
		Sig.		,008	,028
	4,00	F	2,672		2,224
		Sig.	,008		,026
	5,00	F	2,191	2,224	
		Sig.	,028	,026	

The continuation of tabl. A12.48

11	3,00	F		2,416	2,079
		Sig.		,013	,033
	4,00	F	2,416		2,110
		Sig.	,013		,030
	5,00	F	2,079	2,110	
		Sig.	,033	,030	
12	3,00	F		2,276	2,086
		Sig.		,017	,029
	4,00	F	2,276		1,968
		Sig.	,017		,040
	5,00	F	2,086	1,968	
		Sig.	,029	,040	
13	3,00	F		2,072	2,060
		Sig.		,027	,028
	4,00	F	2,072		2,422
		Sig.	,027		,009
	5,00	F	2,060	2,422	
		Sig.	,028	,009	
14	3,00	F		2,021	2,027
		Sig.		,029	,028
	4,00	F	2,021		2,217
		Sig.	,029		,016
	5,00	F	2,027	2,217	
		Sig.	,028	,016	
15	3,00	F		1,922	1,893
		Sig.		,036	,040
	4,00	F	1,922		2,067
		Sig.	,036		,023
	5,00	F	1,893	2,067	
		Sig.	,040	,023	
16	3,00	F		1,808	1,750
		Sig.		,049	,058
	4,00	F	1,808		1,978
		Sig.	,049		,028
	5,00	F	1,750	1,978	
		Sig.	,058	,028	
17	3,00	F		1,713	1,659
		Sig.		,063	,075
	4,00	F	1,713		1,834
		Sig.	,063		,042
	5,00	F	1,659	1,834	
		Sig.	,075	,042	
18	3,00	F		1,595	1,544
		Sig.		,088	,104
	4,00	F	1,595		1,726
		Sig.	,088		,058
	5,00	F	1,544	1,726	
		Sig.	,104	,058	

The completion of tabl. A12.48

19	3,00	F		1,505	1,448
		Sig.		,115	,138
	4,00	F	1,505		1,616
		Sig.	,115		,080
	5,00	F	1,448	1,616	
		Sig.	,138	,080	
20	3,00	F		1,426	1,369
		Sig.		,144	,173
	4,00	F	1,426		1,513
		Sig.	,144		,109
	5,00	F	1,369	1,513	
		Sig.	,173	,109	

The results of analysis of the canonical discriminant functions are presented in tabl. A12.49.

Table A12.49

The eigenvalues for the canonical discriminant functions (Eigenvalues)

Function	Eigenvalue	% of Variance	Cumulative %	Canonical correlation
1	,493(a)	52,8	52,8	,575
2	,441(a)	47,2	100,0	,553

a First 2 canonical discriminant functions were used in the analysis.

The informativity of canonical discriminant functions is approximately equal.

Table P12.50

λ Wilks for each function (Wilks' lambda)

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 2	,465	54,757	40	,060
2	,694	26,115	19	,127

The first string contains the value $\lambda=0,465$ and the statistical significance $p=0,06$ for the entire set of the canonical discriminant functions, the second string contains data for the leftover discriminative ability of a set after the excluding of the first function.

The complete set has a very high discriminative ability, which sharply drops after the excluding of the first canonical discriminant function.

The low value of the nominal value of statistical significance of the second discriminant function shows the little doubt of its interpretation in relation to the statistical general set.

The values of canonical functions of the group centroids are presented in tabl. A12.51.

Table A12.51

**The nominal values of canonical functions for the group centroids
(Functions at Group Centroids)**

Y3	Function	
	1	2
3,00	,744	2,243
4,00	-,995	,106
5,00	,439	-,320

Unstandardized canonical discriminant functions, evaluated at group means

In the table shows the geometrical coordinates of centroids for all groups. They allow to interpret the canonical discriminant functions regarding their role in the differentiation on the classes (excellent-students, good-students and triplet-students). The increasing of the nominal value of this function directly indicates about the increasing of probability of high success of automated training.

The standardized coefficients of canonical discriminant functions (tabl. A12.52) allow to determine the ratio of the contributions of variables into each from the canonical functions.

Table A12.52

**The standardized coefficients of canonical discriminant functions
(Standardized Canonical Discriminant Function Coefficients)**

	Function	
	1	2
VOZR	,435	,295
K7	,321	,211
K8	-,938	1,195
K9	,996	-,942
K14	-,225	-,695
K15	-,371	,038
K16	-,091	-,136
K17	-,600	,273
K18	,505	-,097
K19	-,305	-,052
K20	,137	,445
K21	-,213	-,129
K22	,517	-,152
K23	-,106	-,191
K24	,710	,284
K25	-,408	,043
K27	-,259	,409
K28	,177	,147
K29	-,276	-,588
K45	,145	-,008

The presented structural coefficients of canonical matrixes (tabl. A12.53), like the nominal values of factor loads in the factor analysis, are the coefficients of correlation of independent variables and canonical functions. These coefficients allow to interpret the canonical discriminant functions.

Table A12.53

The structural coefficients of canonical matrixes (Structure Matrix)

	Function	
	1	2
K17	-,461(*)	,089
K19	-,362(*)	,042
K15	-,326(*)	-,072
VOZR	,296(*)	,252
K16	-,246(*)	-,223
K27	-,204(*)	-,046
K7	,184(*)	,155
K21	-,151(*)	-,093
K20	-,136(*)	-,001
K25	-,127(*)	,077
K23	-,114(*)	-,037
K14	-,290	-,582(*)
K8	-,146	,299(*)
K18	-,085	-,292(*)
K45	,102	-,190(*)
K29	-,024	-,186(*)
K24	-,006	,144(*)
K28	-,088	-,133(*)
K9	-,047	,103(*)
K22	,073	-,102(*)

Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions

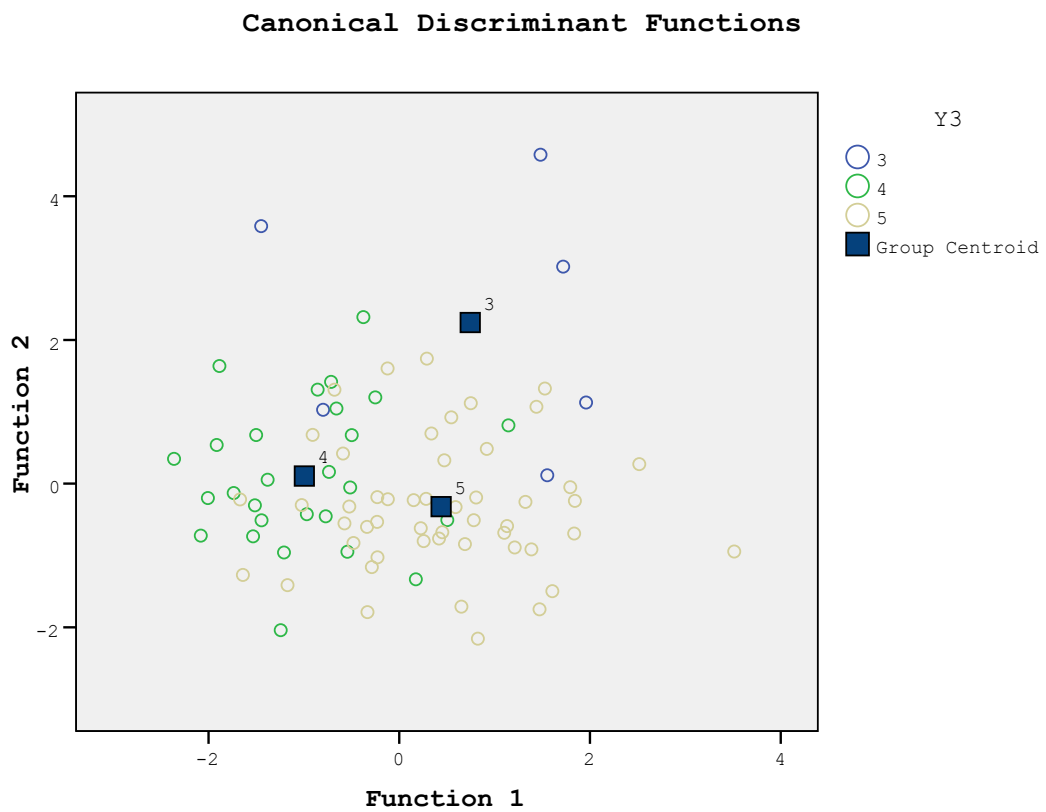
Variables, ordered by absolute size of correlation within function.

* Largest absolute correlation between each variable and any discriminant function

In pic. A12.17 shows directly the group centroids (Group Centroid) and the elements of groups in the axes of canonical discriminant functions.

The graphical interpretation allows to analyze directly the canonical discriminant functions and visually to estimate the quality of classification by the density of objects within each class and by the distinctiveness of boundaries between the classes.

In the picture presents directly the location of the three centroids corresponding to the classes (groups) of excellent-students, good-students and triplet-students, and also the relative distribution of points, included into the corresponding centroids.



Picture A12.17. The graph of canonical functions of the centroids of classes

The personal cards for the registration of a posteriori data are also presented, intended for the registration of a posteriori data of automated testing by means of use of the main and applied diagnostic modules.

**Appendix 13 (information).
The acts about the practical use of results
of the dissertation research**

**Appendix 14 (information).
The copyright certificates about the deposition and registration
of my personal monographies and doctoral dissertation
in “RAS” Moscow city**