

# Discussion on Research and Development of Artificial Intelligence

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**Abstract**—The artificial intelligence is the important achievement of the development in computer science on the 21st century, which has a wide range of applications in many areas. This paper discusses the definition and nature of artificial intelligence, analyzes of the current research in various fields, sums up the history and present situation of artificial intelligence research and analyzes its development direction.

**Keywords**—artificial intelligence; expert system ; development direction; neural network; machine learning)

## I. INTRODUCTION

This paper discusses the definition and essence of artificial intelligence. Artificial Intelligence is a new technological science, which researches and develops for simulating, extending and expanding human intelligence theory, methods, techniques and applications. Artificial intelligence is not a human intelligence, and no more than human intelligence.

The paper analyzes of the current research in various fields, such as knowledge representation, automated reasoning and search methods, machine learning and knowledge acquisition, knowledge processing, natural language understanding, computer vision, intelligent robots, automatic programming and so on.

The paper sums up the history and present situation of artificial intelligence research. There are five phases in the development history. Artificial intelligence has been deep into the social life in all fields; it has been and will continue to be inevitably changing our lives.

The paper also analyzes its development direction, mainly discusses the development trends in three fields of artificial intelligence, such as information retrieval, expert systems and machine learning.

## II. DEFINITION AND ESSENCE

Artificial Intelligence, the English abbreviation is AI. It is a new technological science, which researches and develops for simulating, extending and expanding human intelligence theory, methods, techniques and applications. Artificial intelligence is a branch of computer science, it attempts to understand the substance of intelligence, and produce a new intelligent machine could make reactions similar to the human intelligence, the research on the field of artificial

intelligence include robot, speech recognition, image recognition , natural language processing and expert system.

Artificial intelligence, by its essence, is the simulation of the information process of human thinking.

There are the two roads for the simulation of human thinking, the first one is structure simulation, modeled on the structure mechanism of the human brain, to create a "class human" of the machine; the second one is functional simulation, temporarily put aside the internal structure of the human brain, but its functional simulation. The production of modern computer is simulating the function and information process of human thinking.

Artificial intelligence is not a human intelligence, and no more than human intelligence.

The essential difference between "Machine thinking" and the human mind: ① AI purely mechanical is unconscious mechanical physical process, human intelligence is mainly physical and psychological process. ② There is not sociality in the artificial intelligence. ③ There is not creativity in artificial intelligence, but human has dynamic and motile consciousness. ④ The former is always human thinking, the later is computer's functions.

## III. RESEARCH FIELD

Currently the machine which can be used to study the main material medium of artificial intelligence and the ability to realize artificial intelligence is the computer. The development history of artificial intelligence is linked with the development history of the computer science and technology. Besides computer science, artificial intelligence is also involved information theory, cybernetics, automation, bionics, biology, psychology, mathematical logic, linguistics, medicine and philosophy, and many other subjects. The calculation is an important part supporting structure and vitality of the intelligent system, as important as the blood is for the human body. The main research of artificial intelligence include knowledge representation, automated reasoning and search methods, machine learning and knowledge acquisition, knowledge processing, natural language understanding, computer vision, intelligent robots, automatic programming and so on.

#### IV. THE DEVELOPMENT

##### A. Development History

Phase I: the ignored the rise of artificial intelligence in the 1950s

The Legend of artificial intelligence can be traced back to ancient Egypt, but since 1941, with the development of the computer, technology has finally able to create intelligent machines. "AI" (Artificial Intelligence) was first considered in 1956 by Artificial Intelligence father of John McCarthy, who organized the "Dartmouth Summer Research Association of Artificial Intelligence." Since that time, this field was named "artificial intelligence." Although the Dartmouth Institute is not very successful, but it does gather the AI's organizers and it laid the foundation for later AI research.

After the concept of artificial intelligence was first proposed, a number of significant results emerged, such as machine theorem proving, chess program, general problem solving program, LISP List processing language. Because the finite reasoning ability of the resolution method and the failure of machine translation, the artificial intelligence slides into the low ebb. The features of this stage are: emphasis on problem-solving approach, ignore the importance of knowledge.

Stage II: expert system have enabled a new upsurge of artificial intelligence research in the late 1960s to the 1970's.

Because the expert system's capacity to storage law and information, there has been the stock market forecasting, DENDRAL chemical mass spectroscopy analysis system, MYCIN disease diagnosis and treatment system, PROSPECTOR prospecting system, Hearsay-II speech understanding systems, these expert systems researches and developments cited artificial intelligence to the practical use. And in 1969, International Joint Conferences on Artificial Intelligence (that is IJCAI) established.

Stage III: with the development of fifth generation computers, artificial intelligence has been great development in the 1980s.

Japan, began in 1982 the "fifth-generation computer development program," that is "knowledge-information-processing computer system KIPS", whose aim is to make the numerical calculation achieve as fast as logical reasoning. While this plan ultimately failed, but it is carrying out research in artificial intelligence have created a boom.

During the 1980s, AI has been introduced into the market, showed practical value in the commercial field. People began to feel the impact of computer and artificial intelligence technology. Computer technology is no longer belongs only to a small group of laboratory researchers. Personal computers and a number of technical journals to make computer technology displayed in people's eyes. For example, apply machine vision to the camera and computer on the production line to carry out quality control. While still rudimentary, these systems have been able to distinguish between black and white, then distinguish different shapes of the objects.

Stage IV: the rapid development of neural networks in the late 1980s.

In 1986, Parallel distributed processing research team led by Rumelhart, made neural network back-propagation learning algorithm to solve fundamental issue of the limited capacity of the neural network classification. In 1987, the United States held its first international conference on neural networks, announced the birth of this new discipline. Thereafter, all the countries gradually increase investment in the neural network; the neural network has developed rapidly.

Stage V: a new research upsurge of artificial intelligence in the 1990s

As the network technology, particularly international Internet technology development, and the research of artificial intelligence began to shift from a single-agent to Web-based environment for distributed artificial intelligence. Not only research the same-goal-based distributed problem solving, but also the multiple-intelligent-agents multi-objective problem solving, make the artificial intelligence more practical-oriented. In addition, since proposed the model of multi-layer Hopfield neural network, the research and application of artificial neural networks have emerged thriving scene.

The 21st century is the era of rapid development of computer technology, with the constant development of science and technology, artificial intelligence technology has been used in missile systems and early warning displays, and other advanced weapons. AI technology goes into the home, the increase of intelligent computer attracts the public interest; some for Macintosh and IBM compatible applications such as voice and text recognition has been able to buy; the use of fuzzy logic makes AI technology to simplify the video equipment. Artificial intelligence has been deep into the social life in all fields; it has been and will continue to be inevitably changing our lives.

##### B. Development Direction

The following mainly discusses the development trends in three fields of artificial intelligence, such as information retrieval, expert systems and machine learning.

Artificial Intelligence in the network information retrieval applications, mainly in: ① how to use computer hardware and software systems to imitate, extend and expand the human intelligence's theories, methods and techniques, including machine perception, thinking machine, the machine behavior, that is, knowledge acquisition, knowledge processing, knowledge utilization process. ② As the network knowledge and information include both the regularity knowledge, such as the concept of general principles, and a large number of empirical knowledge. Such empirical knowledge will inevitably carry with fuzziness, randomness, non-reliability and other uncertain factor, reasoning it needed to use artificial intelligence research.

Expert System is the most active and productive field research in Artificial Intelligence. It is a kind of a large program system with domain-specific knowledge and experience. In recent years, the research of "expert system" or "knowledge engineering" has had the successful and effective application of artificial intelligence technology. If a computer program could reflect and apply these knowledge, but also could solve the human expert's problem, and could

help human experts finding the errors of the reasoning process, and now this has been confirmed. Currently popular expert-system-based intrusion detection is a set of inference rules received by network security expert after analyzing suspicious behavior. A rule-based expert system could recruit and amend for the rules by using self-learning capacity, under the guidance of experts, with the accumulation of experience. The dependence on the history of expert system is smaller than statistical methods, so the adaptability is better, could be more flexible to adapt to the security policy and testing requirements.

Machine learning is not an extremely intelligent important symbol, but also very fundamental way to acquire knowledge. Machine learning mainly research how to make the computer simulating or realizing mankind's learning function. Machine learning is a difficult research field, which is closely linked with cognitive science, neural psychology, logic, science and other disciplines, and plays an important role in promoting other branches of artificial intelligence. Robot soccer system is the research hot spot; its characters of high-tech and entertainment have attracted a large number of interests at home and abroad. Decision-making system is mainly to solve the robot soccer and match collaboration in the process. In robot soccer system design, needs to across application with the decision tree, neural networks, and genetic algorithms in the artificial intelligence. For the robot, we need to increase its computing power of precision and fuzzy computing ability and creative thinking skills. With the further development of the artificial intelligence theory, will enable the development of robot soccer have come a long way.

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