



## THE CREATIVE ABILITY OF ARTIFICIAL INTELLIGENCE

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The article is devoted to the philosophical analysis of the creative process in systems with artificial intelligence. In this article we aim to highlight the common methodological background modeling of the creative process in systems with artificial intelligence. This process seems to be a purposeful transformation, implying the reflection of any area of reality and construction of a new product. The creative process includes two stages: search and composition. The conclusion is that systems with artificial intelligence cannot yet compete with a person at the pilot stage as they do not have an information database that can be compared with the database of a person's common sense. The authors argue that there are no insurmountable obstacles to artificial intelligence, in principle, and that it will be able to compete with man in creativity in the future.

**Keywords:** artificial intelligence, creative competition, creative process, knowledge base of common sense, machine works.

### Introduction

For a long time it was believed that certain areas of human activity, closely related to creativity, are protected, in principle, from the intrusion of artificial intelligence. It was believed that poetry, music and the visual arts are manifestations of exclusively human genius. However, at present, we can state that information technology has reached a level that these areas are already invading. The paper highlights the general methodological prerequisites of the creative process simulation systems with artificial intelligence. Thus, we address the following questions: (1) Can, in principle, artificial intelligence substitute a person in the process of creativity?; (2) Can the independent work of artificial intelligence lead to creative breakthrough?

### Systems with artificial intelligence

A human being, when involved in cognitive processes, as a rule, is in a condition that is characterized by varying degrees of uncertainty, as he has to operate with objects including a new, previously unknown content. This circumstance in many respects

determines the creative content of cognitive activity which is complex, nonlinear and contradictory. The process of cognition is characterized by the continuous emergence of new elements with their continuous modification and saving. Thus, the challenges facing the theory and practice of creation of systems with artificial intelligence are very diverse.

Early developments in the field of artificial intelligence imitated the logical step-by-step reasoning of man, which is most clearly manifested in situations of solving tasks in card and other board games. However, these intelligent systems were not suitable for solving the problems of the real world that are ambiguous. That researchers face complexity is largely explained by the presence of significant differences between the human mind and the mind of the machine. Thus, a person has a good ability to make productive conclusions in conditions of cognitive uncertainty. Scientists are able to quickly understand the current conditions, focusing on existing research experience and common sense. Latitude of thought is a kind of intellectual capital. The knowledge base of the person includes data from various sectors and areas of activity which cover knowledge and its manifestations in the form of practical abilities, skills and abilities.

For example, a translation from one language to another is a difficult task and is solved with creative methods. Natural languages do not fit the concept of a “formal system” and speech statements are themselves not subject to strict rules. It follows that the mechanization of linguistic translation requiring either a fundamentally non-formal complex dynamic system or the establishment of systems that are able to work with normalised username systems, that is, to create systems with artificial intelligence. It should be noted that systems with artificial intelligence that can compete with humans to provide high-quality translation from one language to another have not yet been established. In particular, for the solution of language translation tasks, an intelligent system must operate with syntactic and semantic linguistic information from two or more different cultures. It should operate with specific knowledge about the subject, methods and solutions that are based on the specific content of the task.

Cognitive research has shown that using similar reasoning, people solve most of their problems. For many cognitive decision tasks man finds solutions instinctively or intuitively, building on skills which have already been applied to other problems. Thanks to all this, a specialist is able to decipher a distorted speech, illegible handwriting, concentrating his attention only on what leads to a solution. Even sophisticated machines created by the latest technology do not have the capacity and may be totally unsuitable for such tasks.

At the end of 20th century, in the field of artificial intelligence, probabilistic methods and concepts for solving various problems were actively used. However, the research has shown the limitations of the probability approach in this area: the developed algorithms when solving very complex problems require huge computing resources. A similar situation can be described as “a combinatorial explosion” where the memory of the computer and the time required to solve the problem become literally astronomical, and the problem goes far beyond the standard.

## Creative process

Generally speaking, the creative process means creating a new product. In this case, one should not consider that creativity is the product of exclusively human activity. So, the great creator is nature itself, if you look around you, you can see a lot of evidence of nature's creative "achievements". However, when people talk about modeling the creative process, they mean exactly the person with his consciousness as the main character creation. Underlining the presence of consciousness leads to the idea that creativity is a conscious act. Then, presumably, in the process of creative work, there should be a challenging goal. The creative process in systems with artificial intelligence can be represented as a purposeful transformation that involves the reflection of any area of reality and construction of a new product. The creative process can be divided into two stages – an exploratory stage and a composition stage – each of which is characterized by its direction and the logic of development (see Kudryashev, Elkhova 2014).

### Search stage of the creative process

At the first stage of the creative process, you can select the primary phase of knowledge, which is a prerequisite for the successful realisation of the creative process. Although the phase of initial knowledge is the starting point of the creative process, it is here that there is a serious problem in systems with artificial intelligence. The main task in the field of artificial intelligence is to teach a computer program to think sensibly in an uncertain situation. Therefore, among the research projects in the field of creation of systems with artificial intelligence, in our opinion, the most promising are those that attempt to create a machine's knowledge base of common sense. But loading into the database machine the system of knowledge characterized as common sense man is a complicated task.

It was found that the number of atomic facts which operate in regular ordinary people is colossal. A lot of what a person knows cannot be expressed verbally. For example, in art, with just one glance at a statue, a person is instantly aware that it is a fake.

The formation of ideological views, which form a picture of the world of man, is due not only to the rational but also to the emotional sphere of a person (see Kudryashev, Elkhova 2013). For example, professor of computer science, Robert H. Sloan, based at the University of Illinois at Chicago, says:

"All of us know a huge number of things [...]. As babies, we crawled around and yanked on things and learned that things fall. We yanked on other things and learned that dogs and cats don't appreciate having their tails pulled. Life is a rich learning environment" (Quick 2013).

The cognitive features of the most advanced supercomputer to date are very modest. The intellect of such a machine corresponds to the level of a four-year-old child.

Science and technology are still very far from creating an artificial system endowed with common sense, which could compete with the intelligence of a man. Cyc is the

most known and implemented project at the present time, aimed at creating a knowledge base for software with artificial intelligence. The first version of the knowledge base of OpenCyc made 6000 concepts and 60 000 facts available, whereas the latest version contains 239 000 concepts and 2 093 000 facts (cyc.com 2016). Although programs of artificial intelligence manipulate huge quantities of obvious facts and deal with certain tests, yet they are absolutely helpless when faced with issues requiring support based on experience and common sense.

### Composite stage of the creative process

The result of the creative process is to build a new and unique product which can represent much of human creativity as a combination of existing ideas and objects. This vision allows us to simulate the work in systems with artificial intelligence as creating a search methodology in the sphere of possible combinations. New combinations may arise from the structure or union of the various components as a result of their stochastic transformations. You can select the general strategy of combinatorial creativity: the placement of a familiar object in unfamiliar surroundings, or an unknown object in a familiar atmosphere; mixing two outwardly different objects or genres; adding new and unexpected features to an existing object, the connection is incongruous in the same object.

An example of such combinatorial generation is the machine-created works in the field of music. It is worth noting the two directions of its development. The first direction of machine creativity in the field of music involves the generation of new musical compositions by the machine, which are subsequently performed by a person. For example, today the most advanced technological system for the production of such creative products is a design created in the University of Málaga in Spain, called *Iamus* in the honor of the mythical Greek prophet who could translate the birds' singing. The system based on *Iamus* lies in Melomics technology and is programmed to compose music without human intervention. This technology is based on the vast store of more than one billion musical compositions. In the field of contemporary classical music *Iamus* is the first system that is able to create musical works in its own style, not imitating known classics (Johann Sebastian Bach, Ludwig van Beethoven, Wolfgang Amadeus Mozart and others), as did previous technology. In September 2012, *Iamus* released its debut eponymous album *Iamus*, recorded by the London Symphony Orchestra. This event became a sensation in the world of music and science and was described as "the first major work, computer-generated in the performance of the whole orchestra" (Peckham 2013). The second direction of the machine music focused on the generation of electronic music and its reproduction with the use of electronic musical instruments. This area is the area of engineering projects, which provide digital synthesis of musical sounds. Currently, this kind of music is created using special computer programs and is already an independent genre which has a specific sound and includes a variety of styles ranging from classic to pop music. Electronic music is experiencing a period of rapid development, and modern robots demonstrate creative improvisation, which is very important in jazz.

## Limits and possibilities of artificial intelligence

Artificial intelligence is a technical and instrumental continuation of humans' enhancements of their physical and mental capabilities. It can only mimic certain intellectual functions of man. Artificial intelligence is aimed at solving a particular purpose. Such systems cannot yet engage in meaningful dialogue with people or creatively overcome problems. Although scientists report that they have created a self-learning artificial intelligence, in practice, such systems show very modest results. "Integral" artificial intelligence, which is able to simulate all the main intellectual functions of man, has not yet been created. In our opinion, the success of creating a machine analogue of the human mind depends on development of engineering and technical base as well as the availability of the human knowledge about consciousness and natural intelligence.

The problem can be defined as "We do not understand the nature of own consciousness, so we cannot create artificial intelligence". Conscious human activity can be described as dialogical. A person constantly monitors and evaluates himself and gets into an argument with himself while trying to look at himself and considering various projects of development, which entails the possibility of improvement. Man and the world are considered to be closely related; a person is not conceived without the world and a world does not or cannot exist without human presence. A person is included in the diversity and continuity of existential processes. Reflection and self-consciousness appear as the beginning of the constitutive existential integrity in the fullness of life experience related to the installation of the "whole world".

In scientific discourse, the term "reflection" is often used in the sense of "self-consciousness" but it is not entirely true. The concepts of "reflection" and "self-consciousness", of course, are close but not identical. If "reflection" refers to an activity aimed at human consciousness, its object is the internal subjective world of the person. "Self-consciousness" denotes a state of consciousness that reflects the integrity of the person in its unity of subjective and objective and ideal and material.

Human consciousness includes a plurality of sign-language resources, some of which have a priori character (see Dubrovskiy 2013). Yes, cybernetic machines have taken over a significant part of the transformational symbolic operations which were previously performed by human brains. If the mechanical machines perform typical operations of physical human activities, computer technology has formalized perform mental operations person. It is obvious that the machine is able to perform these operations faster and more completely compared with man himself. However, since human consciousness does not correspond to formalizing the plurality of sign-language resources, machine reproduction is problematic.

In our opinion, the implementation of effective communication of sign-language tools is determined by the presence of a person's ability to engage in self-consciousness and reflections. One of the main problems of the field of artificial intelligence is to create systems that are capable of self-awareness including self-knowledge of their internal states and properties and awareness of the world around them.

Current models of artificial intelligence are still limited and imperfect. Simulation of intelligent systems with reflection and self-consciousness require significant interdisciplinary efforts. Obviously, many issues of artificial intelligence are unclear, and there are blank spots that are waiting to be clarified in the future. Can machines be conscious or systems with artificial intelligence only be contenders for the title “zombie”? In the context of advances in computers, cognitive sciences and artificial intelligence express the principle of “relativity of consciousness”. The essence of this principle is that the behavioral act can take place without awareness. From this principle, it follows that behavior and consciousness may exist independently. The popular thought experiment of John Searle’s Chinese room clearly shows that the machine is able to create the illusion of dialogue but is not conscious and is not able to understand.

Philosophers actively use the image of “zombie” to illustrate the philosophical theories in the field of artificial intelligence research. As rightly observes George Chalmers, philosophical “zombies” have found their habitat in the sphere of philosophical articles (Chalmers 1996). Philosophers actively use the image of “zombies” as an illustration of philosophical theories in the field of artificial intelligence research. Philosophical “zombie” refers to beings who are philosophers in their thought experiments. For example, Todd C. Moody, in the article “Conversations with Zombies”, emphasizes the outward manifestations of the machine which has no consciousness or signs of a conscious human (Moody 1994). Continuing the argument, Moody concludes that since the artificial intelligence systems are precisely processes of this type (without awareness), then such a “computer intelligence” is nothing but a “zombie”. If the main feature of conscious activity is intentionality, artificial intelligence does not have it and is the same as a “zombie” that does not have conscious experience and has no self-awareness.

Note that some areas of human intellectual activity which do not have a pronounced creative nature can be represented as a set of clear instructions (algorithms) and transferred to the machine. But this artificial intelligence does not have self-consciousness and cannot learn and improve like a man. Modeling of intelligent systems that are self-aware requires serious interdisciplinary efforts. This fact is well illustrated by the image of a “zombie”. The current model of artificial intelligence, alas, is limited and imperfect. Modern systems with artificial intelligence are presented as imperfect copies of person, a kind of “zombie”.

### The ontology of technical creativity

In the mainstream of scientific and philosophical research is the theme of the co-evolution of nature and society. We are interested in the place of the problem of creativity in this area of research. For specifics, we limit ourselves to the problems of technical creativity. First of all, we try to find out what is the basis of the creative activity of the technical specialist. We think that engineering and design ideas are based on non-homogeneous concepts. There are natural and social components in the results of technical creativity.

Designers and engineers must know the laws of nature to be able to use them in their professional activities; they also need some knowledge of the social sciences and human sciences. The creative work of technicians' two main areas can be identified. Let the first direction be termed as an "imitation", and the second direction a "continuation of development". Let us explain the notation of these directions as follows. Imitative activity is tangibly embodied in copying what already exists in nature, including human nature. It creates, for example, artificial analogues of natural objects. The closer the resemblance to the original the analogue is the better. The second area of creative activity can be described as a continuation of development. We have in mind an innovative continuation of the evolutionary path of the development of nature and society on the basis of their laws.

Development is a more general term, whereas evolution is a specific type of development. Evolutionary changes have their own characteristics; in particular, evolution is always development, which has a definite purpose. Co-evolution is the coordinated development of two or more objects, where each member evolves co-evolutionary changes. Consistent qualitatively different evolutionary processes should be achieved by the interaction of subjects with each other. Their influences on each other are forced, as the subjects co-evolve which thus ensures the continuation of their evolution. Locally, the interaction that takes place with the participation of the subjects of evolutionary change can be "counted" and may be the result of goal-setting. From a philosophical standpoint, we are talking here about the goal as a "super-task" of the creative process that is put before the technicians (see Kudryashev 2012).

In connection with the above, on the topics of evolution and co-evolution, we note a number of points associated with the creative work of technicians. In particular, the interesting question of the target component of the creative work technician.

The possibilities of innovation on the path of "continuing development" have a higher probability than in the direction of "imitation". The creative activity of technicians has the highest value in the pursuit of a specific "super-task" as the ultimate goal of technical creativity, by which we mean to preserve and consolidate the unity of the ideal and the material sides of an evolving world. The ontological meaning of this art is the replenishment of the material results of scientific and technological progress, which ultimately brings integrity to the life of the whole universe.

### Creative competition between man and machine

The widely known classical Ada Lovelace's Objection boils down to the assertion that the computer is not capable of independent creativity since creativity means the production of a new result. Computers cannot invent anything new; their fate is the strict implementation of the requirements specified by the person who writes the programs for them. The implicit precondition of the Ada Lovelace objection is the classification of concepts new to all kinds of results, without considering who produces these results. If we distinguish between the results by the criterion: who receives these results, we get two types of novelty. On the one hand, the new results that a person

receives, on the other hand, new results that artificial intelligence receives. It can be said that at the present time creative competition between man and artificial intelligence is born.

Returning to the goals set at the beginning of this article, we can note the absence of insurmountable obstacles to the growing field of artificial intelligence which, in principle will be able to compete with man in creativity in the future.

### Methodology of the creative process in systems with artificial intelligence

It is necessary to state the following about artificial intelligence and the modeling of the creative process in systems with artificial intelligence. Systems with artificial intelligence cannot yet compete with man in creativity. The creation of technological systems that are capable of creativity, by copying the logic of the individual's step-by-step inference, is a difficult task and ends in a very modest result.

The development of systems with artificial intelligence is very different from conventional programming. If an ordinary computer program can be represented in a paradigm: a program is an algorithm plus data, then for systems with artificial intelligence the paradigm is different: here the program is a knowledge base plus a knowledge-management strategy. The main distinguishing feature of systems with artificial intelligence is that they work with a knowledge based.

In conventional programs, data representation for the algorithm is not difficult. For systems with artificial intelligence, the representation of knowledge becomes a problem. This problem includes a lot of questions: what is knowledge, what knowledge is stored in the system as a knowledge base, in what form and how much, how to use it or replenish it, etc.

It is worth mentioning the differences between data and knowledge. Unlike data, knowledge has the following properties: internal interpretability, structure, connectivity and activity. Internal interpretability assumes that the data have unique names and attributes that make it possible to operate with them as information units. Structure means the decomposition of complex objects into simpler objects while establishing the following relationships between them: "part-whole", "class-subclass", "genus-species", and so on.

Connectedness reflects the patterns of facts, processes, phenomena and cause-and-effect relationships between the elements of knowledge. Human cognitive activity has specific characteristics. In other words, human knowledge is active, while in ordinary programs, data are passively stored in the computer's memory. This fact fundamentally differentiates knowledge from data. For example, the discovery of contradictions in knowledge becomes the motivation for overcoming them and engenders the emergence of new knowledge. The same stimulus of activity is the incompleteness of knowledge, expressed in the necessity of their replenishment. Of course, the idea of providing knowledge activity in systems with artificial intelligence generates methodological difficulties in terms of its implementation.



At present, systems with artificial intelligence cannot compete with a person in creativity, in the absence of a database at their disposal that is comparable to the human potential of the knowledge of common sense.

A few words about the knowledge processing strategy are necessary. The strategy of processing knowledge is closely related to the skills that people have in solving creative tasks based on heterogeneous knowledge that cannot be formalized. It is difficult to implement this function within the software and hardware systems. The knowledge on which the person relies for solving creative tasks is heterogeneous and cannot be formalized. It includes a set of concepts and their interrelations, knowledge about the structure and interaction of parts of different objects and quantitative and qualitative characteristics of objects, phenomena and their elements.

An ordinary computer program carries out a process for the logical operation of data which are given in a single formalized form. The strategy of processing knowledge in systems with artificial intelligence is based on the hardware and information-software complex. The action of this complex is analogous to the action of the mechanisms of the thinking and decision-making of a person.

In conclusion, speaking about the methodology of the creative process in systems with artificial intelligence, we once again emphasize that the creation of technological systems capable of creativity must be carried out according to the principle of the knowledge base plus the strategy of processing knowledge.

## Conclusions

The creative process always involves the creation of a new product.

In principle, we have to admit the absence of insurmountable obstacles to the competition between artificial intelligence and man.

The creative process includes two stages: search and composition.

Systems with artificial intelligence cannot yet compete with the person at the prospecting stage due to the absence of a database comparable to the human potential of common sense.

The composite stage in systems with artificial intelligence creation is realized as programmed search option of a new product in the sphere of possible combinations.

The creation of technological systems capable of creativity must be carried out according to the following principle: the knowledge base plus the strategy of processing knowledge. The strategy of processing knowledge is closely related to the skills that people have in solving creative tasks based on heterogeneous knowledge that cannot be formalized.

The best concept for a human variant of the creative relationship between humans and the machine is to realize that the intellectual progress of man has always been ahead of the imminent progress in artificial intelligence.

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## DIRBTINIO INTELEKTO KŪRYBIŠKUMO GEBĖJIMAS

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### Santrauka

Straipsnis skirtas sistemų, kuriose įdiegtas dirbtinis intelektas, filosofinei kūrybos proceso analizei. Keliamas tikslas išryškinti bendrąjį metodologinį pagrindą, pasitelkiamą modeliuojant sistemų, kuriose įdiegtas dirbtinis intelektas, kūrybos procesą. Šis procesas, atrodo, yra kryptingas procesas, implikuojantis bet kurios realybės srities reflektavimą ir naujo produkto kūrimą. Kūrybos procesas apima du etapus: paieškas ir sukūrimą. Išvada ta, kad sistemos, kuriose įdiegtas dirbtinis intelektas, bandomuoju etapu vis dar negali varžytis su žmogumi, nes jos neturi informacinės duomenų bazės, kurią būtų galima palyginti su sveiku žmogaus protu. Autoriai įrodinėja, kad dirbtiniam intelektui nėra neįveikiamų kliūčių, todėl ateityje kūrybiškumo atžvilgiu jis bus pajėgus varžytis su žmogumi.

Reikšminiai žodžiai: dirbtinis intelektas, kūrybinis konkuravimas, kūrybos procesas, sveiko proto žinių bazė, mašinų veikimas.