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THE USE OF EXPERT LEARNING SYSTEMS IN LINGUISTICS

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Abstract

This article reveals the purpose of expert training systems in linguistics and their application in learning processes. The topic is one of the less developed ones in modern linguistics. Creating and using computer programs is important while learning a foreign language outside the language environment. It is relevant to computer linguistics, a new area of linguistics. Expert training systems facilitate the development of studied languages and allow the maximum use of the acquired linguistic knowledge in practice. An expert training system can be called a program system that implements a specific pedagogical goal based on object knowledge of subject and meta-knowledge of experts in a specific subject area. Expert systems, in turn, with the help of information received from an expert, can partially solve the problem of creating a natural language environment. A list of tasks performed by expert systems, such as the interpretation of the source data, the architecture of the objects and the stages of monitoring, is proposed. Also, the presentation of knowledge in expert training systems and the conditions for their conceptual design are discussed. At the end of the study, the author concludes that the expert system of teaching a foreign language is a multifunctional toolkit for processing and evaluating various types of knowledge. This knowledge is acceptable for linguodidactics, computer linguistics and linguistics in general. It provides the opportunity for the most profitable language environment for learning a foreign language.

Keywords: Computer programs, linguistic knowledge, interpretation, knowledge representation, conceptual design.

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1. Introduction

At present, theoretical and practical ideas about linguistic phenomena, aspects, and the methodology of studying a foreign language are the foundation for linguistic knowledge systems. Such systems not only accumulate information about a language in some internal format, but also use it to process texts in a recognition system, and to analyze and synthesize texts in translation systems. The presentation of linguistic knowledge in expert training systems is carried out by the knowledge base used to collect, store and process lexical and grammatical data that are necessary to create a contextual environment when using or explaining certain language phenomena. Teaching any foreign language is productive in authentic conditions, which, however, is not always entirely possible to implement in a computer environment. Expert systems can partially solve the problem of creating a natural language environment, depending on the information received from the expert. The collection and entry of preliminary expert data into the system is copyright knowledge. The operating mode of the expert system determines the so-called verification, which determines how true the linguistic concept of the expert's person, his ideas and personal knowledge of the functioning of the language is.

The need to learn foreign languages determines the intensification of the development of new technologies that are necessary to create the optimal architecture of training systems. Such systems can be applied both individually and online.

The development of information technology necessitates the creation of more flexible multifunctional systems capable of processing a large amount of knowledge presented in their subsystems, which makes this article relevant in the light of interdisciplinary developments.

2. Problem Statement

The practical use of information and computer technologies allows students to actively develop cognitive activity and acquire new knowledge, develop cognitive independence of students, develop the ability to independently replenish knowledge, search for new information and navigate this flow (Domrachev & Retinskaya, 1996).

One of the directions of increasing training effectiveness, information assimilation and reducing costs of learning processes is the development and use of automated teaching systems (Aliseichik et al., 2017).

An automated teaching system is a set of software, technical, educational and methodological tools that provide students with study materials, tests, interaction between students and teachers in the learning process. It also provides students with the opportunity to work independently to master studied materials (Zaitseva et al., 1989).

The first experiments and the first stage of the study of the possibilities of creating educational systems occurred in the 1950s–1960s. In 1954, Skinner put forward an idea called programmed learning. It meant the desire to increase the effectiveness of the management of the educational process by building it in full accordance with the psychological knowledge of the process. In fact, it was the introduction of cybernetics in the practice of teaching (Talyzina, 1969). This direction began to develop actively in the USA, and later in other countries. One of the modern automated systems in linguistics is an expert

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learning system, which we will discuss in detail. Expert learning systems are becoming increasingly popular in foreign language learning.

3. Research Questions

An expert system is a computer system capable of partially replacing a specialist-expert in resolving a problem situation. Expert systems arose as a result of the application and development of artificial intelligence methods. Artificial intelligence (AI) is a set of scientific disciplines that study methods for solving intellectual problems using computers. Expert systems as an independent discipline were formed at the end of the 1970s–1980s.

An expert system is a technical tool. It is able to make decisions based on knowledge of a specific subject area, controlled by the provided object-oriented software.

According to their purpose, expert systems are intelligent systems that simulate human mental activity (Zubov & Zubova, 2004). The expert system is a part of cybernetic (computer) mechanisms. Such mechanisms independently solve complex problems, such as an accessible explanation of the material, interactive presentation of the material, control and verification of knowledge, step-by-step analysis of the process of mastering the material, an adequate assessment of the knowledge gained, etc. Linguistic expert systems perform various types of tasks, and accordingly have a different purpose and architecture.

It should be noted that expert systems are an object of interest for two types of user audiences: experts creating a knowledge base of expert systems, and end users who use these systems to solve certain problems.

The successes of artificial intelligence in modeling intellectual activity of people are manifested in solving complex problems both in understanding natural language, interpreting visual information and speech, and in accumulating, presenting and using knowledge.

At the initial stages, expert systems were used in modeling gaming activities: chess, proof of theorems, then developers proceeded to problems of natural language recognition; verbal learning and memory, the formation of concepts, etc. The development of expert systems can be carried out in accordance with the following classification of the tasks they solve (Chalykina & Sukhan, 2019; Kuliev, 2009):

The interpretation of source data is based on the tasks of analyzing actions, situations and scenarios, identifying objects that are in the situation, predicting preliminary and step-by-step analysis of actions, predicting the likely consequences of given situations:

— interpretation of initial data covers tasks of diagnosing preliminary, step-by-step acquired knowledge;
— diagnosis of probable violations in systems;
— accounting errors to change the working strategy;
— diagnostics of frequency of repeated errors.

The stage of building objects performs the following tasks of post-diagnostic tasks of designing further actions:

— construction of complex objects on certain conditions;

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— arrangement of system blocks;
— creation of production rules in the knowledge base;
— change of course or working system strategy;
— synthesis of the obtained data to go to the next stage;
— curriculum experiment planning;
— designing an action plan;
— building an action description from elementary operations.

The monitoring phase includes the following tasks:
— testing;
— tracking system operation;
— identification of unforeseen situations;
— emergency critical alert;
— monitoring of unplanned replicas for a speech base for recognizing and fixing errors of correct answers;
— tracking the actions of the object.

4. Purpose of the Study

The purpose of this article is the phased development of expert training systems the presentation of knowledge in these systems and the conditions for the conceptual design of expert training systems. For the first time, the development of expert systems is proposed in accordance with the classification of tasks of various kinds that it solves; the development of a conceptual project for the implementation of which a preliminary picture of the basic needs of the conceptual model is compiled.

5. Research Methods

In carrying out the study, descriptive and experimental methods of linguistics were used.

6. Findings

Representation of knowledge in an expert system. As a rule, the knowledge base of expert systems contains facts (static information about the subject area) and the rules – a set of instructions, applying which you can obtain new facts to already known facts. Knowledge and data are various types of information entered into certain bases and blocks of expert systems. Data can be defined as a type of information, the main characteristic of which individual elements are values.

“Knowledge is defined as a type of information, in which individual elements are systematically connected with each other and with the methods of their use” (Habibova & Jafarov, 2019, p. 789).

The knowledge presented in expert systems is divided into the following types: depersonal knowledge, i.e. global textual information collected by various information media (books, websites); personal knowledge, i.e. individual knowledge of a person, his heuristic knowledge; declarative knowledge, i.e. information representing facts about properties of objects and relationships between them,

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describe the processes and rules for transforming objects; object knowledge, i.e. information about the subject area and methods for solving problems; metacognition, i.e. information on how to use object knowledge;

Objective knowledge and meta-knowledge constitute interpreted knowledge necessary for the conclusion in solving problems.

Meta-knowledge consists of the knowledge of the system that is used by the knowledge acquisition subsystem and controls the knowledge necessary to select the most effective strategies for solving the current problem (Mahmudov, 2013; Valiyeva, 2015). Management knowledge allows you to direct the system to more promising areas of problem solving.

Non-interpreted knowledge includes the interface and detailed and explanatory knowledge.

Knowledge of the interface is vocabulary and grammar of the communication language, tips and questions of multimedia work, valid user responses.

Explanatory knowledge includes data on the source of knowledge, time of acquisition of knowledge, a semantic description of knowledge used to justify the answers of the expert system to user questions.

When constructing an expert system, all the above-listed types of knowledge are distributed in different blocks and sub-blocks. Expert training systems create a learning environment in which the learner is located to achieve his goal. This goal is achieved either independently or through this program. The expert training system is characterized by the following features: presentation of educational material; submission of additional resources; enforcement of directives; data conversion; control over the actions of students; training to solve a specific class of problems.

The created computerized learning environment is used both as an information block for generating the correct answer and for computer support of the decision-making process (Higgins & Johns, 1984). Intelligent learning systems are qualitatively new technologies, the features of which are modeling of the learning process using a dynamically developing knowledge base; automatic selection of a rational learning strategy for each student; automated registration of new information entering the database.

Expert learning systems, being intelligent learning systems, provide the learner with greater freedom in choosing training topics and tasks, allow you to ask questions of your interest and receive answers to them; and also receive an adequate diagnosis of your knowledge and skills.

An expert training system may be termed a program system that implements a specific pedagogical goal based on object knowledge of subject and meta-knowledge of experts in a specific subject area.

In this article, the working subject area is the scientific vocabulary of the English language. Teaching any language aspect has its own specific linguodidactic features, which accordingly affects the expert knowledge introduced into the system's base.

The architecture of expert training systems is based on the following basic algorithm of the communication process, that is, the following sequence of using the system is repeated: the level of knowledge of the student is determined; based on the current state of the learner, the system selects the appropriate learning strategy, the next task is generated that requires the learner to respond; the student's answers or actions are compared with the standard solution in the blocks of correct answers, and based on

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the differences, error diagnostics are performed; incorrect answers are recorded in the block of erroneous answers; according to the diagnostic results, the student is presented with additional material for re-training and consolidation of weak links.

Further, the process is repeated anew in accordance with step-by-step tracking of actions and results, the presence of progress or its absence.

Terms of conceptual design of an expert training system. When constructing an expert training system, first of all, its conceptual project is developed, for the implementation of which a preliminary picture of the basic needs of the conceptual model is compiled: Formulation of the names of the expert training system; Identification of scientific areas involved in the creation of an expert training system; Indication of the field of knowledge, topics; Indication of the audience of users who need to create this system; Type of expert training system (consulting, diagnostic, management); Indication of the main goal set for users of the expert training system; Definition of requirements for a standard model; Definition of functions and capabilities of the trained one by the model; Determination of the results set before the student at the end of the course; Description of software structure; Establishment of methods for representing software concepts; Indication of methods for modeling software processes; Ranking of types of tasks, tasks and tests by types of their use; Methods for presenting educational material according to criteria; Organization of a method for fixing errors, step-by-step observation of the learner's actions; Creating a range of answers (correct) and not correct for each type of task; Definition of types of hints, help tools and blocking messages used in the system; Description of tools for demonstrating and explaining the correct solutions provided for in the system; Identify the types of learner models; characteristic data; Setting a timer during test tasks and other types of tasks; Definition of methods for analyzing the errors of trainees in solving problems; Identify the type of learning management method; Establishing the number of management levels and main goals; Determination of the types of algorithms organizing the operation of the system as a whole and at all levels; Definition of methods for predicting user behavior; Drawing up a general scenario for the functioning of the system; Description of the student’s motivation tools in the system; An indication of the means of encouragement used in the system when the student learns knowledge or skills; The use of animation in instructions, messages and instructions to the student in the system; Using video and audio clips, animation graphics in the system; Using speech recognition tools; Description of the structure of the automatic dictionary in the expert training system, dictionary entry; Description of the multifunctionality of the automatic dictionary in the expert training system; Interface design methods that meet the requirements of modern information technologies; Implementation of the contextual base, the necessary literature.

As the material is presented, then tasks are set, the solution of which requires the use of new educational material. For any user of the system who is trained after determining his level of knowledge before the start of training, the system automatically opens his pocket.

Pocket dictionary – a cell in which all the words or answers to the questions posed that the student could not answer, or the task was completed incorrectly, will be entered. In this system, the goal is to teach the vocabulary of the English language, so such a pocket will contribute to – consolidation of weak links in the framework of acquired knowledge.

The software independently accounts all the penalty words – errors made during the exercises to

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learn the material. Based on the production rules entered into the knowledge base, the system can analyze the step-by-step execution of tasks proposed by the system. This function of re-mastering and consolidating the material can only be carried out through the intellectualization of the functions of diagnosis and control of knowledge performed by the teacher model.

In the case when the student after retraining could not master this material, he is given tasks of a weak model of the student. The teacher model provides tasks for each of the student models individually – exercises of weak, medium and complex levels. However, given the fact that different users have different learning abilities, and not everyone is able to master the material the same way.

Given the requests made by young researchers, they need to participate in more advanced and international scientific events and write articles for advanced journals. For further purposes, the above described training system can be used as an example of teaching English, both for young scientists and for professors and academics with poor knowledge of a foreign language who need this language for speaking at international conferences, symposia and seminars and when writing articles, abstracts and other scientific publications

7. Conclusion

Being a multifunctional toolkit for storing, processing and evaluating various types of knowledge, at the present stage of pairing linguodidactics, computer linguistics and linguistics, expert systems of teaching foreign languages provides the opportunity to create the most authentic language environment for foreign language learning. Modern computer technologies, in turn, contribute to the creation of multi-level conceptual models with a wider range of intellectualization of their architecture.

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