

Preface

Artificial Intelligence's long-term goal is to build the human level of artificial intelligence. AI was born 50 years ago, in the bumpy road has made encouraging progress, in particular, machine learning, data mining, computer vision, expert systems, natural language processing, planning, robotics and related applications have brought good economic benefits and social benefits. Widespread use of the Internet is also exploring application of knowledge representation and reasoning, to build the semantic Web, improve the effectiveness of the rate of Internet information. The inevitable trend of information technology is intelligent. The intelligence revolution with the goal of replacing work performed by human brain work with machine intelligence will open up the history of human post-civilization. If the steam engine created the industrial society, then the intelligent machine must also be able to magically create a intelligent society to realize the social production automation and intelligence which promote the great development of knowledge-intensive economy.

Artificial intelligence is a branch of computer science, is a discipline to study of machine intelligence, that is to use artificial methods and techniques, developing intelligent machines or intelligent systems to emulate, extension and expansion of human intelligence, realize intelligent behavior. Artificial Intelligence in general can be divided into symbolic intelligence and computational intelligence. Symbolic intelligence is the traditional symbolic artificial intelligence, it is the basis of physical symbol system to study the knowledge representation, acquisition, reasoning process. Use of knowledge to solve problems is basic, the most important features of the current symbol intelligence, so people often put the current stage of artificial intelligence known as knowledge engineering. Knowledge Engineering research emphasis on knowledge information processing methods and technologies, and promote the development of artificial intelligence.

Computational intelligence, including neural computation, fuzzy systems, genetic algorithms, evolutionary planning and so on. To achieve intelligence revolution, we must better understand the human brain. Completely reveal the mysteries of the human brain is one of the biggest challenges facing the natural sciences. The early 21st century, the U.S. National Science Foundation (NSF) and the U.S. Department of Commerce (DOC) jointly funded an ambitious program —Convergent Technology for Improving Human Performance, which view the nano-technology, biotechnology, information technology and cognitive science as the four cutting-edge technology of the 21st century. Cognitive science as a top priority areas for development, advocating the development of these four technology integration, and described the prospects for such a science: cognitive science as the guide of convergent technology, because once we are able to on how, why, where, when to understand the four levels of thinking, we can use nanotechnology to make it with biotechnology and biomedicine to achieve it, and finally the use of information technology to manipulate and control it, make it work. This is a tremendous impact on human society.

On the surface, symbolic intelligence and neural computing is a completely different research methods, the former based on knowledge, The latter based on the data; the former use of reasoning, the latter mapping. In 1996, The invited presentation on "Computers, Emotions and Common Sense" given by Minsky at the fourth Pacific Region International Conference on Artificial Intelligence in the view that neural computation and symbolic computation can be combined and neural network is the foundation of symbolic system. Hybrid System is committed to the people, it is from this combination, which is consistent with our proposed hierarchical model of the human mind.

Agents interact with the environment to achieve intelligent behavior. Agent perception of information received from the environment, to work together to perform a variety of intelligent behavior. Since the 1990s, multi-agent systems become one of the core of artificial intelligence research.

Artificial life refers to the generation or construction of simulation system or model system with behavior characteristics of natural living systems by computers or precision machinery. Artificial life is the formation of new information processing system, a strong impetus to study biology and become a particularly useful tool. The study of artificial life may be combine information science and life science to form life information science which is a new ways of artificial intelligence research.

This book is separated into 15 chapters. The Chapter 1 is the introduction, starts from the cognitive questions of artificial intelligence, describing the

guiding ideology of writing this book, an overview of the hot topics for current artificial intelligence research. Chapter 2 discusses logics for artificial intelligence with more systematic discussion of non-monotonic logic, and agent-related logic systems. Chapter 3 provides the constraint reasoning, introduced a number of practical constraints reasoning. Chapter 4 describes the qualitative reasoning, focusing on several important qualitative reasoning. Over the years author and his colleagues have been engaged in case-based reasoning research, and its main results constitute the Chapter 5. Probabilistic reasoning is an important uncertainty reasoning, given by Chapter 6 focuses on. Machine learning is the core of the current artificial intelligence research, but also knowledge discovery, data mining and other fields important basis for the book with the Chapter 7 for discussion, reflecting the latest progress of the study. Chapter 8 discusses support vector machine. Chapter 9 is related to explanation-based learning. Chapter 10 presents reinforcement learning. Chapter 11 describes rough set theory. Chapter 12 focuses on association rules. The evolutionary computation is discussed in Chapter 13, focusing on the genetic algorithm. In recent years, significant progress in the distribution of intelligence, combined with the results of our study, Chapter 14 presents the main theories and key technologies for multi-agent systems. The final chapter addresses artificial life, an overview of artificial life research and progress made.

Author set up the Advanced Artificial Intelligence courses for Ph.D and master students at the Graduate University of Chinese Academy of Sciences in 1994. Based on the lecture notes Science Press published the first edition book in 1998. The second edition book published in 2006. The book is defined as a key textbook for the regular higher education and widely used in China.

This book can serve as a textbook for artificial intelligence course in relevant professional post-graduate colleges and universities and senior undergraduate. It is also available in artificial intelligence, intelligent information processing, pattern recognition, intelligent control research and application of scientific and technical personnel to read reference.

Since author had limited ability, coupled with artificial intelligence developed rapidly and extensive research area, inappropriate and wrong with the book are bound. I sincerely appeal to scholars and readers for comments and help without hesitation.

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