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Development and Application of Artificial Intelligence

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Abstract. Artificial intelligence is an emerging science, which studies and develops theoretical methods and techniques for simulating and expanding human intelligence. Today, artificial intelligence has made significant achievements in pattern recognition, knowledge engineering, robotics, etc. But it is far from the real human intelligence. Based on the elaboration of the concept of artificial intelligence, this study analyzes the development history, the current applicable fields of artificial intelligence, and looks forward to the future development trend. Meanwhile, we discuss the ethical dilemma faced or about to be faced by artificial intelligence technology.

1. Introduction

Artificial intelligence is a new discipline based on the interdisciplinary nature of computer science, cybernetics, information theory, psychology, linguistics and philosophy. It is mainly used to study how to use machines (mainly computers) to imitate and realize human's intelligent behaviors. Intelligence is the unique feature of human beings different from the general characteristics of biological. It can be interpreted as human ability of perception, learning, understanding and thinking. Artificial intelligence is a discipline that studies, understands, simulates human intelligence, and discovers its laws.

As an important branch of computer science, artificial intelligence was formally proposed by McCarthy at a conference at Dartmouth College in 1956 and is currently referred to as one of the world's three cutting-edge technologies [1]. Professor Nilsson, working at the famous Stanford Artificial Intelligence Laboratory in the United States, defines artificial intelligence: "Artificial intelligence is a subject of knowledge - how to express and acquire and use knowledge." [2] Professor Winston at MIT said that "artificial intelligence is the study, how to make computers do what can only be achieved by human intelligence in the past". [3]

Based on the elaboration of the concept of artificial intelligence, this study analyzes the development history and the current applicable fields of artificial intelligence, and looks forward to the future of the development trend. At the same time, we discuss the ethical dilemma faced or about to be faced by artificial intelligence technology.

2. Origin and Development of Artificial Intelligence

Since birth, human beings keep trying to use the machines to replace part of human brain works according to the contemporary level of knowledge and technical conditions. After a long period of development of science and technology, until entering the 20th century, some groundbreaking work occurred in the area artificial intelligence. A historic conference in 1956 at Dartmouth College in the United States was considered a sign of the birth of artificial intelligence science. During the conference McCarthy formally introduced the concept of artificial intelligence, which involves mathematics, computer, neurophysiology, psychology and other disciplines. From that point the artificial intelligence technology, as a formal emerging discipline, began to thrive [4].

Since the 1960s, research on artificial intelligence has been paid more and more attention. Researchers have conducted in-depth research on the applications of artificial intelligence such as problem solving, game theory, theorem proving, and program design. In May 1997, Deep Blue developed by IBM, with the score of 3.5:2.5, defeated the chess world champion for the first time in

the official game, causing a worldwide sensation. This indicates that in some areas, artificial intelligence systems can reach the highest level of human beings. In March 2016, Google's Alpha Go beat the international go master Lee Se-dol 4:1, again conquering the world with superb chess skills and stunning performance. In the current background of big data, these events make human beings placed unlimited hope on artificial intelligence, meanwhile lost into the endless reflection.

3. Applications and Development Trend of Artificial Intelligence

After several decades of development, artificial intelligence technology has been used in many fields of today's society. We explore several typical applications of artificial intelligence and the future direction of development [5-7].

3.1 Problem Solving

Chess program (such as chess and go) that can solve difficult problems is a major achievement of artificial intelligence. The search strategy can be classified as blind search without informational guidance and heuristic search using empirical knowledge, which is determining the priority relation of knowledge in the reasoning step of problem solving. One unresolved question includes the expressional ability of human players, such as the ability of chess masters to gain insight into the chess game. Another unresolved question involves the Meta concept of problems, which is called the selection of problem representation in artificial intelligence, i.e. human beings are always able to find a way to think about the problem so that the solution becomes easy and eventually solve the problem.

3.2 Machine Learning

Machine Learning studies how to use computers to simulate or achieve human learning activities. It is an important application area of artificial intelligence. Learning is an important feature of human intelligence and basic means of access to knowledge. Machine learning is a fundamental way to make the computer intelligent. In addition, machine learning also helps to discover the mechanisms of human learning and reveal the mystery of the human brain. Learning is a process of knowledge acquisition with a specific purpose. Its internal performance is mainly the continuous establishment and modification of the new knowledge structure, and the external performance is the improvement of performance. Essentially, a learning process is that a learning system transforming the information provided by the mentor (or expert) into a form that can be understood and applied by itself. According to the degree of the system’s dependency on the mentor, the learning methods can be categorized as: Rote Learning, Learning from Instruction, Learning by Analogy, Learning from Induction, and Learning by Observation and Discovery, etc.

3.3 Expert System

Expert system is another important branch in the field of artificial intelligence research. It explores the application of general thinking method to the use of specialized knowledge to solve the special problems, and realizes the breakthrough of artificial intelligence from theoretical research to practical application. The expert system can be seen as a class of specialized computer intelligent program system, which can use the expertise and experience from experts in specific fields. The intelligent program system can use reasoning techniques in artificial intelligence to solve and simulate complex problems, which can usually be solved only by experts. In general, expert system is a kind of intelligent software, whose solution method is a heuristic one. Problems solved by expert system have generally no algorithm solution. It is different from the traditional computer program. Expert system often concludes based on incomplete, inaccurate or uncertain information.

3.4 Neural Network

Artificial neural network, consisting of a large number of interconnected processing units (neurons), is briefly referred to as neural network. Neural network is an arithmetic model composed of a large number of interconnected nodes (or neurons). It is an abstraction and simulation of some basic characteristics of human brain or natural neural network. The purpose of neural network is to simulate some of the mechanisms of the brain to achieve functions in some aspects. In detail, the artificial neural network is a technology that aims at solutions of a specific problem, uses the grasp of the biological neural network mechanism, accords with the idea of control engineering and mathematical description method, establishes corresponding mathematical models, uses appropriate

algorithms and determines the mathematical model parameters. The information processing of neural network is realized by the interaction between neurons. The storage of knowledge and information mainly manifests itself as the physical relation between network elements. Artificial neural network has a strong self-learning ability. It doesn't need to rely on the "expert" mind. Instead, it automatically summarizes the law from the existing experimental data. Thus, the artificial neural network is good at dealing with complex multidimensional nonlinear problems.

3.5 Pattern Recognition

Pattern recognition in artificial intelligence means using computers to substitute for or help humans to percept patterns. The main research object is the computer pattern recognition system, i.e. to make the computer system to simulate the human perception through the sensory organs. Earlier pattern recognition researches focused on the recognition of text and two-dimensional images, and achieved many results. Since the mid-1960s, researches of machine vision have begun to turn to the more difficult topic of explaining and describing complex 3D scenes. The hotspot of the current research is the identification and analysis of targets in locomotion (such as an aircraft), which is a sign of the fact that the scene analysis is towards practical research.

As an emergent discipline, pattern recognition is in the continuous development, as well as its theoretical basis and scope of research. Thriving at present, the pattern recognition technology will be developed deeper in the future with the extension of its scope and development of computer science. Quantum computing technology will also be used in the study of pattern recognition.

4. The Ethical Dilemma Faced by Artificial Intelligence

With the rapid development of artificial intelligence technology, the products are not limited to the production area and begin to gradually integrate into the field of life. Therefore, artificial simulation intelligent robot comes into being. They have the appearance increasingly close to that of human beings, which represents the further approach from artificial intelligence to human intelligence. The increasingly close relationship between the intelligent robot and humans triggered a series of ethical issues. As one of the leading manufacturers of artificial intelligence technology, Google, in 2014, first set up an artificial intelligence ethics committee to ensure that artificial intelligence technology is not abused. Many research experts have publicly expressed the concern about the threat from artificial intelligence to human beings. In the huge ethical knowledge system, combined with the actual situation of artificial intelligence, the following ethical issues are mainly involved.

4.1 Should the Human Rights Be Given to Machines That Are "Human"?

Safeguarding human rights is a fundamental moral principle of today's society. The rapid development of artificial intelligence technology makes smart robots who were engaged only in simple physical activity in the past have a certain degree of perception and is given so-called "human nature". Along with the emergence of these "smart lives", human rights have faced significant challenge. Intelligent robots achieve their actions through the computer programming codes, and they are made as close as possible to the behavior of people through the complex, different algorithms. With the popularization of intelligent robots, the discussion of whether or not to give them "human rights" has also become heated. There are opponents who argue that we do not need powerful intelligent robots in our life, and they should not be given "human rights". If robots have the so-called "human rights", the "three rules of the robot" will be violated, which is indulgence of robots and indirect damage to human beings. On the other hand, supporters maintain that if robots are able to have moral cultivation and autonomous interaction with human beings, then "human rights" is what they deserve[4,8]

4.2 How to Locate Intelligent Robots' Moral Status

Since we referred to the human rights ethical issues brought by artificial intelligence, it is inevitable to accurately locate its social moral status. The so-called moral status is based on the unique spiritual characteristics of human beings. With the emergence of artificial intelligence, we have to defend its moral rights, especially when the robots with human emotions emerge. When they have a considerable "human nature", they should have a corresponding moral status.

In the human society, once the rest of the members have a moral status, it means that mankind has a moral responsibility. If we deny the moral status of intelligent robots, we can treat them in any way we like, which can be friendly or harsh and brutal. An individual who has human rights, or a group with corresponding rights, should be treated morally. Imagine that if one day an intelligent robot belonging to our own is subjected to inhumane abuse at home or outside and unfairly treated like some animals today. Is this situation still consistent with the traditional ethics we insist on? As the masters of society, we must always understand that not only human beings have moral demands. When we have robots do dirty works we do not want to do, or when we endlessly ask robots to do things for us, do we have justification for our behavior?

5. Conclusion

Artificial intelligence is always at the forefront of computer science, and its theories and results will control science and technology to a large extent and determine the direction of computer technology development. Nowadays, there are many results of artificial intelligence research involved into people's daily life. In the future, the development of artificial intelligence technology will certainly bring long-term and profound impact to people's work, life and education. However, research in the field of artificial intelligence's ethics should also keep pace with its technology. People should take precautions and meanwhile avoid excessive sensitivity.

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