AJEMA GLOBAL RESEARCH NETWORK

AMERICAN Journal of Engineering, Mechanics and Architecture
Volume 01, Issue 03, 2023 ISSN (E): XXX-XXX

Analysis of the Current State of the Problem of Creating Artificial Intelligence

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Abstract: The article presents the main concepts of artificial intelligence programs, as well as analyzes the prospects for the development of artificial intelligence, the main directions in the study of artificial intelligence. The first is to bring artificial intelligence systems closer to the principles of human thinking. The second is to create artificial intelligence, which is the integration of already created artificial intelligence systems into a single system capable of solving the problems of mankind.

Keywords: artificial intelligence, artificial intelligence, programs, education, technology.

Introduction

Artificial intelligence (from lat. Intellectus - knowledge, understanding, reason) is a branch of computer science that studies methods, methods and techniques for modeling and reproducing intelligent human activity related to solving problems using a computer.

The science of artificial intelligence dates back to the middle of the 20th century. Since that time, in many research laboratories, scientists have been working on the creation of computers that have the ability to think at the same level as a person. At that time, the prerequisites for the emergence of artificial intelligence already existed. So, psychologists created a model of the human brain and studied the processes of thinking. Mathematicians created the theory of algorithms, which became the foundation of the mathematical theory of computation, knowledge about the world was ordered and structured, questions of optimal calculations were solved, and the very first computers were created.

New machines were able to perform calculations much faster than humans, so scientists thought about the possibility of creating computers that reached the level of human development. In 1950, the English scientist Alan Turing published the article "Can a machine think?". In this article, he proposes to determine the degree of intelligence of a machine using a test he developed, which later became known as the "Turing test".

Other scientists also worked in the field of artificial intelligence, but they had to face a number of problems that could not be solved within the framework of traditional computer science. It turned out that , first of all, the mechanisms of sensory perception, assimilation of information, as well as the nature of language, should be studied. It turned out to be extremely difficult to imitate the work of the brain, since for this it would be necessary to reproduce the work of

billions of neurons interacting with each other. But an even more difficult task than simulating the work of the brain turned out to be the study of the principles and mechanisms of its functioning. This problem, faced by researchers of intelligence, affected the theoretical side of psychology. Scientists have not yet been able to come to a consensus on what intelligence is. Some consider the ability to solve problems of high complexity a sign of intelligence; for others, intelligence is, first of all, the ability to learn, generalize and analyze information; others believe that this is an opportunity to effectively interact with the outside world, the ability to communicate, perceive and comprehend the perceived information.

The task of creating artificial intelligence is becoming more and more urgent every day. That is why many studies and publications are devoted to this problem. In particular, the article by V. A. Koss [1] outlines the essence of thinking procedures in managing human functions. The classification of functions is given from the position of psychology, reflecting the essence of human functions, and not his behavioral reactions. The results of the analysis of the thinking process made it possible to take a fresh look at the role and place of artificial intelligence systems in human life. An approach to studying the process of information transformation in human thinking is proposed and a structural model of the thinking process itself is given. Its implementation can serve as a basis for the integration of artificial intelligence systems. And in the scientific work of Alimov A. A. and Shabalina O. A. [2], a software system for controlling the characters of a game virtual world based on a multi-agent approach is considered.

In the scientific work of Ryzhov V.V. and Saifulin V.G. [3], the specifics of artificial intelligence are considered in comparison with human thinking. It is shown that the development of artificial intelligence is in the direction of increasing the computing power of computers. The conclusion is made about the inability of artificial intelligence to scientific creativity at the present stage of development of computer technology.

In the work of R. A. Migurenko [4], attention is focused on philosophical positions regarding artificial intelligence as a tool for cognition of consciousness. Based on the difference between two types of mental properties and the structure of human competencies, a comparative description of natural and artificial intelligences is given. The significance of research in the field of artificial intelligence for the philosophy of mind is determined

The authorship of the term "artificial intelligence" is attributed to John McCarthy, the founder of programming, the inventor of the Lisp language. In 1956, the future winner of the prestigious Turing Award demonstrated a prototype program based on artificial intelligence at Carnegie Mellon University.

Humanity began to dream of smart robots in the first quarter of the 20th century. The famous writer Karel Capek staged the play "Universal Robots" in the London theater in 1924 . The performance amazed the audience, and the word "robot" became firmly established in everyday life.

In 1943-45, the foundations for understanding and creating neural networks were laid, and already in 1950, Alan Turing published an analysis of an intellectual chess game in a scientific publication. In 1958, the first artificial intelligence programming language, Lisp, appeared.

Between 1960 and 1970, a number of scientists proved that computers were able to understand natural language at a fairly good level. In 1965, they developed Eliza , the first robot assistant that could speak English. In the same years, the direction of artificial intelligence began to attract government and military organizations in the United States and other countries. Thus, by the 1970s, the US Department of Defense launched a project of virtual street maps - a GPS prototype.

In 1969, scientists at Stanford University created Sheki, an AI robot that can move independently, perceive some data and solve simple problems.

at the University of Edinburgh - this Scottish member of the AI family could use computer vision to find and assemble different models.

In 1997, they created a well-known chess program - the computer " Dip Blue ", who beat world chess champion Garry Kasparov. In the same years, Japan begins to develop a 6th generation computer project based on neural networks .

An interesting fact is that in 1989 another chess program, Deep Thought beat international grandmaster Bent Larsen. After this duel between machine and man, Garry Kasparov declared:

“If an intelligent machine can beat the best of the best in chess , then it can write the best music, compose the best books. I can not believe this. When I find out that scientists have created a computer with an intelligence rating of 2800, i.e. equal to mine, I myself will challenge the machine to a chess duel to protect the human race.”

The 2000s saw a resurgence of interest in robotics . Artificial intelligence is being actively introduced into the space industry, and is also being mastered in the domestic sphere. There are smart home systems, "advanced" household devices. Robots Kismet and Nomad explore areas of Antarctica.

Now the development of artificial intelligence is taking place in two directions: neurocybernetics and black box cybernetics. One of the directions - neurocybernetics, or artificial intelligence, is based on modeling the work of the human brain using artificial intelligence systems, known as neural networks or neural networks . The second area of artificial intelligence - black box cybernetics, or machine intelligence, is engaged in the search and development of algorithms for the effective solution of intellectual problems using existing computer models. For this direction, the main thing is not the design of the device, but the principle of its operation: the reaction of a “thinking” machine to input actions must be the same as that of the human brain.

Many books have been written about artificial intelligence, but not a single author gives an unambiguous answer to the question of what this science does. Most authors consider only one definition of artificial intelligence, considering scientific achievements only in the light of this definition. The next problem concerns the nature of the human intellect and its status: in philosophy there is still no unambiguous criterion for them. There is no single approach to determining the degree of “reasonableness” of a machine. However, there are many hypotheses proposed since the dawn of artificial intelligence. This is the Turing test, which was mentioned above, and the Newell - Simon hypothesis , and many other approaches to the development of artificial intelligence, of which two main ones can be distinguished:

- semiotic, or top-down: based on the creation of knowledge bases, inference systems and expert systems that simulate various high-level mental processes, such as thinking, emotions, speech, creativity, reasoning, etc.
- biological, or ascending: it is based on the creation and study of neural networks that simulate the processes of the human brain, as well as the creation of biocomputers, neurocomputers and other similar computing systems.

In computer science, the solution of artificial intelligence problems is carried out using the design of knowledge bases and expert systems. Knowledge bases are a collection of knowledge and rules according to which information can be meaningfully processed. In general, the problems of artificial intelligence in computer science are studied with the aim of creating information systems, their operation and improvement. The training of developers and users of such systems is handled by specialists in the field of information technology.

Scientists at the Singularity Institute (SIAI), based in the US, are actively exploring the potential for global risks that could arise from the creation of superhuman artificial intelligence. To prevent such risks, artificial intelligence should be programmed to be friendly to people.

Artificial Intelligence: Applications

From the moment that artificial intelligence was recognized as a scientific direction, and this happened in the mid-50s of the last century, the developers of intelligent systems have had to solve many problems. Conventionally, all tasks can be divided into several classes: human language recognition and translation, automatic theorem proving, creation of game programs, image recognition and machine creativity. Let us briefly consider the essence of each class of problems.

Proof of theorems.

Automated theorem proving is the oldest application of artificial intelligence. A lot of research has been carried out in this area, which resulted in the appearance of formalized search algorithms and formal representation languages, such as PROLOG - a logical programming language, and predicate calculus.

Automatic proof of theorems is also of interest to scientists for the reason that for particularly complex problems it is also possible to use the system, although not without human intervention. Currently, programs often act as assistants. Specialists break the task into several subtasks, then heuristics are thought out to sort out possible reasons. Next, the program proves lemmas, checks less essential assumptions, and makes additions to the formal aspects of the proofs outlined by the person.

Pattern recognition.

Pattern recognition is the selection of essential features that characterize the initial data from the total set of features, and on the basis of the information received, the assignment of data to a certain class.

The theory of pattern recognition is a branch of computer science whose task is to develop the foundations and methods for identifying and classifying objects (objects, processes, phenomena, situations, signals, etc.), each of which is endowed with a set of certain features and properties. In practice, it is necessary to identify objects quite often. A typical situation is recognizing the color of a traffic light and deciding whether to cross the street at the moment. There are other areas in which object recognition cannot be dispensed with, for example, the digitization of analog signals, military affairs, security systems, and so on, so today scientists continue to actively work on creating image recognition systems.

Among the variety of problems of pattern recognition, the following can be distinguished:

Document classification

Definition of mineral deposits

Image recognition

Barcode recognition

Character recognition

Speech recognition

Face recognition

Vehicle number recognition

Artificial intelligence in gaming programs.

Human speech recognition and machine translation.

The long-term goals of artificial intelligence include creating programs that can recognize human language and use it to construct meaningful phrases. The ability to understand and apply natural language is a fundamental feature of human intelligence. Successful automation of this ability would make computers much more efficient. To date, many programs have been written that can understand natural language, and they are successfully applied in limited contexts, but so far

there are no systems that can apply natural languages with the same generality and flexibility as a person does. The fact is that the process of understanding natural language is not only a simple parsing of sentences into components and searching for the meanings of individual words in dictionaries. This is exactly what the programs do well. The use of human speech requires extensive knowledge about the subject of the conversation, about the idioms related to it, in addition, the ability to understand ambiguities, omissions, professionalism, jargon, colloquial expressions and many other things that are inherent in normal human speech.

An example is a conversation about football, where such words as “forward”, “pass”, “transfer”, “penalty”, “defender”, “forward”, “captain” and others are used. Each of these words is characterized by a set of meanings, and individually the words are quite understandable, but a phrase made up of them will be incomprehensible to anyone who is not fond of football and knows nothing about the history, rules and principles of this game. Thus, in order to understand and apply human language, a body of background knowledge is needed, and one of the main problems in automating the understanding and application of natural human language is the collection and systematization of such knowledge.

Game artificial intelligence includes not only the methods of traditional artificial intelligence, but also the algorithms of computer science in general, computer graphics, robotics and control theory. Not only the system requirements, but also the budget of the game depend on how exactly the artificial intelligence is implemented, so developers have to balance, trying to ensure that the game artificial intelligence is created at minimal cost, and at the same time it is interesting and undemanding to resources. It uses a completely different approach than in the case of traditional artificial intelligence. In particular, emulations, deceptions and various simplifications are widely used. Example: a feature of first-person shooters is the ability of bots to move accurately and instantly aim, but at the same time, a person does not have a single chance, so the abilities of bots are artificially underestimated. At the same time, checkpoints are placed on the level so that the bots can act as a team, set up ambushes, etc.

Within a computer game, there are many areas in which a wide variety of artificial game intelligence heuristic algorithms are used. The most widely used game AI is as one of the ways to control non-player characters. Another equally common way to control is scripting . Another obvious application of game AI, especially in real-time strategy games, is pathfinding, or a method to determine how an NPC can get from one point on the map to another. At the same time, obstacles, terrain and a possible “fog of war” must be taken into account. Dynamic balancing of mobs is also not complete without the use of artificial intelligence. Many games have tried the concept of unpredictable intelligence. These are games like Nintendogs , Black & White , Creatures

Many game programmers consider any technique that creates the illusion of intelligence as part of game artificial intelligence. However, this approach is not entirely correct, since the same techniques can be used not only in game artificial intelligence engines. For example, when creating bots, algorithms are used with information about possible future collisions entered into them, as a result of which bots acquire the “ability” to avoid these collisions. But these same techniques are an important and necessary component of a physics engine. Another example: an important component of a bot's aiming system is water data, and the same data is widely used in the graphics engine when rendering. The final example is scripting . This tool can be successfully used in all aspects of game development, but most often it is considered as one of the ways to control the actions of NPCs.

Another interesting task of artificial intelligence is teaching a computer to play chess. Scientists from all over the world were engaged in its solution. The peculiarity of this task is that the demonstration of the logical abilities of the computer is possible only in the presence of a real opponent.

Expert systems.

The development of modern expert systems has been carried out by researchers since the early 1970s, and in the early 1980s, expert systems began to be developed on a commercial basis. The prototypes of expert systems, proposed in 1832 by the Russian scientist S. N. Korsakov, were mechanical devices called “intelligent machines”, which made it possible to find a solution based on given conditions. For example, the symptoms of the disease observed in the patient were analyzed, and the most appropriate medicines were suggested based on the results of this analysis.

Computer science considers expert systems together with knowledge bases. Systems are models of expert behavior based on the application of decision-making procedures and logical conclusions. Knowledge bases are considered as a set of inference rules and facts that are directly related to the chosen field of activity.

The whole variety of areas in which knowledge-based systems can be applied can be divided into classes: medical diagnostics, planning, forecasting, control and management, training, interpretation, fault diagnosis in electrical and mechanical equipment, training.

Artificial intelligence and prospects for its development

Intelligent computers are more powerful than non-intelligent ones , but is it possible to make sure that this power is always used only for good, but not for evil? Artificial intelligence researchers who have devoted their entire lives to developments in this area should be aware of their degree of responsibility for ensuring that the results of their work have only a positive impact on humanity. The degree of this influence is directly related to the degree of artificial intelligence. Even the earliest advances made in this area have had a significant impact on how computer science is taught and how software and hardware are developed. Artificial intelligence has made it possible to create search engines, robots, effective surveillance systems, inventory management systems, speech recognition, and a number of other fundamentally new applications.

According to the developers, the achievements of the average level achieved in artificial intelligence can have a tremendous impact on the way of life of the population around the planet. Until now, only the Internet and cellular telephone communications have had such a pervasive influence, and the degree of influence of artificial intelligence has remained negligible. But one can imagine what benefits the appearance of personal assistants for home or office will have for mankind, and how the quality of everyday life will improve with their appearance, although at first this may entail a number of economic problems. At the same time, the technological possibilities that have opened up to humanity may lead to the creation of autonomous weapons, and its appearance, according to many, is undesirable. Finally, it may well be that success in creating artificial intelligence, superior in level to the human mind, can radically change the life of mankind. People will work differently, relax, have fun, ideas about consciousness, intellect and about the very future of mankind will change. It is easy to understand that the emergence of superior intelligence can cause serious damage to the freedom, self-determination and existence of people. At the very least, all of these aspects may be at risk. Therefore, research related to artificial intelligence should be carried out with an awareness of their possible consequences.

What could be the future? Most science fiction novels follow pessimistic rather than optimistic scenarios, perhaps because such novels are more appealing to readers. But in reality, most likely, everything will be different. The development of artificial intelligence occurs in the same way as telephony, aeronautics, engineering equipment, printing and other revolutionary technologies developed at one time, the introduction of which brought more positive rather than negative consequences.

It is also worth noting that despite the short history of the existence of artificial intelligence, significant progress has been made in this area. However, if humanity could look into the future, it would see how little has yet been done compared to what remains to be done.

Conclusion

The development of information technologies has made it possible for a person to compensate for the psychophysiological limitations of his body in a number of areas. The "external nervous system", created and expanded by man, has already given him the opportunity to develop theories, discover quantitative patterns, push the limits of knowledge of complex systems. Artificial intelligence and its improvement turn the boundaries of complexity available to man into systematically pushed. This is especially important in the modern era, when society cannot successfully develop without the rational management of complex and super-complex systems. The development of artificial intelligence problems is a significant contribution to human awareness of the laws of the external and internal world, to their use in the interests of society, and thus to the development of human freedom.

The man set the task of creating a kind of analogue of himself. And he was able to do it. The mechanical part is similar to the human body and its control is already there - these are robots functioning on servomechanisms. The intellectual functions of a person are partly modeled. But civilization goes further. It's not enough for her. Need to create " Homo te with hnicus ". Solving this problem requires the creation of a "machine" that functions like a human brain, but the further advances in research in the field of artificial intelligence, the more difficult it seems to solve it.

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