A Constructional Approach to Developing AGI

Abstract

The article discusses the need in many economic sectors for AI tools capable of performing complex, multi-stage, and multimodal tasks with sufficient completeness and accuracy. Existing general-purpose LLMs and narrowly specialized neural networks do not fully cope with this task, and the quality of results needs improvement. A likely solution could be Strong Artificial Intelligence, or as it is referred to in English-language literature, AGI (Artificial General Intelligence). An overview is presented of the current global understanding of what should be considered AGI, as well as a review of approaches proposed for its development. We formulate our own understanding of how Strong Artificial Intelligence should be designed and developed.

Keywords: Strong Artificial Intelligence, Strong AI, AI, Artificial General Intelligence, AGI, AI, structure of the human psyche, constructional approach to AI modeling.

Method

To date, the question of the principles of building AGI is characterized by a wide variety of approaches and remains highly debatable. Different research groups propose significantly different approaches and methods. In developing our approach to AGI design, we applied a method of analyzing the approaches of other authors, comparing their strengths and weaknesses, and generalizing and systematizing the obtained results. Upon closer examination, these approaches reveal common similarities and distinctive features. Each of these approaches has a right to exist, but the prospects of any of them seem to us insufficiently promising.

Introduction

While solving problems in various applications of AI, we encountered the fact that LLMs are capable of generating textual documentation in construction projects. Moreover, we managed to find ways, using sophisticated prompts, to obtain graphics, electrical circuit diagrams, layouts of objects on land plots, some building structures, etc. from ChatGPT. However, problems became evident: even the most powerful modern LLMs apparently did not have enough relevant material in their training arrays for the answers to prompts to always contain correct and sufficiently complete data for a designer, which would minimize his participation in validation, subsequent editing, and refinement of the generated texts and drawings. We now understand that a different solution is needed. It must also be based on AI components, but should not only provide descriptions compiled from fragments of previously memorized texts and/or codes in response to a request; it should be capable of quickly learning the topic of interest, generalizing and mastering the knowledge accumulated by humans, and on this basis finding an effective solution to the problem. The solution to these problems could be AGI – Strong Artificial Intelligence.

Results and Discussion

Current state of understanding and approaches to AGI development

The head of the largest AI company OpenAI, the creator of ChatGPT, Samuel Altman, gave the following definition: "AGI is an AI system that can do what very skilled people do in important jobs." [1]

The author of article [3] believes that "The ideal candidate for this role is hierarchical graphs."

The authors from the Keldysh Institute of Applied Mathematics of the Russian Academy of Sciences in article [4], in section 5.4, note: "Modeling the consequences of actions in unknown situations helps compensate for incomplete knowledge and predict their outcomes." And further in section 5.7, they state: "Consciousness reflects the control of the situation, actions, and thinking, which should ensure the switching of neural network structures to modes appropriate to the circumstances." They consider "unsatisfactory the definition of AGI as 'a type of AI that matches or surpasses human capabilities in a wide range of cognitive tasks'." They also believe that "Ben Goertzel's approach to defining AGI as 'a system capable of solving complex problems in a complex environment using limited resources' suffers from vagueness," with which, in their opinion, one cannot but agree. Moreover, they consider that "One of the most constructive definitions of AGI is given by astrophysicist M. Tegmark in [3]. He defines AGI as 'Life 3.0'." They ultimately assert the following: "To correspond to the concept of AGI, the system, in our opinion, must satisfy the properties:

- Ability to master existing and obtain new knowledge (not following from the known according to available methods) and use them for the tasks of civilization development.
- Ability to isolate and describe the properties of simple components from signals coming from a complex environment, based on an adaptive hierarchical knowledge representation structure,

- The development of an adaptive hierarchical knowledge representation structure should allow working with high-level civilizational knowledge."

The authors of article [5] propose building the architecture of Artificial General Intelligence similarly to how an "enterprise information system" is constructed: "How to model human intelligence if it is inherently social? The easiest way is to find an analogous system with already embedded models. Such examples are often sought among biological systems, but not all biological systems are social. A good example, oddly enough, may be an enterprise information system. ... The most striking publication in this regard is the article by three scientists [11], representing different sciences: linguistics, philosophy, and psychology. They assert that human intelligence is not only in the brain but is distributed among other people, connected with cooperation and outsourcing by a person of part of their knowledge."

The authors of article [6] rely on the BRA (Brain Reference Architecture) and propose taking as a basis the idea of developing AGI as "human-like artificial general intelligence by learning based on the whole-brain architecture," where the "whole-brain architecture" is formed as an analogue of the biological structure of the brain as an organ of the human body, consisting of the neocortex, basal ganglia, hippocampus, and amygdala.

Article [7] states that "In 2022, Yann LeCun, Chief AI Scientist at Facebook AI Research (FAIR) and one of the world's leading experts in machine learning, published a position paper 'A Path Towards Autonomous Machine Intelligence'. The key part of the paper is devoted to the concept of Joint Embedding Predictive Architecture (JEPA) – an architecture alternative to generative models. LeCun thoroughly justifies the importance of transitioning to models focused on training encoders that filter irrelevant information and create abstracted embeddings."

Also, issues related to AGI are discussed in articles [8–20]. Unfortunately, in none of the sources known to us has a concept been formulated that would allow building a clear and reliable step-by-step plan for developing what we mean when speaking of AGI; its structure is not described, training algorithms for Strong AI are not proposed, and principles are not formulated that, if followed, would prevent it from becoming a threat to humanity. We have attempted to formulate such a concept.

Proposed Approach to AGI Development

In the field of artificial intelligence, many neural network models capable of solving various problems have been developed, but all these problems are narrow and specific. What we have today is "weak AI." Most of the known successes of modern neural networks are due primarily to the fact that an effective abstract model of the brain neuron – the perceptron – was developed. It was the sufficiently accurate analogy between the operation of a biological neuron and the perceptron, as well as the development of a relevant algorithm for the interaction of perceptrons united in a network, that made the breakthrough in the development of artificial neural networks possible. From this observation, the conclusion naturally suggests itself: when developing "human-like" artificial intelligence, one must try to accurately "reproduce" the structure and functionality of human intelligence.

Proposed definition of Strong AI:

AGI should be structurally analogous to human intelligence and functionally equivalent to it.

It is important to understand one subtlety here. We mean the structure of intelligence, not the structure of the brain. These two structures are interrelated, but the biological brain is too complex, multi-component, and intricately interconnected a system to be reproduced absolutely accurately using the technological means available today. We deliberately simplify the model of intelligence somewhat, abstracting from too subtle and complex details, in order to describe a sufficiently meaningful and functionally close-to-reality model of human intelligence that will allow developing a software-algorithmic complex that operates in a similar manner and reproduces the mechanisms of human intelligence with sufficient precision.

The most natural and promising path to creating AGI is the so-called "constructional approach."

What does this approach consist of? In accordance with the above definition of AGI, it is natural to assume that it should be constructed by analogy with how human intelligence is "constructed" and works – that is, as nature "constructed" it. One of the main problems is that scientists do not have a unambiguous understanding of what human intelligence is, how it is structured and works, and what its structure is. We offer our own formulation, one that best serves the goal of developing AGI.

We need to analyze the structure of human intelligence, understand its organization and functional mechanisms, and try to reproduce them in the form of a clear, transparent "construction" – an abstract model. The question arises: what is the structure of human intelligence? We will try to answer this question with the goal of building AGI in mind.

To begin with, we must look at the problem from a slightly more general perspective, and then analyze in detail the main aspects of the human brain's functioning. Intelligence is inextricably linked to what is called the psyche and consciousness. The human psyche is studied by various scientific disciplines – psychology, psychiatry, neurobiology, neurophysiology, and others. There seems to be a general understanding of the functionality of the psyche – scientists generally agree that the psyche is based on "reactions" to external stimuli. But is it possible to distinguish in the human psyche, as in a system, its structure, some constituent parts, components, subsystems? To understand the purpose of these parts and the functions each of them performs? To find out how these components are connected to each other, how they interact, and how they influence each other? Answers to these questions, unambiguously accepted by the majority of scientists, have not yet been formulated. There are attempts, but there is no general concept.

Let us try to answer these questions and describe the structure of the psyche and intelligence in a way convenient for application to our "constructional approach" concept. When using the "constructional approach," it is natural to build a model of intelligence/psyche/consciousness taking into account the genesis of life and the development of the nervous system from the simplest organisms to humans.

Below we describe the types of functions and constituent parts of the nervous system of animals and humans, from the simplest to the highest forms. The analysis of these functions and constituent parts will allow us to formulate an abstract constructive model of human intelligence, so that we can begin developing the structure of strong artificial intelligence on its basis.

Let us consider such reactions of our psyche as reflexes, instincts, emotions, and thinking, and formulate their connection with what we call intelligence and consciousness.

Reflexes

Already in unicellular organisms, through natural selection, reactions to external factors that posed a threat were developed. For a dangerous increase in water temperature, a reaction was developed – active movement away from the heat source; or, upon unexpected touch, unicellular organisms sought to move away from the source of impact. A reaction was also developed to changes in the chemical composition of water, indicating the approach of a predator – for some it was escape, for others the release of chemicals that repelled the aggressor. Similarly, microorganisms reacted to the presence of food or other factors favorable to their vital activity, such as sunlight.

This mechanism later transformed into reflexes inherent in all living organisms on Earth. Reflexes are the lowest-level and simplest mechanism of response of living organisms to external stimuli. Touching something very hot with our hand, we reflexively withdraw our hand without even thinking and without having time to be frightened. The signal from sensory cells about excessive thermal impact is instantly processed in the nervous system and a command is instantly sent to the arm muscles to withdraw it from the overheating source. The same mechanism works for the body's reaction to pain from a cut, similarly the reaction to tickling, which is perceived as a possible contact with a poisonous spider, scorpion, snake, etc.

The scheme of the reflex mechanism looks approximately as follows.
For the simplest organisms:

external impact	→	**assessment of signal strength**	→	**if the signal is stronger than the threshold value, a command to perform a response action**

For more highly organized organisms:

external impact	→	**signal from sensors to the nervous system**	→	**checking the signal strength**	→	**searching memory for the corresponding pattern and retrieving the appropriate reaction**	→	**command to perform a response action**

The key feature of reflexes is that the processing of the signal from an external stimulus is very simple and fast. If the signal from thermoreceptors is strong enough, a command is immediately sent to perform protective motor actions. The nervous system "remembers" only the threshold value of the signal strength – exceeding the threshold means danger, and for this case a reaction is prepared in memory – withdraw the hand. Memory stores a MODEL of the response. The same with a cut – the nervous system "remembers" only the strength of signals from epithelial receptors reporting a violation of the integrity of the skin, and for this case a model of the response action is also stored – withdraw the hand. Similarly with tickling – the nervous system "remembers" only that a weak impact on tactile skin receptors with rapid displacement indicates possible contact with a dangerous creature (snake, poisonous spider, etc.) and sends a command to the muscles to shake it off, e.g., muscle twitching or a sweeping hand movement.

Instincts

During evolution, the nervous system of animals developed the ability to respond not only to single signals from the same type of receptors, but also to multiple signals from different types of receptors. For example, the smell of smoke in the air and visual detection of smoke plumes in the distance, when processed by the nervous system, are recognized as an approaching fire, and the musculoskeletal system is commanded to immediately move away from the source of the smell and the location of the smoke plumes. The animal does not feel pain from the surrounding fire and does not even see the flames nearby, but the processing of olfactory and visual signals by the nervous system "forms a forecast" of the possible development of events in which fire will surround the animal and assesses such a situation as a risk of death. Upon receiving such a forecast from the senses, the nervous system's memory already stores an algorithm of reaction to this threat, a BEHAVIORAL MODEL that ensures survival. This algorithm is transmitted from parents to children through genes as an instinct.

As with reflexes, a very similar scheme works for instincts:

complex impact of several external factors	→	**signal from sensors to the nervous system**	→	**processing of signals by the nervous system**	→	**selection from memory of the appropriate pattern and reaction**	→	**command to perform actions**

The difference from reflexes is that reflexes are "hardwired" into the memory of the nervous system at the lowest level, and the response is quickly retrieved and immediately executed. Conditioned reflexes can be considered an intermediate, transitional form. In the case of instincts, the nervous system, having previously repeatedly observed the chain of events (external stimuli → set of signals from different types of receptors → consequences), remembers the connection between the initial events and the result and adapts to what is happening – it remembers successful response actions.

Another important point. The mechanism of instinctive reaction is formed on the basis of a combination of reflexes. A reflex reaction to the smell of smoke – establishing the presence of danger (but the source of threat is not yet determined), plus visual fixation of smoke plumes – confirmation of the presence of danger and establishing its location, and consequently, the direction for movement to avoid the threat. An instinctive reaction is usually a complex of reflex reactions processed at a higher level with deeper processing of incoming information, better anticipation of consequences, and a more effective algorithm of response actions. At the same time, the image of the object (e.g., the image of a fire), its MODEL, is already stored in memory.

Emotions

The next level of development of the response mechanism to external factors realized in the psyche of animals and humans is emotions. Seeing a smiling child and/or hearing children's laughter, a person is likely to smile too. Seeing a fox cub with a broken paw, a person will surely feel pity. When a person hears cheerful music, they usually become cheerful as well.

What problem do emotions solve? One of the most important tasks is the synchronization of reactions within a group. We laugh at the same things, thus signaling to other group members that we, like everyone else in the group, consider the subject of mockery absurd, and such words or actions should not be repeated so as not to appear foolish. We admire the same feats to confirm that, like the rest, we consider such actions as role models. We all equally pity the weak or sick – this is necessary so that everyone simultaneously understands that the sick or weak need help, because anyone can find themselves in such a situation, and everyone wants to be sure that they will also be helped when needed, rather than being pushed into an abyss as a useless burden. A group that cares for its members – all for each and each for all – has a better chance of survival, increasing its numbers, and actively developing both biologically and economically and intellectually.

Emotions are based on instincts, such as the instinct of self-preservation and the instinct of procreation, but "emotional memory" contains an additional superstructure over the instinctive one, and this superstructure takes into account the interests of other group members and the entire group as a whole. Emotions are socialized, socially oriented reactions of the psyche. Emotional reactions presuppose the presence in memory of an abstract image of a correct (or incorrect) action. This image is proposed to be considered a MODEL of the event.

The scheme of the mechanism of forming an emotional reaction to external factors:

complex impact → **signal from** → **processing of signals by the** → **construction of an appropriate** → **commands to perform**

of several factors	**sensors to the nervous system**	**nervous system, including the use of the event model**	**response taking into account the interests of the group**	**response actions**

Intelligence (Reason)

Even more complex forms of reactions have been formed in the psyche of people in the process of their economic, cultural, and military activities within their group. For example, to survive in the cold season, it was necessary to build a dwelling in advance, make stocks of food and fuel. To ensure the survival of the family, it was necessary to count the amount of food that would provide all family members with food until the next season of ripening of edible fruits. It was also necessary to stock up enough fuel – somehow determine the quantity, neither too little nor too much. Thus arithmetic appeared, on the basis of which mathematics later developed.

Another example: understanding the mechanism of wind action on a sail allowed fishermen to sail farther from the shore to places rich in fish and confidently return to their places of residence, providing food for larger families. The developed generalized model of the interaction of wind, sail, and vessel made it possible to manage the fishing boat more effectively and provide the group with better chances of survival and faster population growth. Groups that had more members with pronounced intellectual abilities gained advantages and progressed faster, and having larger numbers could take control of larger territories with important resources – fertile lands, building materials in the form of forests or workable stone.

An intellectual reaction to emerging external circumstances consisted in developing new abstract models of objects, processes, systems, etc. Moreover, the most important feature of such models was that they allowed making reliable predictions of the behavior of the object. For example, at what speed will the vessel move if the angle between the wind direction and the plane of the sail is X, and the angle between the plane of the sail and the vessel's course is Y? Only science could answer such a question, which arose as a result of the use of people's intellectual abilities – the ability to build in one's mind abstract MODELS of objects, phenomena, processes, systems, etc., and it was very important to build dynamic predictive models.

The scheme of the intellectual mechanism of forming a response to emerging problems:

awareness of the problem	→	**processing by the nervous system of aspects of the problem, including the use of models of objects, processes, systems, etc.**	→	**Construc-tion of new models**	→	**testing the effectiveness of the newly constructed models (often in several iterations with refinement/improvement at each step)**	→	**use of the obtained new model in practical activities.**

Intelligence apparently arises as a more highly developed form of reaction to external circumstances, based on emotional reactions and instincts, in which the decisive role is played by the ability to create abstract MODELS of objects in memory, and for processes and systems these models also needed to be dynamic and reliably predictive. The human brain can remember dynamic, predictive models of objects, processes, and systems of the surrounding world, and, using these models, it can fairly reliably predict the behavior of these objects over time.

How does the human brain remember models of objects, processes, and systems? And how does it then use them? A static model in the human brain is represented, for example, as a visual image of an object stored in memory (often from several angles), consisting of constituent parts (if the object is complex) and connections between these constituent parts, as well as connections between the object and the rest of the world. Dynamic models are stored in a similar, slightly improved way.

Even a five-year-old child, knowing nothing about coordinate systems, functions, parabolas, etc., is capable without any formulas of remembering the trajectory of a thrown stone and later choosing the angle and force of the throw so as to hit a can placed on a stump. The child definitely has a model of the stone's flight in memory! How did he form it in his memory, how did he remember it, and how does he use it for aimed throws? Obviously, dynamic models are stored in human memory in the form of sequences of states of objects. For example, the model of the flight of a thrown stone is stored as a sequence of visual images of the stone's positions at different moments of flight and the final picture with the point of its fall to the ground or hitting the target. The model of the process of chopping wood with an axe is stored as a sequence of visual images. The first image – the axe is swung back; the next image – the axe is accelerated by muscle power and moves toward the log; then an image in which the sharp edge of the axe hits the end part of the log; and in the final image, the log is split, the axe has stopped. The climate model is stored in memory as a sequence of visual images of changing seasons: summer → autumn → winter → spring, and then summer again. A person, in the course of life, remembers a huge number of such models, from the simplest to the most complex, in great variety.

An interesting question: how does the brain/intelligence create a new model? Concepts such as intuition and analogy can help here. Intuition in this case can be represented as a subconscious enumeration of previously memorized models already present in memory, and the selection among them of the most suitable one for describing a new object "by analogy," followed by modification of the original model to sufficiently match the modeled object and increase the accuracy of its description.

For example, while observing how a kite rises upward if you run and pull it behind you on a string, by analogy, the inventor could have the idea of rising into the air on a device with wings similar to the wings of a kite, propelled by an engine with a propeller. By analogy with the kite, the wings of this device should also create lift if the device can move fast enough. The intuitive application of an "analogous" model of the kite to a new, non-existent object led to the formation in the imagination of the image of an "airplane."

Thus, to create new complex models, the brain uses previously memorized simple models, modifying and combining them when necessary.

Intuition, using analogy, appears to be the mechanism that generates new models and new knowledge by selecting suitable analogies with existing ones, building them up, and testing their suitability in practice. Obviously, intuition is the most important part of intelligence and it is a bridge between low-level reactions (reflexes, instincts, and emotions) and conscious intellectual modeling of objects.

Consciousness

By mastering the environment, a person comprehended not only the external world but also himself, his interaction with the environment, the group to which he belonged, and his place and role in that group. Consciousness, as a phenomenon, can naturally be interpreted as a result of observing oneself, one's body and mental states, how relationships with loved ones and surrounding people are built, and how one manages to interact with the environment. As a result of processing these observations, intelligence builds a MODEL of the surrounding world, a MODEL of the social group, and a MODEL of oneself in this world within this group. This construction, consisting of a set of models – self, group, and world – is closest to what is commonly called consciousness.

Based on these observations and reasoning, we obtain the structure of the psyche presented in Table 1:

№	**Level of intelligence structure**	**Name**	**Brief description**
1	Lower basic level	Reflexes	Simple reactions to external stimuli.
2	Higher level, using reflexes as a basis	Instincts	A higher level of perception of the surrounding world by the human nervous system. At this level, emphasis is added on interaction with a group of similar beings.
3	Even higher level, using reflexes and instincts as a basis	Emotions	A still higher level of perception of the surrounding world by the human nervous system. At this level, an emphasis on interaction with the group is added.
4	Highest level	Intellect	Characterized by the ability to remember and use complex dynamic predictive models and to form new models using intuitive selection of analogies.
5	Unifying supermodel of all levels	Consciousness	The largest and most comprehensive model of oneself, one's social group, the world as a whole, and oneself in this world.

These are the five constituent parts, five components, that can be distinguished in the composition of the human psyche within the framework of an approach based on the genesis of the nervous system from the simplest organisms to humans. It is these five components that ensure a person's ability to respond to external factors and adapt to changing environmental conditions in order to survive and develop.

The functionality of each of these components and their interaction, including the origin of more complex forms from simpler ones, were briefly described above. This structure partly echoes Maslow's pyramid, which in itself serves as indirect confirmation that this approach has a right to exist.

Returning to the problems of Strong AI, modern neural networks are not able to approach the reproduction of the most significant functions of the brain precisely because their developers do not try to implement in any form the structure of the psyche/intelligence/consciousness of a person, to imitate reflexes, instincts, emotions, and the ability to create in memory those very dynamic predictive models that the human brain forms in the process of comprehending information received through different senses.

Current AI designs do not presuppose the reproduction in them of the psyche structure described above, and do not even set as a goal the development of algorithms that mimic the brain's ability to build models.

Based on all of the above, it becomes clear that a neural network implementing Strong AI should apparently be:

- multimodal – it should be able to receive and process as input not only visual and textual data, but also audio data, and in the future, data on the chemical composition of air/water, tactile data, and others.

- this ensemble of neural networks should be able to imitate reactions to external/input factors at the level of reflexes, instincts, and emotions – to store in memory patterns/images of external factors and necessary response actions.

- the ensemble must include components capable of memorizing multilevel dynamic models of objects and phenomena of the surrounding world (in the form of sequences of states – for example, visual images) and forming from previously memorized models new models of any level of complexity – from a grain of sand to a cluster of galaxies, from a hydrogen atom to a DNA molecule – using intuitive enumeration of "analogous" models with modification to match the new, cognizable object or phenomenon.

A way to develop such neural networks could be an approach based on the use of a combination of generative neural networks and genetic algorithms. A detailed description of the process and sequence of training stages for bots with embedded AI components using genetic algorithms will be given in articles being prepared for publication.

From the neural networks trained in this process, a "proto-intelligence" can be formed containing trained neural networks, training arrays, and databases with a sufficient set of recognized types of objects and patterns of reaction to external factors. From these patterns, suitable as templates/building blocks, new models will be built using the mechanism of "intuition + analogy" as the main tool.

The process of using analogy to build a new model of an object is implemented as a enumeration of models already available in memory, a certain modification of the selected model (e.g., complementing the visual image or adding frames to the sequence), and attempts to use the modified model for recognition or prediction of the development of a situation. If, as a result of attempts to use this instance of the modified model, it turns out that the modification gives good results, it is saved as a candidate for new "knowledge"; if attempts to use it give a negative result, it is discarded/erased from memory. Then the transition to the next modification and/or candidate model occurs. As a result of enumerating a sufficient number of candidate models and modifications of each, with verification of the quality of the obtained candidate solution, one of the modified models should be recognized as sufficiently relevant. This will be the new model and new knowledge.

It is important to mention here the aspect of "goodwill" of the cultivated AI. What should be the approach to solving the issue of safety of the obtained solution from the point of view of potentially uncontrolled functioning of Strong AI and the risk of its possible "anti-human" actions? If we want bots to learn the same skills that humans acquired in the process of evolution, then the question arises: what tasks should we set for the bots in the genetic algorithm, what goals should they strive for? And in what sense should the "best" be selected?

It is clear that the bot must learn to survive, which means it must learn to identify threats (form threat models in memory) and develop the ability to counteract these threats. It is clear that the bot must find food and be able to win competitive struggle for scarce resources. It is clear that the bot must strive for procreation. On the other hand, the bot must not destroy itself, must not destroy its own kind, must not create conditions in which survival of itself and its group members is impossible. The question is: how can the process of improving the bot be organized so that it develops in this direction, so that its "proto-intelligence" eventually becomes as similar as possible to human intelligence?

Can basic principles be formulated, following which the bot will learn what we humans need, and will not learn what contradicts human essence?

The answers to these questions, in our opinion, should be sought in the deepest essence of life itself as a phenomenon. We need to find out what principles life itself follows in the process of evolution in all its manifestations.

If we abstract from details and look at the phenomenon of life on the largest scale in its historical development, we can clearly see the following basic features. Life on Earth appeared about 3.5 billion years ago, when the planet was still very young. Living matter developed on Earth, giving a huge number of forms and species, from the simplest to humans, surviving many cataclysms and disasters. It did not perish during collisions with huge cosmic bodies, survived ice ages and overheating. And each time it became stronger and spread wider. From this simple observation, it is easy to conclude that the "overarching task" of life, of living matter, is to survive and develop. Living matter gradually "processes" the mineral substances of the Earth, using them as building material to create new living organisms, of which there are more and more.

If we recognize as obvious the fact that the overarching task of life is to survive and develop, then it is easy to formulate the laws to which all living things obey and how living matter evolves. And these laws are very simple. Everything that promotes survival is good and should be preserved. Everything that promotes development is right and should be supported. Everything that contradicts these goals is bad and should be opposed.

For any species of living organisms on Earth, one can determine its place in the "food chain." Most often, more highly developed forms feed on less developed ones. Mammals can eat both plant foods and insects, fish, and other smaller and weaker mammals. But there are also reverse examples – viruses, bacteria, fungi, blood-sucking insects, internal parasites use mammals, including humans, as a source of their nutrition. The question of who eats whom is a question of expediency from the point of view of survival and development of each individual species and of all living things together. The same principle is reflected in the laws of the structure of human society. If a person has a choice of how to act, it is characteristic of him to choose the option that will save more lives of his loved ones or allow him to develop, improve himself and others, in order to produce more healthy offspring.

This, by the way, explains the phenomenon of a soldier's self-sacrifice in war – giving his life in exchange for the lives of his children.

Based on this principle (survival and development of life), ethics, morality with its ideas of justice, and the entire legal system can be built. Everything that promotes the survival and development of life is "good," and everything that hinders it is "evil."

Proceeding from the above, the survival of the bot should also be conditioned by following the principle of "survival and development of life." Those bots whose neural network is trained to react quickly and correctly to external factors and treat living objects with care should receive advantages in selection to the next stage, while those bots whose neural network does not meet these requirements will be discarded. The former must survive – undergo crossing and mutations. The latter must be discarded during the next control.

Conclusion

The presented approach to AI training, in our opinion, will inevitably lead to the formation of software objects equipped with an ensemble of neural network components that implement analogues of reflexes, instincts, emotions, and mental functions; a database of images of external factors and models of reactions to these factors; and a logical engine that recognizes external factors using neural network components, selects response forms, and controls reactive behavior.

There is also reason to expect that the implementation of the approach consisting of storing models of real objects in memory in the form of visual images and models of real processes in the form of sequential images of the states of objects and/or systems involved in the processes, as well as the mechanism of "intuitive" search in memory for "analogous models" and their editing/completion for generating new knowledge, will allow implementing mechanisms sufficiently similar to the processes of thinking and generating new knowledge in humans. Equipped with such AI, software bots will be able to solve the widest range of problems, and among these tasks, in our opinion, will be tasks related, among other things, to the design of construction objects, from the analysis of initial data and the choice of methods and means to the generation of graphic materials, calculations, and descriptions.

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