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Intellectual and expert systems of distance learning in the system of advanced qualification

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ABSTRACT. Modern socio-economic conditions require the development of science-intensive social technologies that will ensure the transfer of social information as a result of social inheritance not at the level of intuition, past experience, but on a solid basis of modern scientific data, technolization and informatization of social space.

KEYWORDS: teaching technology, distance learning technology, intelligent systems, expert systems.

1. INTRODUCTION

Learning technology (LT) is a way of implementing the learning content provided by the curriculum, which contains a system of forms, methods and teaching aids, and also ensures the most effective achievement of the set goals of the educational process. Distance learning technology is seen as:
1) a certain way of implementing pedagogical activities aimed at achieving educational goals;
2) the essence and significance of the method lies in the rational division and distribution of activities into procedures and stages with their subsequent coordination and synchronization;
3) this division is carried out in advance, consciously and systematically on the basis and using scientific knowledge, experience of pedagogy and related sciences related to it. Thus, the technology of distance learning (TDL) can be defined as a system of methods, specific means and forms of education for the reproducible implementation of a given educational content. TEL is focused on the didactic application of scientific knowledge, scientific approaches to the analysis and organization of the educational process of distance learning. Important elements of a holistic didactic DL system are teaching and information technologies, jointly applied through the use of intelligent systems. Intelligent systems (IS) are systems designed to solve problems in which, as a rule, logical (semantic) processing prevails over computational. IP is used in almost all spheres of human activity. The main types of tasks in which IS are applied are shown in the table[1,2].

The main types of tasks in which IS is applied

№	*Tasktype*	*Definition*
1	Interpretation	DataMeaningProcess
2	Diagnostics	Faultdetectionprocess
3	Monitoring	Continuous interpretation of data in real time and signaling of parameters out of range
4	Forecasting	Predicting the future based on the analysis and synthesis of the past and present
5	Planning	Constructinganactionprogram

Intelligent systems are divided into the following classes:
1) expert systems;
2) computational and logical systems;
3) intelligent CAD and SANI;
4) intelligent robots;

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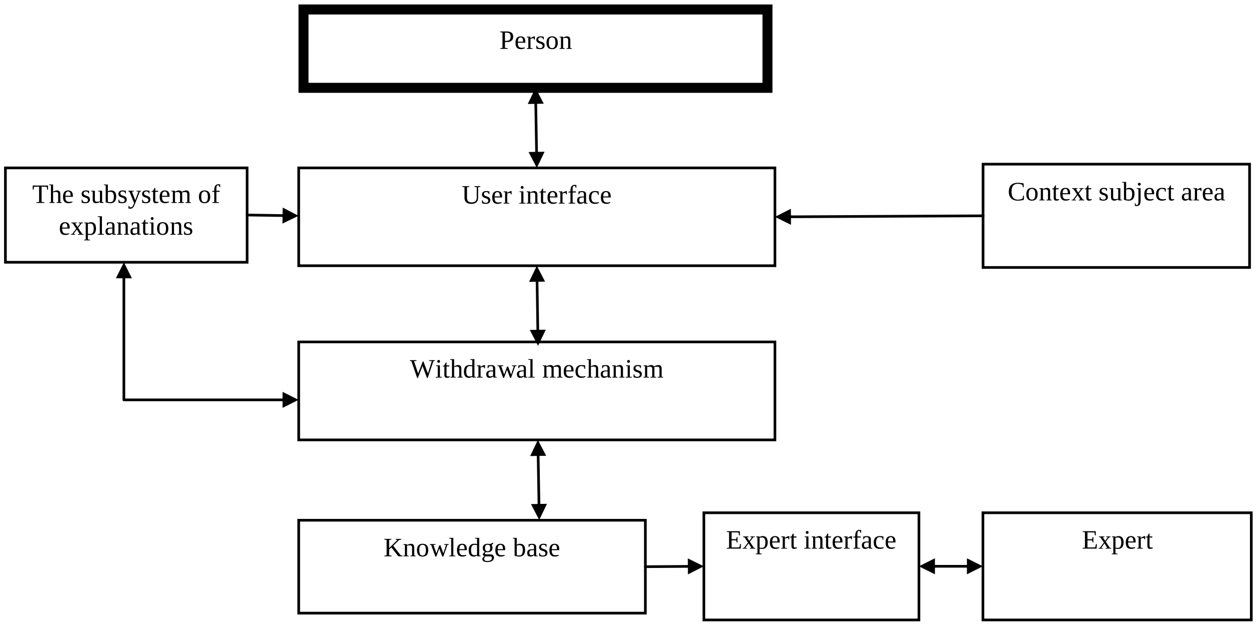
5) training systems;
6) intelligent information systems.
An expert learning system (ELS) is a program that implements a particular pedagogical goal based on the knowledge of an expert in a certain subject area, diagnosing learning and teaching management, and also demonstrating the behavior of experts (subject specialists, methodologists, psychologists). The expertise of EOS lies in the presence in it of knowledge on teaching methods, thanks to which it helps teachers to teach and students to learn.

II. MATERIAL AND METHODS

The architecture of the expert training system includes two main components: a knowledge base (storage of knowledge units) and a software tool for accessing and processing knowledge, consisting of mechanisms for deriving conclusions (solutions), acquiring knowledge, explaining the results obtained and an intelligent interface. Such an intelligent system can give advice, advise, analyze and diagnose at the specialist level in a certain narrow subject area. An approximate diagram of the expert system is shown in the figure [2].



The scheme of the expert system

Each expert system has an intelligent natural language or speech interface. ES includes explanation and learning subsystems for interpreting one's own reasoning. Data exchange between the trainee and the ELS is performed by an intelligent interface program that perceives the trainee's messages and converts them into a form of knowledge base representation, and, conversely, translates the internal representation of the processing result into the trainee's format and outputs the message to the required medium. It is important that the sequence of solving the problem is flexible, corresponds to the ideas of the student and is conducted in professional terms. The presence of a developed system of explanations (SE) is extremely important for ELS working in the field of education. In the learning process, such an ELS will perform not only the active role of a "teacher", but also the role of a reference book that helps the student to study the internal processes occurring in the system by modeling the applied area.SE consists of two components: active, which includes a set of information messages issued to the trainee in the process of work, depending on the specific way of solving the problem, completely determined by the system; passive (the main component of SE), focused on the initializing actions of the student. The active component of SE is a detailed commentary accompanying the actions and results obtained by the system. The passive component of SE is a qualitatively new type of information support, inherent only in knowledge-based systems[4]. This component, in addition to a developed system of help called by the learner, has a system for explaining the progress of solving the problem. The widespread use of "menu" systems allows not only to differentiate information, but also to judge the level of preparedness of the student, forming his psychological portrait. However, the learner may not always be interested in the complete output of the solution,

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which contains many unnecessary details. In this case, the system should be able to select only key points from the chain, taking into account their importance and the level of knowledge of the student.To do this, the knowledge base must maintain a model of knowledge and intentions of the learner. If the learner continues not to understand the received answer, then the system should, in a dialogue, based on the supported model of problem knowledge, teach him this or that piece of knowledge, that is, to reveal in more detail individual concepts and dependencies, even if these details were not used directly in the conclusion[5,6].

III. METHODS/METHODOLOGY

When developing and applying expert training systems, the basic principle is the principle of constructive learning using self-learning and self-learning. It implements an activity-based approach to teaching a subject; learning takes place on the basis of self-education and self-development of an expert teaching system and mutual cross influence. The main distinguishing points of this scheme are:
1) reliance on the capabilities of the student;
2) wide use of expert methods and recognition methods when creating a knowledge base and managing the course of training;
3) the use of an activity approach at various stages of learning and control of knowledge - the student himself acts as a teacher, the proposed tasks are constructive, during the training search elements are introduced that require decision-making in conditions of incomplete information and partial uncertainty, the learning process is recursive, possibly deepening the learning process in the same way[7].
The main purpose of the implementation of ELE is to train and assess the current level of knowledge of the student relative to the level of knowledge of the teacher. Comparison of two grids (the reference one, reflecting the teacher's ideas, and the lattice filled by the student during the dialogue) makes it possible to assess the differences in the teacher's and the student's ideas.
The disadvantage of expert systems is the considerable labor required to replenish the knowledge base. Obtaining knowledge from experts and adding it to the knowledge base is a complex process involving a significant investment of time and money. Designing expert systems also has certain difficulties and limitations that affect their development.
The emergence of methods for solving problems characteristic of artificial intelligence has not canceled everything that has been accumulated by computational mathematics. Many problems of economic planning, modeling social processes and many other types of problems require the joint use of numerical models and models based on the qualitative reasoning of specialists. This is how hybrid systems arise, in which the stages of pure mathematical calculations and logical reasoning alternate when solving problems, therefore such systems are also called computational-logical systems[6,7].
Design automation systems (CAD) and scientific research automation systems (SRAS) occupy a significant place in modern pedagogical and scientific activities. The emergence of the core of intelligent systems in them makes it possible to raise the level of decisions made and provide specialists with a much more convenient way of interacting with CAD and SRAS. Intelligent robots assess the current situation and act in the environment when their actions cannot be predetermined by rigid schemes. Capable of acting autonomously, these robots will be able to work in those environments where human presence is impossible or dangerous, as well as perform such actions that are inaccessible to humans.
Intelligent learning systems arose even before the advent of work in the field of artificial intelligence, but only the methods developed in a new direction of science made it possible to make such systems effective. First of all, this concerns education systems. Intellectual simulators constitute a special class of training systems. They combine a conventional simulator with a system that simulates the activities of an instructor. Such simulators should dramatically improve the quality of professional training of people in various spheres of human activity[6,7].
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In the mode of acquiring knowledge, communication with the ES is carried out (through the mediation of the knowledge engineer) by an expert. In this mode, the expert, using the knowledge acquisition component, fills the system with knowledge that allows the ES in the solution mode to independently (without an expert) solve problems from the problem area. The expert describes the problem area in the form of a set of data and rules. Data define objects,

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their characteristics and values that exist in the field of expertise[8]. The rules define the ways to manipulate data that are specific to the area in question.

IV. DISCUSSION

Consulting systems that provide individual advice on a wide range of issues of interest to people of various social groups. In the consultation mode, communication with the ES is carried out by the end user who is interested in the result and (or) the method of obtaining it. It should be noted that, depending on the purpose of the ES, the user may not be an expert in this problem area (in this case, he turns to the ES for the result, not being able to get it himself) or be a specialist (in this case, the user can get the result himself, but he refers to the ES in order to either speed up the process of obtaining a result, or to assign routine work to the ES). In the consultation mode, the data about the user's task, after being processed by the dialog component, is transferred to the working memory. A solver based on input data from working memory, general data on the problem area and rules from knowledge base forms a solution to the problem. When solving a problem, the ES not only performs the prescribed sequence of the operation, but also pre-forms it. If the response of the system is not clear to the user, then he may require an explanation:ITS should provide an educational dialogue with the user at the level of the individual work of an experienced teacher with a student. Therefore, ITS are not only teaching, but also learning systems[9].

V.RESULTS

The basis of the ITS is the knowledge base of the subject area, which includes objective scientific knowledge (content of the academic subject) and subjective knowledge, that is, the knowledge of an expert (teaching methodology, teacher experience). ITS should make a lesson for one learner different from a lesson for another, since everyone chooses their own teaching sequence. The system must explain the subject to each student in accordance with the level of his training, the pace of assimilation, and other individual characteristics. At the same time, as a result of training, students with different initial levels should achieve results not lower than some of the minimum permissible.

VI.CONCLUSION

The use of ITS is very promising, but their development is extremely difficult and time consuming. For high-quality and affordable education, it is not enough to simply introduce training systems into the educational process; a creative approach to business is required, the creation of an established system for organizing the educational work of teachers and students, taking into account all the features and principles of intensive learning in a virtual environment. The systems must be successfully combined, contributing to the intensification of the learning process, the development of the creative potential and cognitive aspirations of the individual, which is the meaning of education as a whole[10].

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