“Artificial Intelligence” - what is it?

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ABSTRACT
Based on the principle of dialectic symmetry formulated by the philosophy of dialectic positivism, an interpretation of the concept of “artificial intelligence” is proposed. This principle assumes the existence of a hierarchy of information objects, similar to the hierarchy, which reflects different levels of organization of matter (mechanical, chemical, biological, social). The construction of a hierarchy of information objects – information processing systems – allows us to interpret in the same way the essence of both artificial intelligence and the intelligence that a human being is endowed with. These are information processing systems referring to the highest levels of the specified hierarchy.

CCS Concepts
• Computing methodologies → Artificial intelligence → Philosophical/theoretical foundations of artificial intelligence → Cognitive science • Computing methodologies → Artificial intelligence → Philosophical/theoretical foundations of artificial intelligence → Theory of mind

Keywords
Artificial intelligence; dialectical positivism; information.

1. INTRODUCTION
The relevance of research in the area of artificial intelligence systems is currently in no doubt, however, to reveal the concept of “artificial intelligence” is quite difficult.

Nowadays there are very different points of view on which systems can be attributed to artificial intelligence and which cannot [1,2]. These discussions have continued and will continue until an adequate understanding of what intelligence per se is able to be developed. Of course, in the current literature (especially humanitarian, for example, [2]) there are various definitions of intelligence, but they are merely descriptive, i.e. listed are some signs that, in the opinion of a particular author, are inherent in intelligence, and to a very definite one - human.

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By now, it has become clear that the concept of artificial intelligence (and intelligence in general) can be revealed only on the basis of the close interaction of the humanities, natural and technical sciences. In other words, the question of the nature of intelligence is revealed only on the basis of the principle of convergence of natural science, technical and humanitarian knowledge. We emphasize that this thesis very closely echoes the thesis about the New Enlightenment, which the elite of the world expert community formulated recently through the mouths of the Club of Rome [3].

The thesis of the New Enlightenment suggests that the world should no longer be viewed through the lens of splitting the whole picture into many fragments, each of which relates to the subject field of a specific highly specialized science. It is necessary to return to a holistic view of the world, which is the prerogative of philosophy [4].

However, this step alone is impossible without the achievements of specific sciences, and therefore close interdisciplinary cooperation is necessary. The highest popularity of scientific areas, one way or another connected with the development of artificial intelligence, creates a platform for interdisciplinary cooperation, which, in particular, is demonstrated by a new scientific direction called “molecular informatics” [5]. Within its framework, it is possible to show exactly how systems based on hydrophilic polymers are able to process information, that is, take the first step to understanding the mechanisms of evolution that precede biological [5], as well as substantiate models that describe the genesis of mind.

In this article it is proved that the most consistent interpretation of the concept of “intelligence” can be given on the basis of the principle of convergence between natural science, technical and humanitarian knowledge, which is developing in the framework of the philosophy of dialectic positivism [6-8].

2. INFORMATION AS PHILOSOPHICAL CATEGORY: INTERPRETATION WITHIN THE FRAMEWORK OF DIALECTICAL POSITIVISM
In accordance with the arguments [6-8], intelligence should be considered, first of all, as a system of information processing. However, in order for the interpretation of the concept of

"information processing system" to become operational, it is necessary first of all to give an adequate interpretation of the concept of information itself.

In modern textbooks (say, in the theory of electrical connection), numerous definitions are proposed in which an attempt is made to reveal the essence of the category of information through such concepts as "data", "messages", and so on. It is easy to see that all these definitions are tautological statements. In fact, the category of information is one of the basic categories of objective dialectics, which include such paired categories as form and content, quantity and quality, etc.

In accordance with this point of view, information should be considered as a dialectic category paired with the category of matter [6-8] (Fig 1.). As known, objective dialectics defines the basic concepts called categories, precisely through contradistinction. It is impossible to give the ordinary "definition", understood in the usual "school" sense of the word, precisely because they are the basic, most fundamental concepts on the basis of which the whole building of philosophy is built. An attempt to reveal the content of basic concepts through others inevitably leads to a vicious logical circle, which can be avoided by using the definition through contradistinction.

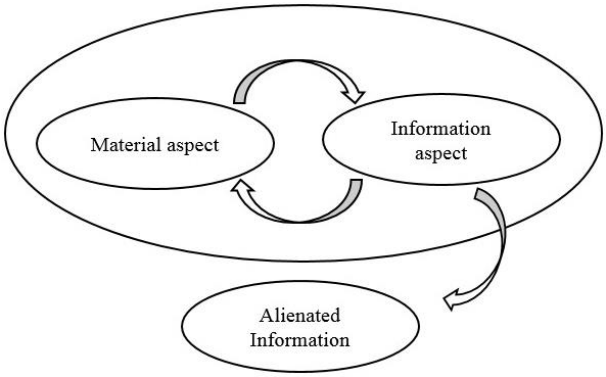

Figure 1. Matter and information as paired dialectic categories

It is appropriate to emphasize that the definition of information given in the framework of dialectical positivism avoids many of the difficulties associated with attempts to clarify the practical use of information. So, attempts to use the concepts of "valuable information" and so on are known. The definition under consideration leads to the concept of "alienated information", which removes numerous difficulties associated with the use of the concept of "valuable information" (for example, it is necessary to clarify for whom exactly the specified information is valuable).

3. INTERPRETATION OF THE CONCEPT OF "INTELLIGENCE" BASED ON THE PRINCIPLE OF DIALECTIC SYMMETRY

Categories of objective dialectics that make up a interconnected opposites are equal. If we accept that they really reflect objective reality, we will also have to admit that any constructions made on their basis in one sense or another should be symmetrical. Symmetry embedded in the conceptual structure of objective dialectics cannot but be a reflection of a certain symmetry inherent in objective reality. This is what we designate as the principle of dialectical symmetry [7,8] (Fig. 2).

This principle can be most clearly illustrated by considering the paired categories of matter and information.

Namely, there is a well-defined hierarchy, reflecting the marked distinctions between the various levels of organization of matter (mechanical ... chemical, ... biological ... social). All these levels of organization of matter, of course, have sublevels. The principle of dialectic symmetry states that a similar hierarchy exists in relation to all those entities associated with the category of information.

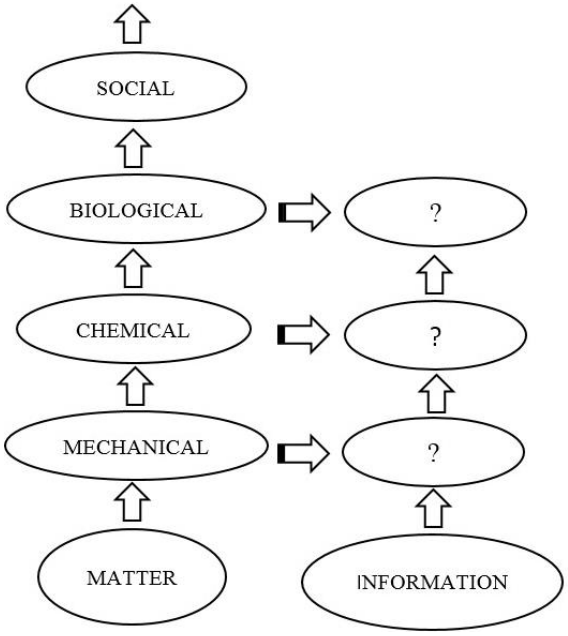

Figure 2. Principle of dialectical symmetry

It is most directly related to the problem of artificial intelligence and to the problem of the interpretation of the concept of intelligence.

Indeed, the simplest form of information is that associated with individual messages. For example, a binary number record or a record made by the letters of any of the known alphabets. At the next level of the hierarchy there are information objects, which are the rules of operating with information of the simplest type. An example of this kind of rules are the rules for operating with binary numbers.

Indeed, the arithmetic rules of addition, multiplication, taken on their own, also represent some information, but this is a special type of information. It allows you to work with other information objects of a simpler nature (in particular, add binary numbers) and thereby receive some new information (the result of addition, for example).

At an even higher level of the hierarchy are information objects, which are not just information processing systems, but some more complex objects that allow the generation of systems that can process information. To simplify, we are talking about such information (for example, a set of rules) that allows you to construct (or abstract from the surrounding reality) some new entities that make it possible to obtain new non-trivial rules for operating with certain sentences written using a certain sign system.

The most obvious example of an information object of a higher order is mathematics as a whole. This is a well-defined information object that is capable of developing within the framework of its own logic. Yes, of course, this development is carried out by the efforts of specific mathematicians, but mathematics as such is not connected with any of the mathematicians individually, the corresponding information is "stored in the memory" of the world mathematical community as a whole, and its development proceeds in accordance with its own internal logic. It would not be a great exaggeration to say that mathematics as an information object is fixed by the noosphere (understood in the spirit of V.I. Vernadsky [9]) as a whole.

A definite analogy can be drawn between such an information object as "mathematics" and the intelligence of an individual person, which, in the framework of the philosophy of dialectic positivism, is also regarded as a purely informational object (Fig. 3).

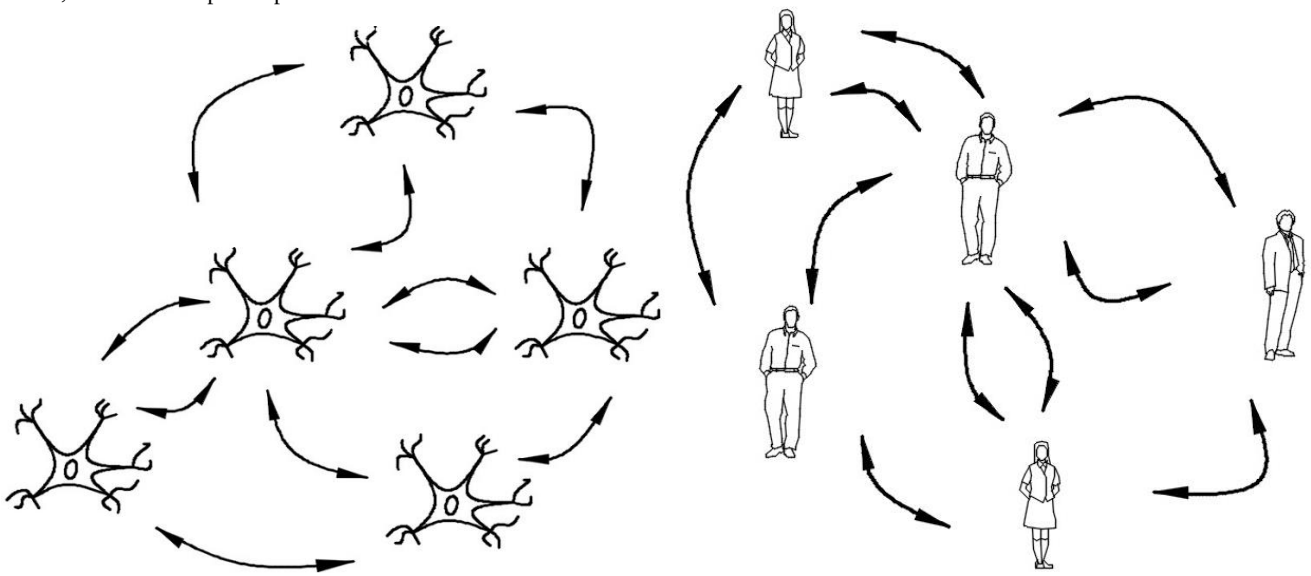

Figure 3. The formation of information objects due to the exchange of signals between elements of a complex system

In both cases, we are talking about some kind of information entity that appears due to the exchange of signals (or messages) between the elements of a complex system. The individual's consciousness is generated by communications between neurons of the brain, and mathematics (regarded as integrity) is generated by communications between those who are professionally engaged in this type of activity.

Further, the entire history of the development of mathematics can be considered as the history of the receipt of "rules generating rules." The simplest example is any of the trigonometry theorems that are still used today, including for applied purposes. Putting any concrete theorem into practice is always generating new information (for example, calculating the geometry of an object that does not yet exist). But, obtaining this information became possible only due to the existence of information related to a higher level of the hierarchy in question (i.e. a specific theorem). At an even higher level are the means of proving theorems — logic, axiomatics, and other ideas that underlie mathematical knowledge as such. An even higher level, obviously, relates to science as such - it was this means of information processing that allowed us to develop both logic and axiomatics, i.e. means, which, in turn, made possible the appearance of geometry, which in turn developed the science itself, its ethos. Intelligence itself occupies an even higher floor in the hierarchy under review.

Thus, we can come to the following interpretation of the concept of "intelligence", given from a purely information point of view. There is a well-defined hierarchy of information objects. Each subsequent level is represented by information objects capable of generating objects of a lower level (like the fact that classical geometry theorems make it possible to find proportions of a particular architectural structure beforehand).

What we call intelligence today corresponds to the highest level in this hierarchy (Fig. 4); it is an opportunity to receive such information processing systems that gives possibility to operate with information about the object itself, which is their source.

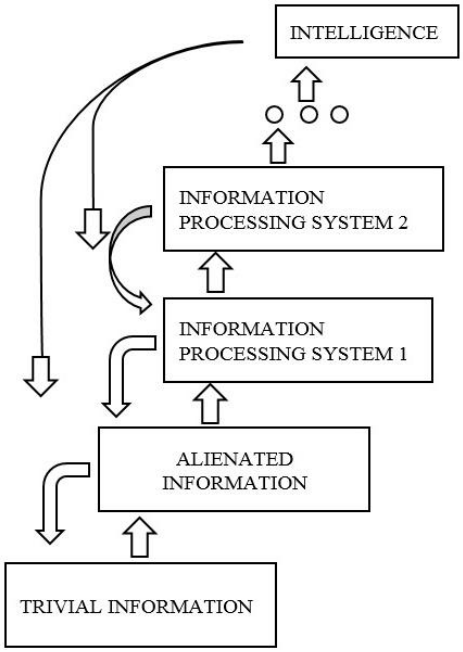

Figure 4. Hierarchy of information objects` levels

As a matter of fact, it is precisely the possibility of obtaining such information processing tools what is called a "reflection" in a

philosophical language, i.e. an opportunity for understanding both the world around us and the fact that what (or who) implements reflection. The stated thesis is a generalization (in the language of information theory) of the well-known statement that the hallmark of human intelligence is the ability to become aware of one's "I".

4. THE ESSENCE OF ARTIFICIAL INTELLIGENCE IN TERMS OF DIALECTICAL POSITIVISM

This approach is surely of direct applied interest. Namely, artificial intelligence can be defined as an information processing system capable of generating new non-trivial information processing systems; simplifying - to create new algorithms for solving certain tasks. Of course, there is a definite nuance here related to which level of the above mentioned information this system belongs to. But, from the point of view of the definition itself, this is not significant, since this nuance relates to the classification of artificial intelligence systems (the need for such a classification is felt more and more clearly, for example, "strong" and "weak" artificial intelligence are already distinguished [10,11]

Note that this definition of artificial intelligence is satisfied by definition of neural networks, more precisely, the procedures for their training. They obviously represent an information object capable of generating information objects of a lower level, say, neural networks, which provide recognition of some images.

We emphasize that the above analogy between mathematics (as an information object) and human intelligence can be generalized, moreover, it clearly shows that the last one is not something unique - it occupies a very definite place in the hierarchy of various information processing systems.

Moreover, in accordance with this definition, intelligence (including artificial) does not necessarily have to be similar to human, in any case, obviously, does not have to possess all the signs of a human. Works [12] have already appeared, according to which spontaneous artificial intelligence can appear in modern telecommunication networks. However, there is no reason to assume that we will immediately understand that it appeared, since it can radically differ from ours. Nevertheless, its appearance will inevitably have an impact on society: information objects that spontaneously appear in telecommunication networks will "take on a life of their own" and we will have to somehow interact with them.

Therefore, speaking about the problems of artificial intelligence, one cannot focus on the study of only human intelligence; it can also have a completely different nature. It is in this sense that the definition formulated by us in a purely philosophical language is valuable.

5. CONCLUSION

Thus, the principle of dialectical symmetry, as well as the definition of the philosophical category of information, given through the opposition of the category of matter, allows us to reveal the nature of intelligence in general. In accordance with this definition, intelligence is, first of all, an information processing system capable of generating information processing systems related to a lower level of the hierarchy of information objects.

The proposed approach allows us on the same basis to give a sufficiently clear definition of artificial intelligence systems and creates the prerequisites for constructing their classification.

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