ARTIFICIAL INTELLIGENCE AS A TECHNOLOGY OF THE FUTURE AT THE PRESENT STAGE OF DEVELOPMENT OF SOCIETY

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INTRODUCTION

The systems approach has a long history of formation: from system concepts to the design of the systems approach and systems theory, system analysis. A systemic vision of space, comprehension of the world order, reasoning about a single thing was characterristic of mythology and ancient philosophy. So, the ancient Greek philosopher Platon wrote that there is a whole and parts of a whole, a lot and a single one, which, according to the philosopher, can only be the subject of research. The category "one" in Plato fixes the multitude united into the good, it contains the limitations of the plural. The scientific definition of the system today reflects the vision of the ancient philosopher.

Aristotle in his work "Metaphysics" formulated the thesis, which was the basis for the organization of thinking36. Its essence lies in the fact that the whole is something more than the simple sum of its parts. Otherwise, the world must be considered as a single whole, and the creation of its part, the phenomenon is only a part of this wholeness. Aristotle also belongs to the substantiation of the category of "integrity", which was associated with the concepts of order, organism, structure, organization, etc. The Pythagorean scientists, when explaining and describing the phenomena under study, already used rational methods - proof, comparison, analysis, drawings, schematically formalized what was being studied, which indicated that needs for rationalization of mental activity, organization of the cognition process. Thus, in the ancient period of the development of scientific knowledge, not only the formation of the concept of a system is observed, but the system acquires methodological significance, as an approach to organizing thinking, researching and shaping new and existing knowledge. In the subsequent period and for a long time, the epistemological approach was established in the consideration of the system. Medieval philosophy operates with the concepts of sum, doctrine, being, previously considered contemplatively, is included in the scope of analysis of various sciences, while each science, with its inherent methods, tries to penetrate into the essence of being. Kant (1910) in his work "Critique of Pure Reason" gives his understanding of the system.

The philosopher notes that the system is a kind of unity of knowledge that has one, common idea, thereby fixing attention on development and contradiction.

In the works of G. Hegel (1927) the system is not the subject of special consideration, but for him everything is systemic, everything that falls into the focus of his scientific interest is investigated as a self-developing system. So, the idea, the world of ideas, is gives by the property of integrity, consists of moments, stages, each of which, in turn, is also a system.

Philosophizing, believes Hegel, if it is not systemic, not a moment of the whole, then it is not scientific, nothing scientific carries.

Condillac (1805), philosopher-educator (XVIII century), in his work "Treatise on Systems" defined a system as such an orderly arrangement of parts when parts cannot exist without mutual support of each other, and when each subsequent part can be explained by the previous one, focusing on some properties of systems, namely, interdependence and order.

Any object of cognition is considered from the position of consistency, and the relationship between the components of the system is the basis of the relationship between different areas, levels of knowledge. Science experienced an urgent need for generalization, systems approach and method of cognition. Thus, the general theory of systems as an object of research in the article has a system as an integral set of elements that are in relationships, interconnected, interacting with each other. Interaction, connection, interconnection, dependence of system components are necessary conditions for the functioning of the system. General systems theory examines a system in several aspects:

- a system as a structure, a set of interrelated elements;
- the system as a set of functions, targeted actions;
- systems as a whole;
- the system as a kind of hierarchy: "system-subsystem-element";
- study of sequential changes in the states of the system.

At the end of the 19th - the beginning of the 20th century, the systems approach moves from the theoretical area to the practical plane, becoming a methodological approach in the study of social, natural processes, solving organizational, management tasks. This justifies the relevance of this article. Everything that surrounds a person and the person himself is systemic, structured formations, therefore, their study, their management without the use of systemic methods does not provide the completeness of knowledge and the possible result.

METHODS

The systems approach, being in the research field of many scientific areas, has provided the emergence of a number of scientific areas with their own understanding and methods of studying it:

- philosophical and methodological, within which the developing theory of cognition with a system of categories that give a holistic view of the natural world, society, and man has become the method of conceptualization and analysis;
- psychological: the principle of the adequacy of the nature of the activity to the structures of the psyche and the principle of anticipatory reflection:
- biological: the principle of homeostasis as a way of development and functioning of organisms;
- design and technological: the principle of isomorphism of laws and structures (significant in the design, construction of complex systems and objects);
- cybernetic: the principle of goal-setting is identical for a complex system and any organism.

A qualitatively new level in systems research has become possible thanks to the development of synergetics as a theory of self-organization of complex nonequilibrium systems. Systems of various complexity and nature, in which in the process of self-organization, characteristics appear that are not characteristic of the elements that make up the system as a whole - the subject of synergetic research. The transition to the study of other systems required a different methodology of cognition, a rethinking of the methodology of science.

Analysis of the literature allows us to conclude that the concept of a system (from the Greek systema, which means consisting of parts) is multifaceted, and the definition of the concept in

different scientific areas differs in emphasis. Considers the system as an interacting complex - a system as a set of parts of any nature, a complex of interconnected elements that are in a relationship with each other. This vision of the system is generally accepted in science. In the understanding of Hegel (1927), a system is an aggregate, a collection of simple elements, parts. It should be noted that many researchers focus on the aspect of interaction, the relationship in defining the system, which, in our opinion, narrows, does not give a complete picture of the system. Ashby (1941) believes that any a set of such variables that the researcher chooses from a variety of variables inherent in a particular "machine". Indeed, there is a variety of approaches to understanding, interpretations of the "system" phenomenon, but they can be systematized, generalized, highlighting:

- an ontological approach, according to which consistency is an essential characteristic of all objects of cognition, while the totality of elements, the presence of connections between them is something that comes from the nature of the objects themselves, therefore, it is objective about the essence;
- a system as a mental construct that does not have objective foundations in nature, and the system approach is a way of organizing (systematizing, formalizing) knowledge, a way of thinking.

The current stage of research is characterized by the development based on a systematic approach using computer technologies, mathematical modeling and artificial intelligence computers, intelligent and intellectualized systems. Systems today are not only are the object of study, advances in science and technology have made it possible to design a wide variety of systems (SYROTENKO, SOTNIKOV, IASECHKO, LARIN, IASECHKO S., OCHKURENKO, VOLKOV, 2019).

The emergence and development of new areas of science and activity make significant adjustments to the ways of designing systems. So, if traditionally research was carried out from an object to an ideal model, mentally constructed, then in the design of intelligent systems different algorithms of research actions are different, for example, “function - functional structure - functioning - material”. Consideration of an object from the point of view of the system presupposes its representation through a number of categorical blocks - process, functional structure, organization of material and morphology.

Systems theory has its own categorical-conceptual apparatus. Let us dwell on some concepts that are used in the fields of "Artificial Intelligence", "Intelligent Systems". The concept of a system can be operated when a set of interrelated elements (element is a part system with certain properties, functions that are not divided within the limits of the problem being solved), is enclosed in certain boundaries. Anything outside the limited set is the system environment or, in other words, the environment external to the system. The set of relations between the components of the system, which are preserved in the observation interval, is the structure of the system.

Communication, as a basic concept in the system approach, expresses the law of the functioning of the system, can be classified on different grounds:

- the nature of the relationship - forward / backward, the description of the relationship - probabilistic / deterministic. Research taking into account the principle of feedback involves performing a number of necessary operations: the operation of comparing data at the input and output, the operation of identifying non-compliance; correction operation, decision-making on action based on data mismatches "input-output" (IASECHKO, SHELUKHIN, MARANOV, 2021).

The system is characterized by a number of properties inherent in it:

- “system efficiency” fixes how much a given, planned result has been achieved, implemented;
- emergence: during the functioning of the system, elements have new characteristics, but which at the same time do not violate the property of integrity,

organizational unity of the system;

- functionality as a manifestation of functions when interacting with the system environment;
- structuredness as the orderliness of the arrangement of parts with the existing relations between them;
- behavior as a change in the state of the system in time, depending on the influence of external influences and the nature of the reaction; the system is considered stable (tenacious, durable, reliable, adaptable) in the event of opposition disturbing external influences;
- the property of growth as the ability of the system to acquire a new state.
- The theory of systems, defining different bases, classifies systems, breaks them into classes based on any characteristic. Let's consider just some of the classifications with a brief description of some, based on the objectives of our study:
- taking as a basis the nature of interaction with the external environment, open, closed and combined systems are distinguished;
- if the basis is the structure of the system, then the systems are simple and complex. If simple systems are distinguished by a clear definiteness of elements and connections between them, then complex systems are considered to be heterogeneous, having many parts and a branched structure, multifunctional. Each component in the structure of a complex system can be considered as a subsystem or studied as a simple system. In the epistemological aspect, the system will be considered complex if for its study it is necessary to rely on a number of concepts and theories; if its complexity is clearly visible through a set of features (for example, structural complexity). Intelligent systems, as we see from the description of complex systems, as well as due to their inherent properties of uncertainty, probabilities belong to the class of complex systems.
- based on the nature of the functions - universal (or multifunctional) and specialized;
- decisive, predictive, self-organizing - from the type of behavior. Self-organizing systems have features of diffuse systems, nonstationary of parameters, unpredictability, adaptive properties, and variability of actions when solving problems (IASECHKO, IASECHKO S., SMYRNOVA, 2021).
- in terms of content - real and abstract, which are the product of thinking. So, real systems are divided into: natural, that is, systems of inanimate (physical, chemical) and living (biological) nature; artificial (anthropogenic), created by people to solve various kinds of problems, to meet vital needs, which are subdivided into technical (man-made) and social systems (social systems).

So, the analysis of the formation of the philosophical and theoretical foundations of the formation and development of the systemic approach allows us to conclude that at present the systemic approach is one of the main approaches of the methodology of scientific knowledge. The basic principles of the systemic approach are the principles of integrity, structuring, plurality, hierarchy, consistency (possession of an object with the properties of a system). The considered philosophical and theoretical foundations of the systems approach are necessary for the study and understanding of such phenomena as intelligent systems.

The logical approach comes from the logic of Aristotle and Boolean algebra and is based on a person's ability to think logically. The development of science made it possible to introduce subject symbols, develop a system for representing initial data, and create knowledge and data bases. The structural approach is associated with modeling the human brain with its inherent structural components - neurons, neural networks. The evolutionary approach is characterized by the development of not only a basic model of an intelligent system, but also the rules, guided by which the system is able to evolve.

The simulation approach is associated with objects such as "black box" (nothing is known, high level of uncertainty), "gray box" (something is known or there are hypothetical

assumptions) and "white box" (minimum level of uncertainty). As you can see, the named objects differ in the level of uncertainty (PISKUNOV, IASECHKO, YUKHNO, POLSTIANA, GNUSOV, BASHYNSKYI, KOZYR, 2021).

Data on their properties. The model of such objects is designed considering the specifics of behavior in the "impact-response" system and the connections between the response and external influences.

RESULTS AND DISCUSSION

Based on the above, a number of conclusions can be drawn on the relevance and focus of research in the field of intelligent systems. The problems facing and being solved today in the field of research "Intelligent systems", which have a theoretical and implementation nature, include:

- the problem of the synthesis of the goal, the mechanism of interaction of the components of the goal, for the goal is also a system-forming factor;
- the problem of determining (capturing) the critical potential of such a set of target components, when the target is synthesized;
- development of the theory of intelligent control, theoretical understanding of purposeful systems;
- finding and designing mathematical models that are adequate to living nature based on the theories of information processes and control;
- construction of models: a model of an action program, a model of an action acceptor and their practical implementation in intelligent systems.

CONCLUSION

An analysis of philosophical concepts, theories of artificial intelligence, approaches to the definition and understanding of artificial intelligence allowed us to conclude that there is no consensus on what "artificial intelligence" is. Exists, since there is no clear fixation of the characteristics of the human mind, an unambiguous understanding of natural intelligence, which also gives rise to the problem of defining artificial intelligence.

Despite the difference in approaches, one can also distinguish common features that are characteristic of many approaches. The common thing is that artificial intelligence is a system that imitates the process of solving a variety of tasks by a person in his life, performing the intellectual functions of a person, capable of solving tasks of different levels of complexity in a similar way, but differently than a person. The main directions of artificial intelligence were studied, their essential characteristics were revealed:

- heuristic (informational) - the development of programs for intelligent systems that solve computational problems;
- bionic - the study of the processes of human mental activity in solving problems, the construction of a network of artificial neurons inherent in the human nervous system;
- evolutionary - the creation, "cultivation" of intellectual programs capable of self-learning.

In conclusion, it is necessary to identify the main directions of research in the field of intelligent systems, in which scientific developments are currently being carried out. Having identified the object of research as the basis for identifying areas of research, one can include among the priorities: research of the human brain, its structure and mechanisms of work, models of intelligence; research of intelligent systems and modeling on based on intelligent computer technology; development of intelligent systems with interactive characteristics in the "man-machine" system.

It has been established that the vector of research in the field of artificial intelligence is aimed at developing methods of formalization, generalization, classification, knowledge representation; study and formalization of reasoning, their modeling; research of communication, the specifics of the dialogue between the intellectual system and the person; development of algorithms for the operation of computer technology and training of intelligent systems.

REFERENCES

ASHBY, W.R. *The origin of adaptation,* 1941, British Library, London. Available at: http://www.gstatic.com/generate_204http://www.gstatic.com/generate_204http://www.gstatic.com/generate_204. Access: June 11, 2021.

CONDILLAC, E. B. *Logic or mental science*. Guiding to the Attainment of Truth, 1805.Available at: http://wiki.kneu.edu.ua/HistOfEcoTeor. Access: March 11, 2021.

HEGEL G. W. F. Sämtliche Werke. Jubiläumsausgabe, hg. H. Glockner, 36 Bd. – Stuttgart, 1927. Available at: https://shron1.chtyvo.org.ua/Zavidniak_Bohdan/Teoditseia_Georha_Vilhelma_Fridrikha_Hegelia.pdf. Access: June 11, 2021.

IASECHKO, M.; SHELUKHIN, O.; MARANOV, A. Evaluation of The Use of Inertial Navigation Systems to Improve The Accuracy of Object Navigation. *International Journal Of Computer Science And Network Security*, 21:3, 2021, pp. 71-75. Available at: http://paper.ijcsns.org/07_book/202103/20210310.pdf. Access: March 30 2021.

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. Available at: https://doi.org/10.24115/S2446-622020217Extra-B929p.316-323. Access: June 11, 2021.

KANT I. *Achievements of metaphysics*. On the form and principles of the sensible and intelligible world; II. The successes of metaphysics, 1910, pp. 41-119. Available at: http://kant-online.ru/o-kante/bibliografiya/trudy-kanta. Access: March 11, 2021.

PISKUNOV, S.; IASECHKO, M.; YUKHNO, O.; POLSTIANA, N.; GNUSOV, Y.; BASHYNSKYI, K., KOZYR, A. Application Of Probability Filter For Maintenance Of Air Objects. *IJCSNS International Journal of Computer Science and Network Security*. Vol. 21 No. 5, 2021, pp. 31-34. Available at: http://paper.ijcsns.org/07_book/202105/20210505.pdf. Access: March 11, 2021.

SYROTENKO, A.; SOTNIKOV, O.; IASECHKO, M., LARIN, V.; IASECHKO, S.; OCHKURENKO O.; VOLKOV, A. Model of Combined Solid Plasma Material for the Protection of Radio-Electronic Means of Optical and Radio Radiation, *IJATCSE*, 8(4), 2019, pp. 1241 — 1247. Available at: http://doi:10.30534/ijatcse/2019/33842019. Access: June 11, 2021.

Artificial intelligence as a technology of the future at the present stage of development of society

A inteligência artificial como tecnologia do futuro no estágio atual de desenvolvimento da sociedade

La inteligencia artificial como tecnología de futuro en la etapa actual de desarrollo de la sociedad

Resumo

O artigo estabelece que o vetor de pesquisa no campo da inteligência artificial é destinado a desenvolver métodos de formalização, generalização, classificação, representação de conhecimento; estudo e formalização do raciocínio, sua modelagem; Pesquisa de comunicação, as especificidades do diálogo entre o sistema intelectual e a pessoa; Desenvolvimento de algoritmos para a operação de tecnologia de computadores e treinamento de sistemas inteligentes.

Palavras-chave: Tecnologia da informação. Sistemas inteligentes. Inteligência artificial. Aspectos tecnológicos.

Abstract

The article establishes that the vector of research in the field of artificial intelligence is aimed at developing methods of formalization, generalization, classification, knowledge representation; study and formalization of reasoning, their modeling; research of communication, the specifics of the dialogue between the intellectual system and the person; development of algorithms for the operation of computer technology and training of intelligent systems.

Keywords: Information technology. Intelligent systems. Artificial intelligence. Technological aspects.

Resumen

El artículo establece que el vector de investigación en el campo de la inteligencia artificial está orientado a desarrollar métodos de formalización, generalización, clasificación, representación del conocimiento; estudio y formalización del razonamiento, su modelado; investigación de la comunicación, las particularidades del diálogo entre el sistema intelectual y la persona; desarrollo de algoritmos para el funcionamiento de tecnología informática y entrenamiento de sistemas inteligentes.

Palabras-clave: Tecnologías de la información. Sistemas inteligentes. Inteligencia artificial. Aspectos tecnológicos.