

# INTELLIGENT INFORMATION RETRIEVAL SYSTEM: EMPLOYABILITY OF NATURAL LANGUAGE UNDERSTANDING & KNOWLEDGE ACQUISITION AS AN INFLUENCER TO ENHANCE CREDIBILITY OUTPUTS

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## ABSTRACT

*The purpose of this article is to describe explores ways to solve the difficult problems in the study of the intelligent information retrieval system. This paper first discusses the basic concepts and the structure of the intelligent information retrieval system, the principles of artificial intelligence, the relationship between computer and artificial intelligence, the stage of artificial intelligence research experience, research areas and applications of artificial intelligence, the components and the use of the artificial intelligent information retrieval system in detail. And using the results of artificial intelligence research suggests the method to solve the difficulties which are in the areas of natural language understanding, knowledge representation and knowledge acquisition.*

**Keywords**—Intelligent Information Retrieval System; Artificial Intelligence; Natural language understanding; Knowledge representation; Knowledge acquisition

AI (Artificial Intelligence) is a new technological science to research and develop theory, methods, technologies and applications for simulation, extension and expansion of human intelligence. Artificial intelligence is a branch of computer science. It attempts to understand the substance of intelligence and produce a new intelligent machine which could respond in a similar manner as human intelligence, in The areas of research of AI include robotics, speech recognition, image recognition, natural language processing and expert systems, etc.

Pamela McCorduck in "machines who thinks" (1979) Pointed out that there is a long-term link between the complex mechanical devices and intelligent. From the appearance of the mythical giant bell and mechanical automatic machines several centuries ago, people have been making visual contact the complexity of the operation of the machine with its own certain intelligence activities. A few centuries later, the new technology has greatly improved the complexity of the machine.

The research of Artificial Intelligence was started in 1956. In a meeting held at the University Dartmouth firstly used the term "Artificial Intelligence" officially. The subsequent decades, people began to research from the problem-solving, intelligence, computer systems, such as the ability to solve differential equations, integrated circuit design analysis, synthesis of human natural language, and to information retrieval, providing speech recognition, handwriting recognition of the multi-modal interface, the expert system used in disease diagnosis and control of spacecraft and underwater robots which are close to our lives. The case that the IBM's "Deep Blue" in the board defeated chess master Garry Kasparov is a prominent example.

## **INTELLIGENT INFORMATION RETRIEVAL SYSTEM**

Intelligent Information Retrieval System is an intelligent computer information retrieval system, which simulates the human thinking process on information processing and intelligence activities, and achieve information and knowledge storage, retrieval and reasoning, and provide users with intelligent support.

## **STAGE OF ARTIFICIAL INTELLIGENCE RESEARCH EXPERIENCE**

### **A. 50's -- The rise and ignorance of artificial intelligence**

Since the concept of artificial intelligence first proposed, there have emerged a number of significant results successively, such as machine theorem proving, chess program, general problem-solving program, LISP List Processing language. However, the limited digestion reasoning ability, as well as the failure of machine translation makes the artificial intelligence go into low ebb. The feature of this stage is the emphasis on the problem-solving approach, ignorance the importance of knowledge.

**B. 60's to late 70's -- Expert systems have enabled a new upsurge of artificial intelligence research**DENDRAL mass spectroscopy analysis system, MYCIN disease diagnosis and treatment system, PROSPECTOR prospecting system, Hearsay-II speech understanding systems, expert systems research and development, led the practical use of artificial intelligence. And the International Joint Conference on Artificial Intelligence established in 1969. logical reasoning and theorem proving, natural language understanding, game, automatic programming, expert systems, learning, and robotics, etc. There has been established a number of different degree of artificial

**C. 80's -- With the development of fifth generation computers, artificial intelligence has been great development**Japan started the "fifth-generation computer development program," or "knowledge-information-processing computer system KIPS" in 1982, whose aim is to enable the

logical reasoning to be fast as the numerical calculation. This plan ultimately failed, but it has created a boom in the research of Artificial Intelligence.

D. Late 80's -- The rapid development of neural networks

In 1987, the United States held its first international conference on neural networks, announced the birth of this new discipline. Since then, with the gradually increase investment in many countries in the neural network in the neural network has developed rapidly.

E. 90's to now -- A new upsurge of Artificial Intelligence Because the development of the network technology, especially international Internet technology, artificial intelligence research began to shift from a single-agent to Web-based environment distributed artificial intelligence research. Not only researches to solve the distributed problem based on the same goal, but also study the multiple intelligent agents in a multi-objective problem, to make artificial intelligence more practical-oriented. In addition, with multi-layer Hopfield neural network model proposed, research and application of artificial neural networks have emerged thriving scene. Artificial intelligence has penetrated into all areas of social life.

## **RESEARCH AREAS AND APPLICATIONS OF ARTIFICIAL INTELLIGENCE**

Artificial intelligence has aroused great interest in recent years. Its research goal is to use the machine, usually electronic devices, computers and so on, as much as possible to simulate the activities of the human spirit, and strive to ultimately improve and beyond human capacity in these areas. Its field of study and range of applications are very wide, such as automatic theorem proving, reasoning, pattern recognition, expert knowledge systems, intelligent robots, learning, gaming, natural language understanding, etc.

Pattern recognition may be the most basic and the most important discipline of artificial intelligence. In short, pattern recognition is to allow computers to understand the things around it so that our communication with the computer more natural and convenient. It includes character recognition (reading), speech recognition (listening), speech synthesis (say), natural language understanding and computer pattern recognition. Now the computer can be said to be another-Song and dumb, and a blind, if the pattern recognition technology can be fully developed and applied to the computer, then we will be able to naturally communicate with the computer and does not need to remember the English order and can be access to a computer and order it directly. It's also for the intelligent robot research provided the necessary conditions which enable the robot to like people to communicate with the outside world.

The most interesting application of artificial intelligence should be robots. The range of robots is very wide, including not only all kinds of the appearance of intelligent robots, but also some

robots used in industrial production or to replace human labour. The current robot technology has achieved some results in the manufacture of the robot of a certain function, but it is also needed a lot of time to develop multifunctional, user-friendly intelligent robots. By that time, the contradiction between humans and robots what we have seen in the sci-fi film may become a reality.

The expert system has a certain commercial property. It firstly enters the main knowledge of a particular industry (such as medical, legal, etc.) into the knowledge library of the computer system. Then the designer according to the unique relationship between the knowledge and professional experience of staff to design a system that not only provides users with services of inquiries and suggestions about industry knowledge. More importantly, as an artificial intelligence system, it must have automated reasoning and learning ability. Expert systems often applied to a variety of commercial uses, such as internal customer information systems, decision support systems, and the medical adviser, legal advisers and other software that we can see the surface alive.

In addition, we can find in many uses of artificial intelligence in our lives. For example, home appliances with smart chips, cars, aircraft navigation system, electric game artificial intelligence program, and some specially designed electronic products to help people.

## **ARTIFICIAL INTELLIGENCE IN INFORMATION RETRIEVAL SYSTEM APPLICATION**

A. The advantages of the intelligent information retrieval system because of the use of artificial intelligence

The powerful ability to understand natural language, allows users to express their information needs more accurately with natural language. Simulation expert retrieval method, move the task of dealing with the user's information needs, developing solution strategies and analysis of the outcome to Intelligent Information Retrieval System. The intelligent information retrieval system has a strong ability to learn, is able to automatically acquire knowledge, can directly learn from the book, and can achieve self- improvement in practice.

B. The Structure of Intelligent Information Retrieval System

1) human-computer interface

Human-computer interface is the interface for exchange between information retrieval systems and user interface. It can understand, analyze the user's natural language questions, and produce results appropriate to the user also has the function of explaining features. It consists of a set of hardware components corresponding to procedures for completion of input and output work.

System input knowledge, updated knowledge library through the human-computer interface. The general user input information needs through it.

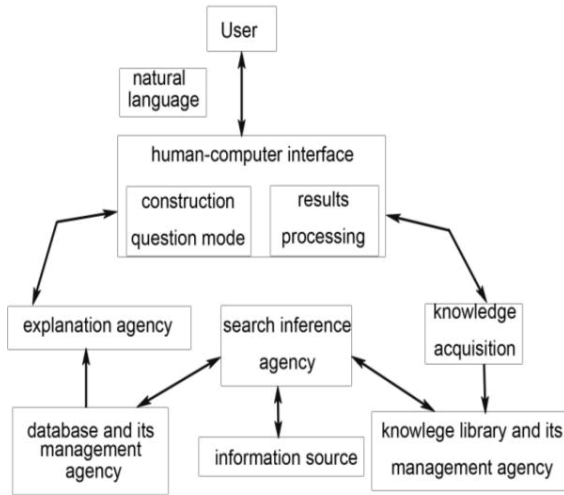


Figure 1. The basic structure of Intelligent Information Retrieval System

## 2) Knowledge library and its management system

Knowledge library is knowledge stored institutions, used to store the information required to solve user information needs, such as the principle of knowledge, expert knowledge and empirical and other relevant facts. The knowledge in knowledge library derived from the knowledge acquisition institutions, while it provides the necessary knowledge to the inference engine to solve the problem, it closely related to both.

## 3) Database and its management system

Database and management system stores the initial fact provided by the user, description of the problem and intermediate results during system process, final results, the information of running (such as the knowledge chain from reasoning) and so on.

## 4) Search inference agency

Search inference agency combines the application of information retrieval strategies and reasoning, using the knowledge in knowledge library, according to a certain reasoning strategy to solve the user problem.

## 5) Knowledge acquisition

Knowledge acquisition is a body to acquire knowledge composing of a group of programs. Its basic task is to turn knowledge entered into the Knowledge Library and is responsible for

maintaining the integrity and consistency of knowledge and establishes a good working knowledge library.

6) Explanation agency

It is able to explain their actions and answer the user's "Why?", "How come is the conclusion?" etc, is an important measure to make the user trust of information retrieval systems.

## **VI. USING THE RESULTS OF ARTIFICIAL INTELLIGENCE RESEARCH TO EXPLORE WAYS TO SOLVE THE PROBLEMS FACED BY INTELLIGENT INFORMATION RETRIEVAL**

1) Natural language understanding

Natural language understanding is the basis for intelligent information retrieval system. Natural language is extremely complex. For each of us, understanding the natural language is based on all of our knowledge. Machine understanding of natural language needs to enter all the highly similar "background knowledge" which are in every human brain into the computer, and then use the contextual knowledge to reason, but it is difficult to achieve.

In the field of artificial intelligence, natural language understanding is to study how to make a computer to understand natural human language. Specifically, it wants to achieve the following three objectives: (1) Computer can understand people's natural language input, and can correctly answer the relevant issues in the input. (2) A computer can generate a corresponding summary of the entered information and different terms can be used to repeat the content of the input. (3) A computer can automatically translate a certain kind of information in natural language into another natural language. For Intelligent Information Retrieval System, the main goal is to achieve the first two. Research on natural language understanding can be traced back to the 50's of the 20th century. But this is mostly researching translate a natural language into another natural language. Beginning of the 70's of the 20th century, a number of uses syntax -- a semantic analysis of natural language understanding system stand out, has made substantial progress in the linguistic analysis of the depth and difficulty than the earlier system. Beginning of the 80's of the 20th century, it is more emphasis on the important role of knowledge in natural language understanding. Over the past decade in the study of natural language understanding is the upsurge of corpus linguistics. It believed that knowledge comes from corpus linguistics, only obtaining knowledge from large-scale corpus in order to truly understand the language. At present, although the corpus-based natural language understanding methods are not yet ripe, and are in research, it is a remarkable research direction. And we can use the results have achieved for the natural language processing on an intelligent information retrieval system.

## 2) Knowledge representation

In artificial intelligence, knowledge representation is actually a description of knowledge or is a set of conventions, a data structure used to describe the knowledge accepted by the computer. The process of knowledge representation is a process to encode the knowledge into a data structure.

The study of knowledge representation is inseparable from the study and understanding of knowledge. As the structure and mechanism of human knowledge is not completely clear, so that the theory of knowledge and the standards are not yet established. Nevertheless, people worked out some specific knowledge representation methods in the process of study and establishing an Intelligent Information System. To sum up, these representations can be divided into two categories: symbolic representation, the connection mechanism of representation.

The same knowledge can generally be represented in a number of ways, but their effects are different. Because different areas of knowledge have different characteristics in general, each of representation methods has their own strengths and weaknesses. Thus, some areas of knowledge may be more appropriate to adopt this model, while some areas of knowledge may be better to adopt another model of a gesture. Sometimes, several models can be combined as a whole to represent the domain knowledge in order to achieve the complementarities effect. In addition, the above method of knowledge representation, mostly conducting for a specific study or the establishment for a certain intelligent system, there are some targeted and limitations, applications must be in accordance to make appropriate changes in the actual situation. In the establishment of a specific intelligence system, to use which model, there is no uniform standard. There was no universal model of knowledge representation. But generally speaking, to make choice of knowledge representation method, the following aspects should be considered: whether fully express the domain knowledge, in other words, to determine a knowledge representation model, the first thing should be considered is whether it can adequately express domain knowledge; whether it is conducive to the use of knowledge; whether facilitate the organization, maintenance and management of knowledge; whether easy to understand and to achieve.

## 3) Knowledge acquisition

Having the knowledge is an important symbol of intelligent information retrieval system different from general information retrieval system, and the quality and quantity of knowledge is a key factor to determine their performance. How to Make Intelligent Information Retrieval System obtain high-quality knowledge, this is the task of knowledge acquisition problem.

Due to various reasons, knowledge acquisition is still a very difficult task, although there are many scholars of artificial intelligence to carry out research in this area of work, hope to achieve automatic acquisition of knowledge, that is done automatically by the information retrieval

system for knowledge acquisition, and also achieved some results, but from the goal that the fully automatic acquisition of knowledge far, need to go a long way to address a number of theoretical and technical problems.

At present, knowledge acquisition is usually completed by knowledge engineers and knowledge acquisition agencies of systems. Knowledge engineer is responsible for the extraction of knowledge from experts in the field, and with the appropriate knowledge representation model to come out. The knowledge acquisition agency of system is responsible for converting knowledge to internal form that a computer can store and then send them into knowledge library. In the storage process, it should test the consistency and integrity of knowledge.

The task of knowledge acquisition is to acquire knowledge for the information system or expert system, create a sound and effective knowledge library to meet the needs of solving problems. For intelligent information retrieval systems, is to meet the needs of information retrieval. To accomplish this task, knowledge acquisition must be (1) Extract knowledge: that is extracting knowledge in knowledge sources (domain experts, books, related papers and operation of the system in practice, etc.) through the understanding, screening, induction, etc. in order to build knowledge library. (2) Knowledge conversion: that is to transform one knowledge representation form to another representation form. (3) Input knowledge: that is a process of putting knowledge with the appropriate representation mode, through editing, compiling into knowledge library. (4) Knowledge test: establishment of the knowledge library is through knowledge extraction, conversion and importation and other links to achieve, and the errors of any part of this process will cause errors on the knowledge, will cause a direct impact on system performance. So is necessary to do knowledge detection in order to detection and correction possible errors as early as possible.

According to the degree of automation, knowledge acquisition can be divided into non-automatic knowledge acquisition and automatic knowledge acquisition. Automatic knowledge acquisition is the ultimate goal of knowledge acquisition, it is an ideal way of knowledge acquisition, but it involves many areas of artificial intelligence. For example, pattern recognition, natural language understanding, machine learning. And this theory is still in the research stage, a number of technical issues need further study. On the current research results have been made, it is still insufficient to truly achieve automatic knowledge acquisition. Thus, the fully automatic acquisition of knowledge is still only as a goal people fighting for.

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