Technological Aspects of the Use of Modern Intelligent Information Systems in Educational Activities by Teachers

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Summary
The article considers one of the areas of development of artificial intelligence where there is the development of computer intelligent systems capable of performing functions traditionally considered intelligent - language comprehension, inference, use of accumulated knowledge, learning, pattern recognition, as well as learn and explain their decisions.
It is found that informational intellectual systems are promising in their development. The article is devoted to intelligent information systems and technologies in educational activities, ie issues of organization, design, development and application of systems designed for information processing, which are based on the use of artificial intelligence methods.

Key words:
information technology, communication technologies, education system, educational process.

1. Introduction

Artificial Intelligence (AI) is the science of concepts that enable computers to do things that humans make appear intelligent. But what is human intelligence? Is there this ability to reflect? Is there this ability to assimilate and use knowledge? Is there this ability to operate and exchange ideas? Surely all of these abilities are part of what is intelligence. In fact, it seems impossible to give a definition in the usual sense of the word, because intelligence is a fusion of many skills in the field of processing and presenting information.
The central tasks of AI are to make computers more useful and to understand the principles behind intelligence. Therefore, computer scientists and engineers need to know how AI can help them solve difficult problems.

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There are many areas of application of AI: theorem proving; games; pattern recognition; making decisions; adaptive programming; composing machine music; natural language data processing; learning networks (neural networks); verbal conceptual learning.
In educational institutions, computers should look at the problems that students solve, in search of errors, just as they look for errors in a program, and eliminate them. They must provide students with superbooks stored in the memory of computing systems.
The process of higher education entering the world educational space requires improvement, as well as a serious reorientation of the computer information component. The explosion of information has given rise to many problems, the most important of which is the problem of learning. Of particular interest are issues related to the automation of learning, since “manual methods” without the use of technical means have long since exhausted their capabilities. The most accessible form of teaching automation is the use of a computer, that is, the use of computer time for teaching and processing the results of a control survey of students' knowledge.
The increasing use of computers makes it possible to automate and thereby simplify the complex procedure that researchers and teachers use to create teaching aids. Thus, the presentation of various kinds of "electronic textbooks", teaching aids on a computer has a number of important advantages. Firstly, it is the automation of both the process of creating such and storing data in any necessary form. Secondly, this is work with an almost unlimited amount of data. The creation of computer technologies in teaching is side by side with the publication of a new generation of textbooks that meet the needs of the student's personality. Educational publications of the new generation are designed to ensure the unity of the educational process and modern innovative scientific research, i.e. the expediency of using new information technologies in the educational

process and, in particular, various kinds of so-called “electronic textbooks”. In my opinion, the effect of the use of computer technology in teaching can be achieved only when a specialist in the subject area is not limited in the means of presenting information, communications and working with databases and knowledge.
The most extensive is the branch of computer knowledge. Which, in general, is easy to explain. Some truly prestigious foreign universities, of course, will not even think to offer you such a form of study. The most progressive in this direction are American and Western European educational institutions, which readily develop such courses.

2. Theoretical Consideration

Many types of human mental activity, such as writing programs for a calculating machine, doing math, doing reasoning at the level of common sense, and even driving a car, require "intelligence." Over the past decades, several types of computer systems have been built capable of performing such tasks.
There are systems that can diagnose diseases, plan the synthesis of complex synthetic compounds, solve differential equations in symbolic form, analyze electronic circuits, and understand the limited volume of human speech and natural language text. We can say that such systems have, to some extent, artificial intelligence.
Work on the construction of such systems is being carried out in an area called artificial intelligence (AI).
When implementing intellectual functions, information called knowledge is certainly present. In other words, intelligent systems are at the same time knowledge processing systems.
Currently, there are several main directions in research on artificial intelligence.
1. Representation of knowledge. Within the framework of this direction, problems are solved related to the formalization and representation of knowledge in the memory of the AI system. For this, special models of knowledge representation and knowledge description languages are being developed, various types of knowledge are being introduced. The problem of knowledge representation is one of the main problems for an AI system, since the functioning of such a system relies on knowledge about the problem area that is stored in its memory.
2. Knowledge manipulation. In order for knowledge to be used in solving a problem, the AI system should be taught to operate with it. Within the framework of this direction, methods of replenishing knowledge based on their incomplete descriptions are being developed, methods are being created for reliable and plausible inference based on existing knowledge, and models of reasoning based on knowledge and imitating the features of human reasoning are proposed. The manipulation of knowledge is very closely related to the representation of knowledge, and it is possible to separate these two directions only conditionally.
3. Communication. The range of tasks in this area includes: the problem of understanding and synthesizing coherent texts in natural language, understanding and synthesis of speech, the theory of communication models between humans and the AI system. On the basis of research in this direction, methods are formed for constructing linguistic processes, question-answer systems, dialogue systems and other AI systems, the purpose of which is to provide comfortable conditions for human communication with the AI system.
4. Perception. This area includes the development of methods for representing information about visual images in the knowledge base, the creation of methods for transitioning from visual scenes to their textual description and methods of reverse transition, the creation of tools that generate visual scenes based on internal representations in AI systems.
5. Training. To develop the ability of AI systems to learn, i.e. to solve problems that they have not met before, methods are being developed for forming the conditions of problems by describing a problem situation or by observing it, methods of transition from a known solution of particular problems (examples) to solving a general problem, creating techniques for dividing the original problem into smaller and already known for AI systems. In this direction, AI has done very little.
6. Behavior. Since AI systems must operate in a certain environment, it is necessary to develop some behavioral procedures that would allow them to adequately interact with the environment, other AI systems and people. This direction in AI is also very poorly developed.
In recent years, the term "knowledge" has been increasingly used in computer science. Experts emphasize that the improvement of the so-called intelligent systems (high-level information retrieval systems, dialogue systems based on natural languages, interactive human-machine systems used in management, design, scientific research) is largely determined by how successfully problems are solved (problems of) knowledge representation.
It is not surprising that those who deal with the problem of knowledge representation are faced with the question of what knowledge is, what its nature and main characteristics are. In this regard, attempts are being made, for example, to give such a definition of knowledge, from which one could proceed in solving the problems of representing knowledge in computer systems.
Data presentation has a passive aspect: a book, a table, memory filled with information. In the theory of artificial intelligence, the active aspect of knowledge representation is especially emphasized: the acquisition of knowledge

should become an active operation that allows not only memorizing, but also applying the perceived (acquired, learned) knowledge for reasoning on its basis.

The use of a symbolic language, such as the language of mathematical logic, allows descriptions to be formulated in a form that is simultaneously close to both a common language and a programming language. However, mathematical logic allows reasoning based on the acquired knowledge: logical conclusions are really active operations of obtaining new knowledge from the already mastered.

The fundamental ideological setting consists in considering the computer as an intermediary object in cognitive human activity. A computer system, like other intermediary objects (tools and household items, tools, devices, sign-symbolic systems, scientific texts, etc.), playing an instrumental role in cognition, is a means of objectifying accumulated knowledge -niya, the embodiment of a certain socio-historical experience of practical and cognitive activities.

The problem of knowledge representation arose as one of the problems of artificial intelligence. It is associated with the transition of research in this area to a new phase. We are talking about the creation of practically useful systems (primarily the so-called expert systems) used in medicine, geology, chemistry. The creation of such systems requires intensive efforts to formalize the knowledge accumulated in the relevant science [14-16].

The term "knowledge representation" is associated with a certain stage in the development of computer software. If at the first stage programs dominated, and data played an auxiliary role as a kind of "food" for "hungry" programs, then at subsequent stages the role of data steadily increased. Their structure became more complicated: from a machine word located in one cell of the computer memory, there was a transition to vectors, arrays, files, lists. The culmination of this development was abstract data types, which provide the ability to create such a data structure that is most convenient for solving a problem. The consistent development of data structures has led to their qualitative change and to the transition from data representation to knowledge representation. The level of knowledge representation differs from the level of data representation not only in a more complex structure, but also in essential features: interpretability, the presence of classified links (for example, the relationship between knowledge related to an element of a set and knowledge about this set), which allow storing information that is the same for of all elements of the set, recorded in one act when describing the set itself, the presence of situational relations (simultaneity, being at one point in space, etc., these relations determine the situational compatibility of certain knowledge stored in memory). In addition, the level of knowledge is characterized by such signs as the presence of special procedures for generalization, replenishment of the knowledge available in the system, and a number of other procedures.

Computer modeling was understood as the technical implementation of a certain form of sign modeling. However, considering the computer in epistemological terms as an intermediary in cognition, it makes sense not to focus attention, first of all, on the "hardware" of the computer, but to consider the entire computer system as a complex system of interconnected and, to some extent, independent models - as material ones, and iconic, that is, ideal. This approach not only corresponds to the consideration of computer systems in modern informatics, but is also epistemologically justified.

In recent years, the term "computer simulation" has been increasingly used.

The first complex is a set of tools that execute programs (executive system), designed from the standpoint of effective problem solving, in some cases has a problem orientation. The second complex is a set of intelligent interface tools with a flexible structure, which provides the ability to adapt to a wide range of interests of end users.

The third set of means by which the interaction of the first two is organized is the knowledge base, which ensures the use of the computational means of the first two complexes of an integral system of knowledge about the problem environment, independent of processing programs. The executive system (IS) unites the entire set of tools that ensure the execution of the formed program. An intelligent interface is a system of software and hardware that provides the end user with the use of a computer to solve problems that arise in the environment of his professional activity either without intermediaries or with little help from them.

Conclusions

An overview of the main technologies of adaptive and intelligent learning systems allows you to do conclusions on the peculiarities of the use of such technologies in the context of education. One of the problems of many systems can be expressed as the principle of complete control over the learning process. The system, being pedagogically conscious, tries to do everything for the user and tends to take a position of full power over the learning process.

The approach based on the principle of "intellectual partnership" is considered more expedient, when the system, having pedagogical consciousness, directs the user in the spirit of the adviser and gives him the widest opportunities for independent adaptation of the training. This allows you to use "to help artificial intelligence" system of natural intelligence of the student, which, no doubt, will be a significant contribution to the effectiveness of learning and enough strongly democratizes the educational process that meets the requirements of learning.

In addition, given the analysis of the peculiarities of education, it should be noted that the considered adaptive and intelligent learning systems do not pay enough direct attention to some specific requirements: compliance of the system architecture with the phenomenon of "information explosion", professional orientation of training, interdisciplinary knowledge.

The problem of conformity of architecture to the phenomenon of "information explosion". While adaptive and intelligent learning systems focus on problems within the course, often out of focus the fact remains that there is a need for intensive support for the large number of courses required constantly create in response to the expansion of targeted knowledge for learning. This requirement is displayed on functionality of means of creation and preservation of educational resources. This problem is also expressed as problem with closed content systems.

The requirement for interdisciplinary knowledge to be acquired in the learning process is related to professional orientation and reflects the need for holistic training for a particular job or professional position. This again emphasizes the inadequacy of just one look inside the course, an interdisciplinary level is required. Therefore, in intelligent systems of lifelong learning should provide for the existence of a single multi-subject base of educational materials and the existence of interdisciplinary links.

References

[1] Corrall, S. (1998). Key skills for students in higher education. SCONUL Newsletter, 15, 25-29.

[2] Lazorko, O, Zhanna, V., Yahupov, V., Valchuk-Orkusha, O., Melnyk, I., & Sherman, M. (2021). The Safety of Professionalization Subjects in Psychological and Neuropsychological Aspects. BRAIN. Broad Research in Artificial Intelligence and Neuroscience, 12(1), 19-39.

[3] Meera N. S. Quality education for all? A case study of a New Delhi government school, Policy futures in education, 2015, № 13 (3), pp. 360–374.

[4] Mykhailo Sherman, Yaroslav Martynyshyn, Olena Khlystun, Liubov Chukhrai, Yuliia Kliuchko, Uliana Savkiv. Optimization of the Educational Environment Using Information Technologies. IJCSNS International Journal of Computer Science and Network Security, VOL.21 No.4, April 2021. pp. 80-83.

[5] Alfred P. Rovai, Linda D. Grooms The relationship of personalitybased learning style preferences and learning among online graduate students. Journal of Computing in Higher Education. - 2004. - №16, Issue 1. - pp 30- 47.

[6] Andrea Santo-Sabato, Marta Vernaleone From the First Generation of Distance Learning to Personal Learning Environments: An Overall Look. ELearning, E-Education, and Online Training. - 2014. - №138. - C. 155-158.

[7] Shapiro, J., & Hughes, S. K. (1996). Information literacy as a liberal art: Enlightenment proposals for a new curriculum. EDUCOM Review, 31(2), 31-35.

[8] McMillan R. Man Builds Twitter Bot That Humans Actually Like. Wired. URL: wired.com/2012/06/twitter_arm/

[9] Conlan, O., O'Keeffe, I., Tallon, S.: Combining adaptive hypermedia techniques and ontology reasoning to produce dynamic personalized news services. In: Wade, V., Ashman, H., Smyth, B. (eds.) Proc. of 4th International Conference on Adaptive Hypermedia and Adaptive Web-Based Systems (AH'2006). Lecture Notes in Computer Science, Vol. 4018. Springer Verlag (2006) 81- 90.

[10] De Bra, P., Web-based educational hypermedia, Book chapter in: Data Mining in E-Learning, dited by C. Romero and S. Ventura, Universidad de Cordoba, Spain, WIT Press, ISBN 1-84564-152-3, pp. 3-17, 2006.

[11] Stash, N., Cristea, A., De Bra, P., Authoring of Learning Styles in Adaptive Hypermedia: Problems and Solutions, Proceedings of the WWW 2004 Conference, New York, NY, USA, May 2004, pp. 114-123.

[12] Dordick H.S., Wang G. The Information Society: A Retrospective View. Newbury Park — L., — 1993.

[13] Knowledge management e e-learning in ambito sanitario. M. Masoni, M. R. Guelfi, A. Conti, G. F. Gensini, Milan: Springer, 2011, pp 65-72.

[14] Iasechko, M., Iasechko, S., smyrnova, I. Aspectos pedagógicos do autodesenvolvimento de alunos de educação a distância na Ucrânia. Laplage Em Revista, 7(Extra-B), 2021, p.316-323.

[15] Iasechko Svitlana, Ivanovska Alla, Gudz Tetyana, Marchuk Mykola, Venglinskyi Oleksandr, Tokar Alla Information as An Object of Legal Regulation in Ukraine/ IJCSNS International Journal of Computer Science and Network Security, VOL.21 No.5, pp. 237-242.

[16] Iasechko Svitlana, Kuryliuk Yurii, Nikiforenko Volodymyr, Mota Andrii, Demchyk Nadiia, Berizko Volodymyr Features of Administrative Liability for Offenses in the Informational Sphere/ IJCSNS International Journal of Computer Science and Network Security, Vol. 21, No. 8 pp. 51-54.