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RESEARCH ARTICLE

WHAT IS THE RELATION BETWEEN ARTIFICIAL INTELLIGENCE AND PATTERN RECOGNITION?

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ABSTRACT

At present, the electronic commerce and the customer alliance network shopping and network analysis is becoming increasingly popular, mainly is the result of highly developed and popular wireless communication. The work of software mainly includes artificial intelligence and the Internet of things, and the knowledge of artificial intelligence will be used in the research of the Internet of things. Assembly language mainly includes sequential branch cycle programming, subroutine definition and call. The core component of microcomputers is microprocessors. Intel introduces Pentium MMX (multi energy Pentium), Pentium Pro (high energy Pentium), Pentium two generation, three generation, four generation and so on. And Itanium. IBM is also known as the blue giant. The IBM PC series microcomputer has the characteristics of advanced design, rich software, complete functions, cheap price and openness. The system function call mainly includes two kinds of DOS and BIOS. In the DOS operating system, there are two layers of internal subroutines for users to use, and they are the basic input-output subroutines, BIOS and DOS layer function modules. Many functions of DOS are similar to those of BIOS calls. They both have similar writing formats, but DOS provides more necessary tests. Therefore, DOS operation is generally easier than the corresponding BIOS part. Assembly language mainly involves BCD code and ASCII code. Software engineering mainly involves the use of visio_project_powerdesign mapping, library management system feasibility study report and project development plan writing, data flow diagram and system flow chart production. Project 2003 project management and Gantt chart. "Ticket booking system" is an important issue in the field of software engineering. The UML modeling under software engineering is modeled with Visio, powerdesign, and rationalrose. The aerospace science and technology industry is also an important application of the Internet of things.

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INTRODUCTION

The first achievement of AI is to develop a chess playing program that can solve difficult problems. By studying the chess playing program, people have developed search strategies and problem reduction techniques in AI. The problem solving research design problem represents the study of space, the research of search strategy and the study of the reduction strategy. The typical problem solving procedure is chess playing program, computer chess programming, Chinese chess, chess and checkers, etc., which has reached the level of international championships. Twelfth International Joint Conference on artificial intelligence held in Sydney in August 1991, IBM company developed Deep Thought 2 computer system with the Australian chess champion Johannsen held a man-machine match, results 1:1 a draw; IBM supercomputer deep blue in May 1997 to develop IBM company in the United States of New York and Manhattan at the human world chess champion in the Soviet Union Kasparov played 6, won the blue. Artificial intelligence is the ability to simulate people's consciousness, thinking, and handling things. This is a big field, and all you can think of is the "intelligence" that can be included. The so-called smart home, the smart city of everything is. Pattern recognition including Bayesian decision theory, probability density function estimation, linear discriminant function, nonlinear discriminant function, nearest neighbor method, minimizing the empirical risk minimization and orderly risk selection and feature extraction, K-L expansion feature extraction based on unsupervised learning method, artificial neural network, fuzzy pattern recognition, statistical learning theory and support vector machine, the application of pattern recognition in the processing of speech signal in the application of printed Chinese characters recognition. Pattern recognition is a subject, and you can use it as a way of thinking and way to deal with problems. From the name, pattern recognition, first is the "mode", the nature of the

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problem into a model; then "recognition", from this point of view is the main job of classification (it's). The problem of target detection and classification in image processing is a typical pattern recognition problem. Is machine learning and pattern recognition is very close, the two have a lot in common; some sense are the areas of artificial intelligence. The conclusion is that AI is a concept. Pattern recognition is applied in some ways, and there are many specific methods. Data mining is an application. The methods used include both knowledge and knowledge in machine learning and pattern recognition. Artificial intelligence is the two level subject, and pattern recognition is a class of three. Pattern recognition should be in a branch of artificial intelligence, artificial intelligence, including artificial intelligence, pattern recognition, neural network, expert system of Natural Language Processing, so better, as to why the two side by side, that is because in recent years, the pattern recognition in artificial intelligence field more and more important role, made a lot of important the results of. Like the prevalence of the 80s neural network, neural networks and artificial intelligence are often tied together. At present, the electronic commerce and the customer alliance network shopping and network analysis is becoming increasingly popular, mainly is the result of highly developed and popular wireless communication. The work of software mainly includes artificial intelligence and the Internet of things, and the knowledge of artificial intelligence will be used in the research of the Internet of things. Assembly language mainly includes sequential branch cycle programming, subroutine definition and call (Golden Sea Soluble, 2007). The core component of microcomputers is microprocessors. Intel introduces Pentium MMX (multi energy Pentium), Pentium Pro (high energy Pentium), Pentium two generation, three generation, four generation and so on. And Itanium IBM is also known as the blue giant.

The IBM PC series microcomputer has the characteristics of advanced design, rich software, complete functions, cheap price and openness. The system function call mainly includes two kinds of DOS and BIOS. In the DOS operating system, there are two layers of internal subroutines for users to use, and they are the basic input-output subroutines, BIOS and DOS layer function modules. Many functions of DOS are similar to those of BIOS calls. They both have similar writing formats, but DOS provides more necessary tests. Therefore, DOS operation is generally easier than the corresponding BIOS part. Assembly language mainly involves BCD code and ASCII code. Software engineering mainly involves the use of visio_project_powerdesign mapping, library management system feasibility study report and project development plan writing, data flow diagram and system flow chart production. Project2003 project management and Gantt chart. "Ticket booking system" is an important issue in the field of software engineering (Li Jingxia, 2006). The UML modeling under software engineering is modeled with Visio, powerdesign, and rationalrose. This part is mainly based on artificial intelligence, machine learning, data mining, big data, neural network, SVM, pattern recognition, statistical learning and theory, and Internet Internet of things in order of theoretical and applied research. Artificial intelligence is a branch of computer science, it is the current science and technology is developing rapidly, the new idea of (Li Pei, 2006), new ideas, new theory, a discipline of the emergence of new technology, but also a involving mathematics, computer science, cybernetics, information theory, psychology, cross disciplinary and interdisciplinary philosophy and (Li Yun, 2001) other subjects.

Artificial intelligence research and application area, problem solving, machine learning, expert system, pattern recognition, automatic theorem proving, automatic programming, natural language understanding, robot, artificial neural network, intelligent retrieval and other (Bao Xinzhong, 2009). Machine learning is an important field of artificial intelligence (Gao Zhijun, 2001). Knowledge discovery and data mining techniques should also belong to the scope of machine learning (Sun Xida, 2001). Data mining models and algorithms mainly include artificial neural networks, genetic algorithms and regression analysis (Zhou Hongmei, 2010). Machine learning: machine learning, basic data based on machine learning is a very important aspect of modern (Ma Chi, 2007) technology, we mainly study how from some observations (samples), are currently can not be obtained by the analysis of principle of (Cao Zhaolong, 2006), the use of these rules to analyze the object and data or data (Ma Chi, 2007) predict the future may not be observed. The purpose of machine learning is to get the correlation between input and output of a system based on a given known training sample, and to predict the location output accurately (Mao ting, 2006). The training process is the design process of the classifier (Lin Peng, 2007). This step will generate parameters for identification. Emphasis on learning ability, the machine under the guidance of the algorithm has a certain learning ability, such as neural network, training algorithm, and other (http://blog.csdn.net/u 011023036/ article/d etails/49).

Statistical analysis: from a statistical point of view, we find the rules of the system, such as linear regression, but the neural network can also be considered as a nonlinear regression (http://www.w2bc.com/article/181993). Data mining: the emphasis on valuable data from a large number of data, such as the most profitable information indicators. Neural network: emphasis on the simulation of the biological nervous system, especially the neural network of the brain. For example, BP networks, competitive neural networks and other biomimetic algorithms (http://scholar.google.com/schhp? Hl=zh-CN&as_ sdt=0c). The convergent (http://blog.csdn.net/ u012116229/ article/details/24.) of neural network learning mechanism will be discussed. AI: the key is to make machines as smart and free as human beings. It is worth mentioning that rules, neural network and other bionics are worth mentioning, and can be used for me. Pattern recognition: emphasis on training and recognition, such as identifying images of the face, identifying trees, backgrounds, and identifying codes. Use a variety of learning algorithms, classification algorithms, such as neural networks, SVM (http://www.w2bc.com/article/181993). Artificial intelligence is the largest, and the content is the same as the (technology) name, and is devoted to the development of more intelligent machines and software (http://www.itpub.net/thread-1861681-1-1.html). Machine learning is the study of (algorithm), which is specially used to study (http://www.w2bc.com/article/181993) based on an algorithm that is automatically improved by experience. A neural network is a (http://www.w2bc.com/article/181993), a mathematical model that analogue the central nervous system, and can be used for pattern recognition and machine learning. Statistical analysis is part of the theory of statistics and statistics, and is a tool for machine learning (http://www.w2bc.com/article/181993). There are many methods in machine learning that use statistical theory to estimate a probability estimator for the prediction of (http://www.w2bc.com/article/181993).

In the view of statistical and data mathematician, machine learning is a computer scientist doing statistical (Zhang Yangsen, 2017). What is the relationship between machine learning, statistical analysis, data mining, neural networks, artificial intelligence and pattern recognition? Machine learning, statistical analysis, data mining, neural network, artificial intelligence, pattern recognition, it is hard to say who can contain who can only separate the meaning of each concept, and service data mining is a concept from data to meaningful information. Many people think that data mining is a new subject, is based on big data, this is not true, if you provide a data, Li Jiacheng has more than $100 billion, giving you a data is the national average level of 13279 yuan per capita disposable income, you can dig a message called (http://blog.csdn.net/u0110230 36/article/details/49.), Li Jiacheng it is also very rich, data mining. Pattern recognition is the purpose of identifying a pattern, for example, the two eyes of the nose are the face type. If there is no manual through the computer, through the calculation to identify the model, also belong to the pattern recognition of machine learning is a method commonly used in pattern recognition, machine learning is not intuitive data to obtain the model, which will require the use of a variety of knowledge, such as statistical analysis of knowledge.

The concept of AI is big, its concept is to create artificial and human intelligence, so many people come up with science fiction products such as robots, human intelligence, and rely on the powerful computing power of machines. In fact, AI is not necessarily related to computers, but now only computers have such a powerful computing power. If one day, biotechnology can be broken, maybe it can also be achieved. Neural network is a very difficult mode in learning algorithm. It is called multidisciplinary simulation of human neural process combination. It is a good way to learn. It can be said that it is based on statistics. Artificial intelligence is the largest, and the content is the same as the (technology) name, and is devoted to the development of more intelligent machines and software (http://blog.csdn.net/u011023036/article/details/49...). Machine learning is a study of algorithms and is devoted to the study of algorithms that can be automatically improved according to experience. Neural network is a kind of (model), and is a mathematical model simulating central nervous system, which can be used for pattern recognition and machine learning. Statistical analysis is a part of data and statistics, and is a tool in machine learning. There are many methods in machine learning is the use of statistical theory to estimate a probability estimator and forecast. In the view of statistical and data mathematician, machine learning is the statistics of a computer scientist. The difference between data mining and machine learning is that data mining problems usually have huge data, especially for computing efficiency, which is more important than statistical accuracy. Usually from a business perspective, machine learning is more biased towards AI. Pattern recognition is a field of machine learning, which refers to the process of labeling input (the process of prediction). In the classification problem, the input is classified. In regression, the real value of (http://www.w2bc.com/article/181993) is given to the input. What does data mining have to do with neural networks? Neural network is part of AI, but it can be used for data mining, such as training neural network models through a batch of data, and testing new data (http://www.liuxingshe.com/qt/1038575.html). It is the application of classification technology in data mining. Data mining is a large amount of data from mining useful knowledge. Neural network is a learning ability similar to human brain activity technology. In fact, knowledge is being refined. Data mining and many disciplines are intersecting, probability and statistics, database, machine learning and other (http://www.liuxingshe.com/ qt/1038575.html). Pattern recognition mainly includes SVM model, BP neural network model, machine learning and so on. The three idea is to first use small sample training to get the model, then use the model to complete the prediction or classification task. The theory and method of pattern recognition: image recognition system of image frame, image information is identified to obtain the feature extraction decision information processing. The purpose of pattern recognition research is to construct a machine system that automatically handles some information in place of the task (Pan Zhijie, 2008) to complete the classification and identification. The basic problem of machine learning theory: machine learning based on data is a very important aspect of modern intelligent technology. It mainly studies how to proceed from some observation data (samples), and obtains the rule (Hu Zhenxin, 2011) which cannot be analyzed in principle. By using these rules, we can analyze objective objects, predict future data or unobservable data (Ma Chi, 2007). The basic model of machine learning problems can be shown in the (Mao ting, 2006) as shown in Figure 1.

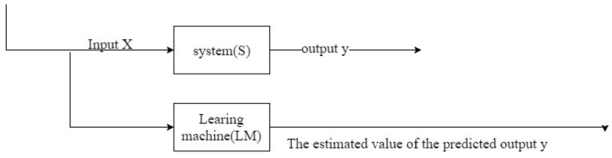

Figure 1. The basic model of machine learning problems

The basic model of machine learning is (Lin Bihua, 2008) as shown above. Among them, the system S is the object of research, it is a certain input x to get a certain output y, LM is the learning machine, the output of the estimated value of y (Li Siguang, 2008). The purpose of machine learning is to get the estimation of the relationship between input and output of a system based on a given known training sample, so as to predict the location output accurately (Mao ting, 2006). Predictors are often referred to as learning functions, learning models, or learning machines (Ma Jie, 2006). Under the premise of sufficient sample size, the traditional pattern recognition and machine learning methods are studied. The proposed method only guarantees the (Liu Jingli, 2010) of the sample performance and the infinite theory. In most practical applications, the number of samples is usually limited to (Yang Banghua, 2006). This is also the case with the image sample, because the amount of storage and calculation required for the image is large, and it is unthinkable to take a large amount of sampling for it. Statistical learning theory is a small sample statistics, statistical pattern recognition of limited samples and more extensive machine learning research has established the theoretical framework of (Liu Jian, 2009) better, but also developed a new pattern recognition method of support vector machine, can better solve the problem of small sample. Training: the training process is the design process of the classifier (Sun Zhihui, 2009). This step will generate the parameter (Zhang Yangsen, 2017) used to identify.

METHODS

The term "artificial intelligence" has been silent for nearly 30 years. In recent two years, the salted fish has been turned over.

It has become the battlefield of public relations and the attraction of network media. Then, press conference, forum, government strategic planning introduced, all kinds of news declared a "smart too busy to attend to all, is king" era. What is artificial intelligence in the end? What is the stage of the present study? How will it be developed in the future? This is a common concern. Due to the wide range of disciplines and technologies covered by AI, it is a very difficult task for us to understand and understand AI in a short time. Therefore, a lot of propaganda and decision-making are now before understanding, which inevitably leads to some confusion of thought and public opinion. One, artificial intelligence is a very wide area. AI currently covers many large disciplines. I have summarized them into six parts: (1) computer vision (for example, pattern recognition, image processing and other problems). (2) the understanding and communication of natural language (and the introduction of speech recognition and synthesis, including dialogue). (3) cognition and reasoning (including a variety of physical and social common sense). (4) Robotics (machinery, control, design, motion planning, task planning, etc.). (5) game and Ethics (the interaction of multi agent agents, confrontation and cooperation, robot and social integration). (6) machine learning (a variety of statistical modeling, analysis tools, and calculation methods). At present, these areas are still relatively scattered, and at present they are in the process of intersecting and moving towards unity. I regard them as "popular during the Warring States six male", Chinese history is originally "Warring States", I am here to save trouble, put the two small areas: game and ethics of the merger, all equilibrium ethics itself is the game.

The ultimate goal is to form a complete scientific system, from the current engineering practice rattly become a real science Science of Intelligence. Due to the scattered disciplines, most of the professionals who are engaged in related studies, such as doctorate, professors and so on, are usually only involved in the above subjects, or even focus on specific problems in a discipline for a long time. For example, face recognition is a very small problem in computer vision. Deep learning is a popular school in machine learning. Many people now use deep learning as artificial intelligence, which is the equivalent of saying a prefecture level city into the country. You will find that no matter how many layers of the CNN network, it is still very shallow, and the tasks involved are still very small. Researchers in various fields of artificial intelligence, according to Indian proverb can be called "on the basis of one-sided viewpoint", but this is obviously a verbal offence, or Chinese writer Su Shi tour of Mount Lu have a standard: cross as a peak, near and far different level. Do not know the true face of Mount Lu, just because in the mountains."

Second, the artificial intelligence development of the generation of the phenomenon. Due to the development of the history of artificial intelligence, since 1980s, has been more than a few differentiated University, independent development of these disciplines and basic research methods abandoned 30 years before by logical reasoning and heuristic search based, instead of the probability and Statistics (modeling, learning) method. In the traditional AI field, such as logic reasoning, search game, expert system and so on, there is a lot of global vision in the older generation without shunting to the above branches, but most of them have passed away or retired. Only a few of them in the 80-90 era, with sharp eyes, or led the way of probability statistics and learning, became academic leaders. However, there are few researchers in the field of artificial intelligence after the 80s. The differentiation and historical dating of this field objectively lead to confusion in the current academic and industrial circles. However, with a positive attitude, this situation is indeed on the young generation of researchers, now the students provide a good opportunity to make contributions and wide stage. In view of these phenomena, the colleagues and colleagues of the editorial department of the visual search urged me to write a review and introduction of an AI. I will avoid it for its difficulty. I will talk about what AI is based on the experience, observation and speculation of 30 years' reading and interdisciplinary research, its research status, tasks and framework, and how to achieve unification. Machine learning and pattern recognition learning summary. Combining the knowledge points of pattern recognition and data mining concept and technology, we sort out and summarize some knowledge structures of machine learning: machine learning includes two main problems: 1, what to learn, how to learn and how to learn 2. First of all, to sort out what to learn. A study of 1., what to solve what problem? Machine learning mainly solves the following three problems: a) supervised learning problem: given a set of input and output sets, i.e., a set of artificial markers, we use this data set to train a selected model, and the trained model can predict its output for new input. The specific prediction tasks include the classification problem, the annotation problem and the regression problem. B) semi supervised learning problem: the use of part of the artificial labeled samples and not labeled samples consisting of sample set to train the model trained on the new model can predict the output input. C): non supervised learning problems on learning without artificial markers samples, in order to find out the structural knowledge in the data. Cluster analysis and association analysis all belong to this kind of problem.

learn which model: select practical models and solutions for specific problems. The following basic models are listed in all kinds of learning problems. Most of the models in actual application are improved on these basic models for specific business requirements. The basic models of tagging include hidden Markov and conditional random fields. A) generation model using classification problem of supervised learning (Naive Bayesian, neural network model (K), discriminant perceptron, nearest neighbor, decision tree, Logistic regression, SVM, boost etc.). Regression: linear neural network, decision tree regression, Logistic regression, and the ordinary regression model B) semi supervised self training model, including 1 problems: the first use of a class of labeled data for training the model, the unlabeled data were labeled using the model, select the most certain markers added to the sample the training set and used again for training the model training set, marking the unlabeled samples with the new model..... So repeated. 2, cooperative training model: contains multiple sub models, each sub model of learning the labeled data, the model is used to label the unlabeled data and labeled the most certain added to the labeled data set, a new labeled data set to train another model, again not to mark labeled data for other models of learning. In this model, one model is the teacher of another model, and many models are taught to each other, so there is a name for collaborative training. C): non supervised learning problems including clustering model and correlation analysis model. In association analysis, it is common to mine frequent models (find frequent substructures in data sets) and mining association rules (shopping cart often used in commodity analysis).

The clustering problem is mainly from the four aspects of clustering mining (1), the clustering model based on the division of K K, the mean center point, the main principle is divided based on attribute similarity (2) clustering model based on hierarchical agglomerative clustering: mainly for the inverse process and the method, the method (Division Division) mainly used for the formation of clustering and partition groups. (3) the density based method: (1) (2) the shortcoming of the method is mainly the structure with arbitrary shape is found in the cluster, the density based method can overcome this shortcoming, the high density region to identify the clustering structure of China Unicom (in image processing OCR recognition can be used for preprocessing operation the character image). (4) a grid based approach.

Second, the basic understanding of the problem. After choosing the model, we need to solve the problem of how to learn the model: two. How to learn. 1. data collection, feature extraction, pre processing data: data preprocessing is often used to fill the missing values, or abnormal value removal operations, including appropriate transformation of the original data (such as PCA, ICA, wavelet transform, FFT and so on), including the conversion of data format and size (such as processing in HD map image compression for images of fixed size, the specified format). The 2. what algorithm and optimization model: model and algorithm depends on the cost and time of learning system. The common optimization algorithms include gradient descent algorithm, Newton method, quasi Newton method, LM algorithm, and constraint solving algorithm using Lagrange duality. Different methods need the corresponding model according to the optimization criteria in the process of building the model (method of distributed parameter estimation using the maximum likelihood method, using the EM method, to estimate the hidden variables for decision tree using information gain for a class of objects, etc.) model of the different optimization criteria are different, this process is worthy of further study. At the same time, in order to avoid overfitting, the regularization method is usually added to the model. 3. evaluation model: after solving the model is completed, need certain standards on the quality of the measurement model, including evaluation indexes commonly used: accuracy, recall, TP, FN, FP, TN, ROC curve and area, cross validation, regression problems will measure using the fitting residual and fitting goodness. Not every indicator is effective, it is the key to measure the use of the appropriate indicators to measure the business problems.

Pattern recognition: from 70s to 80s, the emphasis is how to make a computer program to do some looks very "smart" things, such as the distinction between "3" and "B" or "3" and "8", often need to design some special manual classification rules, such as filtering, edge detection and morphological processing technology. (the birth of an intelligent program). Machine learning: at the beginning of 90s, stressed that in the computer program to input some data (or machine), he must learn these data, and this learning step is clear, the study results are classified on the existing data and a prediction model, the prediction model can be used to predict unknown data. (an intelligent program that is learned from the sample, data-driven). Deep learning: twenty-first Century is very popular, emphasizing the model you use, such as deep convolution multilayer neural network, and the parameters in the model can be learned from data. (frame monopolized) artificial intelligence is relative to the human brain intelligence, intelligent display machine, is a fuzzy concept. The combination of the robot field is more direct than the other concepts. Artificial intelligence is a branch of computer science, it is a subject in the current rapid development of science and technology and new ideas, new ideas, new theories, new technologies continue to emerge the situation, is an involved in mathematics and computer science, cybernetics, information theory, psychology, philosophy and other disciplines. And the cross edge discipline. The term artificial intelligence has been proposed for the first time since 1950s, in the past 40 years, the development of artificial intelligence has experienced controversy, many difficulties and challenges, twists and turns, ups and downs, but the researchers removed hundreds of indomitable efforts, it still continues to grow. Its birth and development became one of the greatest scientific achievements in the twentieth Century. Researchers believe that AI technology will play a decisive role in the information technology led knowledge economy in twenty-first Century, and will play a greater role in promoting the progress and development of science and technology.

The birth and development of artificial intelligence

The birth of artificial intelligence can be traced back to 1950s. In the summer of 1956, the United States some engaged in computer science, mathematics, psychology, information theory and neuroscience research of young scholars, gathered at Dutt Maus University (Dartmouth), held a two month long symposium, serious and lively discussion with the simulation of human intelligence machine. At this meeting, the term "artificial intelligence" was used for the first time to represent the research direction of machine intelligence. This is the first artificial intelligence Symposium in human history, which marks the birth of artificial intelligence, which is of great significance. Since the birth of artificial intelligence is more than 40 years old, the development of artificial intelligence has experienced a lot of twists and turns over the past 40 years. In 1950s, the research on artificial intelligence was started based on game and game theory. The reasoning process of intelligent system is in fact the process of problem solving. It not only depends on the reasoning method used, but also depends on the control strategy of reasoning. The control strategy of reasoning including reasoning direction, search strategy, conflict resolution strategy, strategy, strategy and solving limit; reasoning method is that after the reasoning control strategy is determined, to take the matching method or uncertainty transfer method in the specific reasoning.

The basic concepts of deterministic reasoning, reasoning, and reasoning

Reasoning is the process of deducing the fact conclusion from the known facts and using the acquired knowledge, or inducing some new conclusions. Among them, the facts used in reasoning can be divided into two cases, one is the initial evidence related to the solution problem, and the other is the intermediate conclusion obtained in the reasoning process. These intermediate conclusions can be used as known facts or evidences for further reasoning. In general, the intelligent reasoning process in the artificial intelligence system is done by some programs, which are called the reasoning machines in the artificial intelligence system. In addition to the inference engine, an intelligent system usually includes a comprehensive database and knowledge base, comprehensive database for storing facts or evidence reasoning, and the knowledge base is stored for necessary reasoning knowledge, when reasoning, the

inference engine according to the facts in a database, to the knowledge base to find the matching of knowledge, and in all, choose a proper knowledge knowledge (called knowledge reasoning, if enabled) to obtain some intermediate conclusions, also need them as known facts or evidence put into a comprehensive database, and can continue to search for matching knowledge, so repeated so far, until the launch of the final conclusion. This reasoning process is actually a problem solving process. The methods of reasoning and their classification are like many ways of thinking in human intelligence, and there are many kinds of reasoning in artificial intelligence. The following reasoning methods are classified according to the logical basis of reasoning, the certainty of knowledge and monotonicity of reasoning process. According to the logical basis of reasoning, classification is based on logical basis of reasoning. Commonly used reasoning methods can be divided into deductive reasoning, inductive reasoning and default reasoning. (1) deductive reasoning. Deductive reasoning is a process that deducts a conclusion suitable for some particular case from the known general knowledge. It is a general to individual reasoning method. The most commonly used deductive form is syllogism, which includes 3 parts: the big premise, the small premise and the conclusion. Among them, the major premise is the judgement of known general knowledge or reasoning process; the minor premise is the judgement about a specific situation or a specific instance; the conclusion is deduced from the premise and is suitable for the judgement of minor premise. For example, there are 3 judgements as follows: (1) the students of the music department will play at least one instrument; (a major premise). Li Cong is a student of the music department; (small premise). (3) Li Cong will play at least one instrument. (conclusion). This is a typical syllogism. The conclusion is obtained by using the big premise (general knowledge) and the small premise (the judgment of a specific instance) through reasoning. This way of reasoning is deductive reasoning. A typical characteristic of deductive reasoning is that in any case, the deduction deduced from deductive reasoning is always contained in the general knowledge given by the major premise. Due to the assumption that the general knowledge in the large premise is correct, so long as the judgment in the small premise is correct, the conclusions from them are also correct. (2) inductive reasoning. Inductive reasoning is a process of inference from a large number of special cases and generalize the general conclusions, which is from individual to general.

The method of reasoning

The basic idea is: First guess a conclusion from the known facts, then confirm the correctness of the conclusion, and confirm that mathematical induction is a typical example of inductive reasoning. The inductive reasoning can be divided into complete inductive reasoning and incomplete inductive reasoning, if the scope of the special cases is selected from the induction. If the method of reasoning is used, inductive reasoning can be divided into enumerative inductive reasoning, analogical inductive reasoning, etc. The so-called complete inductive reasoning refers to the investigation of all instances or objects of the selected thing when it is induced, and according to whether all these instances or objects have some attribute, it is introduced whether this kind of thing has this property. For example, if you want to a company's computer product quality inspection, when each machine on the company's production of quality inspection, and are qualified, can infer the conclusion "the company's computer quality", this is a complete inference induction. Incomplete inductive reasoning refers to the conclusion that when we summarize, we only examine some instances or objects of the selected things, and we get the conclusion about the attributes of the thing. For example, conduct quality inspection on a company's computer, in order to simple, just random checks of the parts of the machine which is based on the investigation of these machines results indicated that the company produced by the machine is qualified conclusion, this is the incomplete inductive reasoning. Forward reasoning is a reasoning way from the known facts, and is using the inference rule forward. It is a data (or evidence) driven reasoning way, also known as the front Necklace reasoning or bottom-up reasoning. The rule of forward inference is to choose knowledge or rules by matching the known facts in the integrated database with the precondition (or rule antecedents) of knowledge in the knowledge base. The basic idea of forward reasoning is that the user provides a set of initial evidence in advance and puts it into a comprehensive database. After the start of the inference engine reasoning, according to the facts in the database, to find the matching knowledge, the formation of a current matching knowledge set, and then follow the conflict resolution strategy, choose a knowledge as knowledge reasoning from the knowledge enabled, and new facts added integrated database, as back to the known facts available reasoning, so this process is repeated until find a solution or knowledge base is no longer available knowledge so far.

The forward reasoning process can be described as follows: (1) the initial evidence or the known facts provided by the user are put into the comprehensive database. (2) check whether the comprehensive database contains the solution of the problem, if there is, the solution ends, and the successful exit; otherwise the execution (3). (3) check whether there is knowledge in the knowledge base that matches the existing facts in the integrated database. If so, if all of them match the knowledge set up the current matching knowledge set, turn to (4); otherwise, turn to (5). (4) according to a strategy of conflict resolution, a knowledge is selected from the current matching knowledge set, which is used to enable knowledge to be used for reasoning, and the new facts or evidences introduced into the integrated database, and then transferred to (2). (5) ask whether the user can further supplement new facts or evidence. If it can be added, add the added new facts or evidence into the comprehensive database, then turn to (3); otherwise, it will show no solution and fail to quit. The schematic diagram of the algorithm is shown in Figure 2. The forward reasoning algorithm seems to be simple on the surface, but in fact, there is a lot of work to do in every step of the reasoning. For example, how to select matching knowledge from the knowledge base according to the existing facts in the comprehensive database? When knowledge base is matched with the existing facts in the integrated database, which knowledge should be chosen as the enabling rule for reasoning? This involves a matching method of knowledge and a conflict resolution strategy, which will be discussed later. The advantage of forward reasoning is intuitionistic, allowing users to provide useful facts and information, which is suitable for solving problems in diagnosis, design, prediction, monitoring and other fields. The main disadvantage is that the reasoning has no clear target, and many unrelated operations may be executed when solving the problem, which leads to lower reasoning efficiency.

Reverse reasoning

Reverse reasoning is a reasoning way based on a hypothetical target and reversely using inference rules. It is a goal driven inference method, also called backward chain inference or top-down reasoning. The so-called reverse reasoning rules is in reasoning, with the known facts in the database (the actual fact is the assumption that goal or sub goal reasoning) and knowledge conclusion (or rule consequents) matching, selection of available knowledge or rules. The basic idea is: firstly, according to the reverse reasoning problem solving, to prove the goal (called assumptions) constitute a hypothesis set, then took out a hypothesis from the assumption that the focus of its verification, whether there is evidence supporting the hypothesis, check if there is a comprehensive database, the hypothesis; if not, whether there is a conclusion that matches the hypothesis of knowledge check the knowledge base, and the use of conflict resolution strategies, selected from all the knowledge, a knowledge reasoning is used as the opening, the prerequisite of knowledge enabled all conditions as a new hypothesis in the hypothesis set. Repeat the above process on all hypotheses of the hypothetical centralization until it is successfully exited.

In order to verify the assumption, if there is no match with the evidence for the hypothesis that the comprehensive database, ask the user whether the hypothesis as evidence, if can be used as evidence that this hypothesis is true, and add it to the database; if it is not possible to explain the hypothesis as evidence to verify the hypothesis of failure then, from the assumption that the centralized verification takes the next hypothesis and repeat, until the assumption of centralized hypothesis until the end. The reverse reasoning process can be described by the following algorithms: (1) a hypothesis set is formed by the objective of the requirement (called hypothesis). (2) select a hypothesis from the hypothesis, whether this hypothesis, check if there is a comprehensive database, is that this hypothesis is true, at this time, if the set is empty, then the successful exit, if the set is not empty, then choose the next assumption, execution (2) without the assumption; comprehensive database, execute (3). (3) check the knowledge of whether there is a conclusion in the knowledge base to match the selected assumptions. If no matching knowledge, is to ask the user whether the assumptions for the original facts can be confirmed by the user if this hypothesis is true, and put it into the database, and then re select a new hypothesis, if not, turn (5); if the matching knowledge is executed (4). (4) a matching knowledge set is composed of all the knowledge that matches the hypothesis in the knowledge base. (5) check whether the matching knowledge set is empty, if empty, failed to exit; otherwise, execution (6). 6) use the conflict resolution strategy to select a knowledge from the matching knowledge set as the enabling knowledge and continue to execute (7). (7) every subcondition in the knowledge premise is put into a hypothesis set as a new hypothesis, and (2). The algorithm can be expressed as a schematic diagram as shown in Figure 3. Reverse reasoning is obviously more complex than forward reasoning. The algorithm presented here is only a frame description of reverse reasoning, and there are still many problems to consider when it is implemented concretely.

For example, at the beginning of the algorithm, the selection of the initial target directly affects the efficiency of the inference engine. If the target selection is accurate, the efficiency of inference will be higher.

There are two methods to select the initial target, one is to specify the target by the user, the other is the independent selection of the intelligent system. Although the former is simple, but the degree of automation is poor, the latter, although the degree of automation is high, but the blindness is relatively large. In addition, when a premise that a hypothesis is matched is a logical combination of multiple sub conditions, the relationship between these sub conditions may be "relationship" or "or". How will these conditions into the integrated database and schedule them in order to improve the reasoning, reasoning efficiency, but also need to seriously consider; for instance, the verification of a subset of conditions, need to take it as a new hypothesis, and find the knowledge base with this new hypothesis, this knowledge. It will produce a new set of conditions, so the reasoning process constantly down, will produce at different levels on the multi group condition, form a tree structure. When reasoning arrives at a leaf node (that is a fact in a comprehensive database), it will go back up layer by layer, and it may need to go down again in the process of return. It can be proved that the reverse reasoning is a very complicated process. The main advantage of reverse reasoning is that the goal of the reasoning process is clear, and it is not necessary to find and use information and knowledge which are not related to the assumed target, but also to provide users with explanations, which is more effective in the diagnostic expert system. The main drawback is that when users are not clear about the solution situation, the blindness of the target is chosen by the intelligent system. If the choice is not good, it may need to make many assumptions, which leads to the reduction of the reasoning efficiency of the intelligent system.

Mixed reasoning

As mentioned above, forward reasoning and backward reasoning have their own advantages and disadvantages. For a more complex problem, any application of them will not have high inference efficiency. In order to give full play to the strengths of these two ways of reasoning, avoid their respective shortcomings and make up for each other, they can be used together. The reasoning that combines positive and reverse reasoning is called mixed reasoning.

The implementation of mixed reasoning

There are many kinds of concrete methods to combine forward reasoning and reverse reasoning to realize mixed reasoning. For example, in the reasoning process, we can use the forward backward backward method and the two way of reasoning alternately, and we can also use the reverse backward forward method and the two inference mode alternately. The following two cases are simply discussed. (1) a mixed reasoning that is backward and backward. The method first carries out forward reasoning, introduces some results from the known facts, and then verifies the results with the reverse reasoning. The reasoning process is shown in Figure 4. Secondly, the backward backward forward hybrid reasoning method is first used for backward reasoning, and some intermediate hypotheses are deduced from the assumed goals. Then, these intermediate hypotheses are confirmed by forward reasoning. The reasoning process is shown in Figure 5. (2) the application of mixed reasoning. When the reasoning method is used to solve the problem, the mixed reasoning method is suitable when the following several cases are encountered. (1) the facts are not enough.

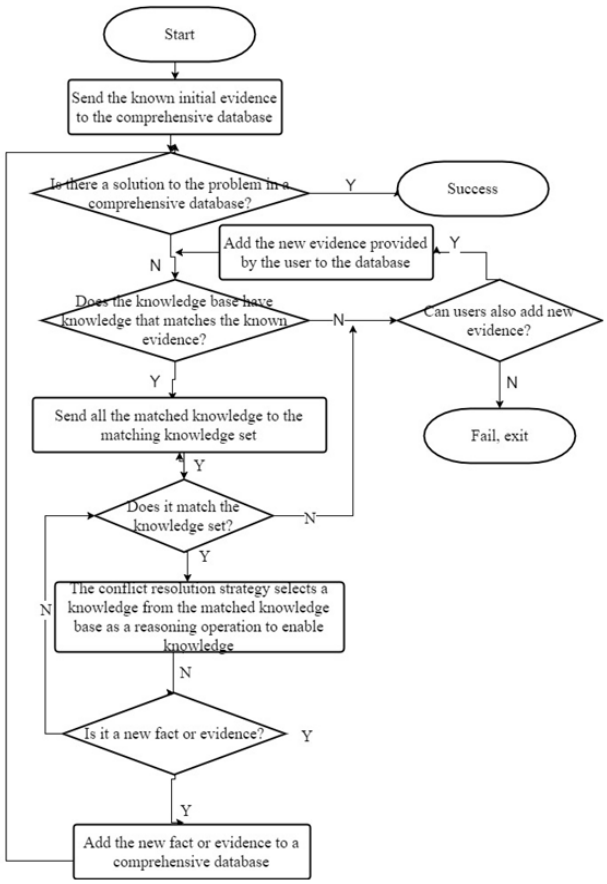

Figure 2. Positive reasoning schematic diagram

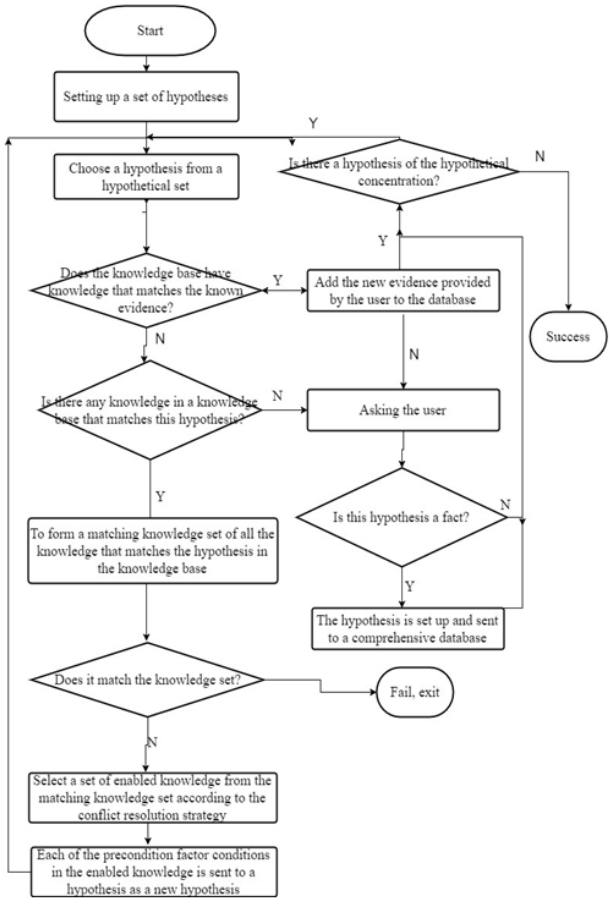

Figure 3. Reverse reasoning schematic diagram

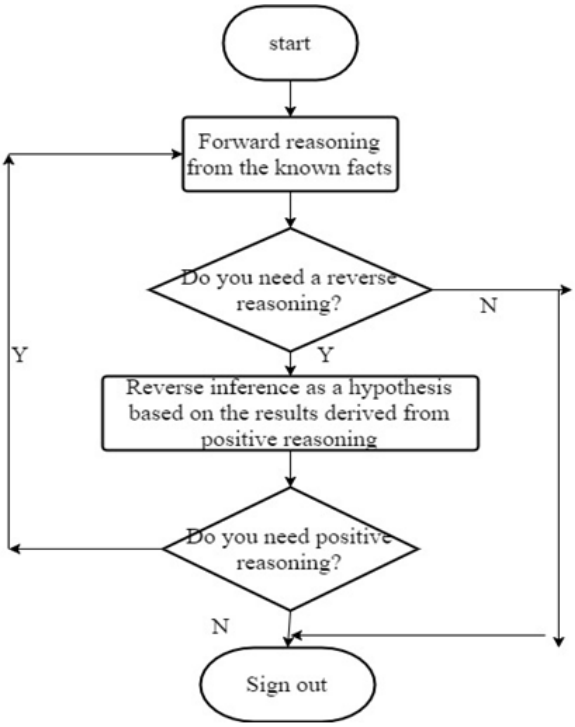

Figure 4. A mixed reasoning diagram that is first and backward backward

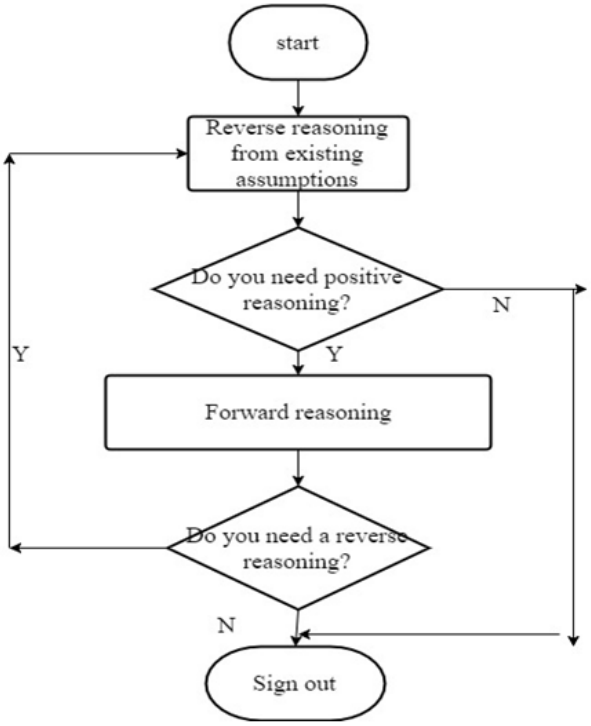

Figure 5. A schematic of a backward backward forward mixed reasoning

When using forward reasoning to solve problems, when the known facts or evidence in the integrated database are not enough, there may be such a situation that no prerequisite for knowledge in the knowledge base can match the known facts or evidence in the integrated database. This will make the reasoning process of positive reasoning cannot go on. At this time, if only part of the fact that the sub conditions cannot match those prerequisites (i.e. incomplete matching) knowledge to find out, and put the knowledge conclusion as a hypothesis of reverse reasoning, is due to the backward reasoning can ask the user to obtain relevant evidence, new

facts or evidence of positive reasoning the reasoning process is likely to make it. In this case, we first use forward reasoning to find some matching knowledge, and take the conclusions of these knowledge as hypotheses, and then verify the hypotheses by reverse reasoning, so as to solve the problems. Second, the conclusion derived from positive reasoning is not reliable. In some cases, although positive reasoning can be used to deduce the conclusion of the problem, the reliability of the conclusions is low. To solve this problem, can choose a few relatively high reliability of the conclusion as a hypothesis or goal, starting from their use of backward reasoning reasoning, in the process of reasoning, the system can be interactive to the user asking for further evidence, after obtaining reliable evidence, in turn forward inference. Because of the higher reliability of the evidence obtained by the use of reverse reasoning, the positive reasoning may introduce a more credible conclusion. I hope to draw more conclusions. In reverse reasoning, intelligent system can provide some questions to users by interacting with users, so as to get some previously unknown facts or evidences. Using these facts, intelligent systems can be used not only to verify the assumptions that need to be proved, but also to introduce some other conclusions. That is to say, after proving some hypotheses with reverse reasoning, we can take these assumptions as new evidence and give some other conclusions by forward reasoning.

Bi-directional reasoning

The so-called two-way mixed reasoning is a reasoning method that is based on the simultaneous inference of forward reasoning and reverse reasoning, which makes the reasoning process end in a certain step in the middle. The basic idea is to make positive reasoning according to the known facts of the problem according to some choice, or to do reverse reasoning from the hypothesis goal. During the whole reasoning process, the two reasoning algorithms are executed alternately based on a certain control strategy. Forward reasoning is not expected to push from the initial evidence to the final goal. Reverse reasoning does not expect to move from one hypothesis to the original one, but rather to expect the reasoning process to converge somewhere in the middle.

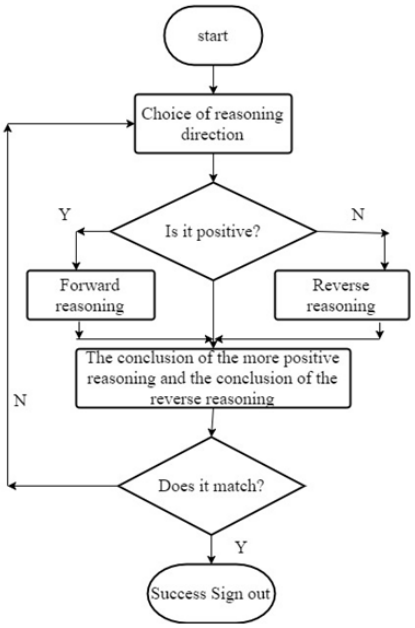

Figure 6. Bidirectional reasoning schematic diagram

This convergence shows that the intermediate results obtained from forward reasoning just satisfy the requirements of reverse reasoning, which indicates that the conclusion of reasoning is the conclusion of reasoning when the conclusion is successful. If in the reasoning process in one step, a sub hypothesis conclusion and backward reasoning reasoning in contradictory, it shows that the assumption of backward reasoning is wrong, it can give up this hypothesis, this will reduce the reverse reasoning target (assumption) choice blindness, so as to improve the efficiency of reasoning problems solving. Figure 6 is a description of the reasoning process.

The conflict resolution strategy of reasoning

In the process of using reasoning to solve problems, if known facts in the integrated database (evidence) matched with a plurality of knowledge in the knowledge base, or a number of known facts (evidence) can be matched with a certain knowledge in the knowledge base, or a plurality of knowledge of a number of known facts and knowledge in the library, then call the condition of knowledge (or rules) conflict. At this time, we need to choose a best knowledge from these matching knowledge according to some strategy, which is called conflict resolution. The strategy used for conflict resolution is called the conflict resolution strategy. A conflict resolution strategy is discussed with the production system as an example. Generative system of rules in the use of forward inference, if multiple generative rule's premise and comprehensive database of facts, success, or comprehensive database has a set of facts, the success of the first with the same generative rules, or integrated data library contains a number of known facts with the knowledge base of the plurality of generative rules before a match, that happened conflict rules. Similarly, when backward reasoning is done by production system, if the posterior parts of multiple production rules are successfully matched with the same hypothesis, or if there are multiple production rule's successes, it can also be successfully matched with multiple hypotheses, also known as a rule conflict. Conflict resolution is the task of resolving conflicts, select a rule from the multiple matching rules as enabled rules, it will be used for the reasoning for forward reasoning, is given by the operation of the production rules after a pointed out conclusion or execution of rules; for backward reasoning, as new that is before will match the rules, into a comprehensive database, in order to continue reasoning. The basic ideas of many existing conflict resolution strategies are sorting the matching knowledge or rules to decide the priority level of matching rules. The high priority rule will be used as the enabling rule. There are several commonly used sorting methods. (1) sort by the nearest principle. This strategy takes knowledge recently as a basis for knowledge sorting, giving priority to recent knowledge and prioritized it. This is in line with human behavior norms, and if a knowledge or experience is often used recently, people tend to give priority to this knowledge. (2) sort according to the particularity of knowledge. This strategy takes the particularity of knowledge as the basis of knowledge sorting, with special knowledge arranged in front, and gives higher priority. In current matching knowledge, special knowledge generally requires more prerequisite knowledge, special knowledge is more pertinent than general knowledge, and conclusion is closer to the characteristics of goals.

The priority selection of special knowledge will improve the efficiency of reasoning and shorten the process of reasoning. (3) sort by context restriction. The strategy of the knowledge in

the context of order as the basis of knowledge, namely knowledge according to the description of the context is divided into several groups, in the process of reasoning, according to the situation, the current database facts or evidence and context (distance), from which the group decided to choose knowledge enabled knowledge, distance or small good knowledge of the group, have higher priority. (4) sort by the freshness of knowledge. This strategy takes the freshness of knowledge as the basis of knowledge ranking, and holds that fresh knowledge is the renewal and improvement of old knowledge, which is more effective than old knowledge. Therefore, it gives higher priority to fresh knowledge. Fresh knowledge is based on the knowledge (or rules) of fresh facts or evidence for the premise to determine, and fresh facts or evidence is based on the integrated database has added to determine that this idea is somewhat like a depth first search strategy. Generally, it is assumed that the fact or evidence in a comprehensive database is more fresh than the facts or evidence that is added first. (5) sort according to the difference of knowledge. This strategy takes the difference of knowledge as the basis for the sort of knowledge, giving a higher priority to the knowledge that has been used in the last time. In this way, it is possible to avoid repeated execution of those similar knowledge and prevent the system from doing inefficient, repetitive reasoning near a problem. (6) sorting according to the characteristics of the field, this strategy regards the characteristics of the field as the basis of knowledge ranking, that is, knowledge is arranged in a certain order according to the characteristics of the field problems, and the prior knowledge has a higher priority. (7) order according to the order of rules.

This strategy is based on the order of rules in the knowledge base in the knowledge base, and the precedence of the rules has a higher priority. (8) sort the scale according to the precondition. This strategy takes the size of knowledge's precondition as the basis of knowledge ranking. In conclusion, the knowledge with fewer preconditions has higher priority in the conclusion of the same multiple knowledge. The reason is that the knowledge of less premise is easy to be realized when it matches the knowledge in the comprehensive database, and it takes less time. In addition to the several knowledge sorting strategies discussed above, in the process of system implementation, there are many strategies that can be used in accordance with the actual situation. For example, in uncertain reasoning, knowledge is sorted according to the matching degree of knowledge. Of course, some of these strategies can also be combined to sort knowledge to form a more effective conflict resolution strategy.

The method of uncertainty reasoning

After simply discussing the general concept of reasoning and the natural deductive reasoning method, this paper mainly introduces the method of resolution reasoning based on first order predicate logic. This method is based on the evidence that the predicate is deterministic, the knowledge represented either "true" or "false", the reasoning process is based on symbolic logic, reasoning process is rigorous, the conclusion is determined, the conclusion is either established or not established. Therefore, the method of resolution based on the first - order predicate logic is a deterministic reasoning method. However, in everyday life, what people usually encounter is that information is not perfect and accurate, that is, the knowledge that is mastered is uncertain. People use this uncertainty knowledge to think, reason and solve problems. Therefore, in order to solve practical problems, we must study uncertain knowledge and reasoning process, which is the uncertainty reasoning method discussed in this chapter. There are many ways to express and analyze uncertain knowledge, but the most important and famous methods are credibility, subjective Bayes and evidence theory. In this chapter, the three methods are discussed in detail on the basis of an overview of the uncertain reasoning methods and their concepts.

RESULTS

An overview of uncertainty reasoning and the concept of uncertainty reasoning

Reasoning is the process of thinking from the known facts and using related knowledge or rules to gradually produce conclusions or prove that a hypothesis is established or not. Among them, the known facts and knowledge (rules) are the two basic elements of reasoning. The known fact is the starting point of the reasoning process and the knowledge used in the reasoning. It is called evidence, and knowledge (or rule) is the basis for reasoning to go forward and reach the final goal gradually. An artificial intelligence system consists of a total database, a knowledge base and a reasoning machine. Among them, the total set of database is known facts, and the knowledge base is the rule base, is a collection of people summed up the rules of the reasoning machine is composed of some algorithms, these algorithms will be based on the rules in the knowledge base and database in fact reasoning calculation. Among them, the knowledge base is the core of the artificial intelligence system. The relationship between the real world and things is extremely complex, inadequate exposure plus the objective existence of randomness and fuzzy, and some things or phenomena, which leads to their understanding of the inaccurate and incomplete, has certain uncertainty. This uncertainty of cognition is reflected in the knowledge and rules that people summarize and the evidence obtained from the observation, forming uncertain knowledge and uncertainty evidence respectively. Therefore, the knowledge base in AI system is often composed of some uncertain rules, and its total database contains some evidences with certain uncertainties. In this case, if in the process of reasoning is still using the classic, based on logic and precise reasoning method, is bound to the uncertain relationship of objective things with the original uncertainty and things exist as uncertainty, thus losing the authenticity of the description of the objective world. It can be seen that the research of reasoning in AI can not stay on the level of deterministic reasoning, but should be further expanded, so that computer can simulate human's thinking and carry out uncertainty reasoning. And this uncertainty reasoning is based on the evidence with uncertainty, using knowledge with uncertain knowledge in the knowledge or rule library, and finally launching the thinking process with a certain degree of uncertainty, but a reasonable or almost reasonable conclusion

The classification of uncertain reasoning methods

At present, the uncertain reasoning method can be divided into two categories, one is called the model method, the other is called the control method. The characteristics of the model method correspond to the uncertainty evidence and the uncertainty knowledge separately with some measurement standard, and give the appropriate algorithm to update the uncertainty of the conclusion, so as to form the corresponding uncertainty reasoning model. Different conclusions of

uncertainty are corresponding to different models. Some of the uncertain reasoning methods introduced below belong to the model method. The characteristics of the control method is the influence caused by the uncertainty of some characteristics and the corresponding control strategy to limit or reduce the uncertainty through system identification in the field, this kind of method not unified model uncertainty, the effect is greatly dependent on the control strategy, control strategy selection and research is the key to this kind of uncertainty inference method. Heuristic search, correlation guidance backtracking and so on are several common control methods. The model method is divided into two categories: numerical method and non numerical method.

Numerical method is a quantitative representation and processing method for uncertainty. At present, the research and application of the numerical method are much more, and a variety of application models have been formed. It can be divided into probability based methods and fuzzy reasoning methods according to the theoretical differences it is based on. The theory based on probability is the theory of probability, while the theory based on fuzzy reasoning is fuzzy theory. The non numerical method refers to all the other methods of processing uncertainty except the numerical method. It also includes many methods. Logical method is a non numerical method, which uses multi valued logic and non monotone logic to deal with uncertainty. In all the above uncertain reasoning methods, because of the perfect theory of probability theory, and the existing formula for the synthesis and transmission of uncertainty, it is used to represent and deal with the uncertainty of knowledge, and become an important measure to measure uncertainty. The method of expressing and dealing with uncertainty purely by probability model is called the pure probability method or the probability method. Although the pure probability method has strict theoretical basis, it requires the priori probability and conditional probability of events, and these data are not easy to get, so their applications are limited. Therefore, after many years of research, based on probability theory, people have developed some new ways to deal with uncertainty. These methods include credibility, subjective Bayes and evidence theory. The focus of this chapter is to introduce the three kinds of uncertain reasoning methods.

The basic problem in uncertain reasoning

In uncertain reasoning, knowledge and evidence have some degree of uncertainty, which makes the complexity and difficulty of the design and implementation of the inference engine increase. It must not only solve the reasoning direction, reasoning method and control strategy issues, measurement and representation problem of uncertainty, but also solve the general knowledge of evidence and the uncertainty of knowledge (or rules) synthesis problem matching problem, uncertainty propagation algorithm and multiple evidence also supports the conclusion under the condition of uncertainty. 1. the uncertainty is expressed. The uncertainty mainly includes two aspects, one is the uncertainty of the evidence and the other is the uncertainty of knowledge.

Therefore, the representation of uncertainty is included in the representation of evidence and knowledge representation. (1) the representation of the uncertainty of the evidence. In the process of reasoning, the source of evidence is generally two: one is the initial evidence required to solve the problem by the observation. For example, in solving the problem of medical diagnosis, some symptoms of the current patient and the results of the test are all initial evidence. Because of the inaccuracy of the observation itself, the resulting initial evidence is uncertain. Another source is to use the previous reasoning in the process of reasoning as the current new reasoning evidence. Because of the uncertainty of the initial evidence used in the preceding reasoning and the uncertainty of knowledge in the reasoning process, the uncertainty of the result is caused. That is to say, the evidence that the current reasoning depends on is bound to be uncertain. The representation of evidence uncertainty is usually a numerical value to indicate the degree of uncertainty of the corresponding evidence. For the initial evidence obtained from observation, its value is usually given by users or experts, and for the conclusion that the preceding reasoning is used as the evidence of current reasoning, its value is calculated by the uncertainty transfer algorithm in reasoning. (2) the representation of knowledge uncertainty. In the second chapter, various methods of knowledge representation are discussed in detail. Most of these methods represent deterministic knowledge, and the representation of uncertain knowledge is not discussed in depth.

In real life, how do those uncertain knowledge be expressed? When expressing uncertainty knowledge, there are two factors to consider: one is to accurately describe the characteristics of the domain problem, to meet the needs of problem solving; the other is to facilitate the inference of uncertainty in the reasoning process. As long as these two factors are taken into account, the corresponding representation method can be applied. Generally, the uncertainty of knowledge in expert system is given by a domain expert, expressed in a numerical value, which indicates the uncertainty of relevant knowledge. 2. inference calculation. The process of uncertainty reasoning mainly includes the transfer algorithm of uncertainty, the combination of evidence uncertainty algorithm and the conclusion of uncertainty update or synthesis algorithm. Suppose that CF (E) represents the degree of uncertainty of E, while CF (H, E) represents the degree of uncertainty of knowledge (rule) E to H. The problems to be solved are: 1) the problem of uncertainty transmission. The uncertainty measure given the evidence for CF E (E), and the rules of E to H for CF uncertainty measures (H, E), then the conclusion how to calculate the uncertainty of H CF (H), that is how the evidence of E uncertainty and rules E, the uncertainty of H transfer to H conclusion on. (2) the synthesis of uncertainty of evidence. If more than one, but some evidence to support the conclusion, the evidence may be AND or OR, by CF (E1) and CF (E2) to calculate the CF (E1 E2) and CF (E1 V E2). (3) conclusion the problem of synthesis of uncertainty. If two evidence is supported by two rules, the uncertainty of the conclusion is determined according to the uncertainty of the two evidence and the two rules. That is, known E1 to H, CF (E1), CF (H, E1), E2 to H, CF (E2), and H (x), and how to calculate "("). 3. the measure of uncertainty. In the process of knowledge representation and reasoning, the degree of uncertainty in different knowledge and different evidence is generally different. The uncertainty of reasoning results will also change. It is necessary to express their uncertainty with different numerical values, and at the same time, we need to define the range of its value. Only in this way each value will have a definite meaning. The measurement of uncertainty refers to the numerical value method and the range of value when a certain number is used to express the uncertainty of knowledge, evidence and conclusion. In determining a measure method and scope, should pay attention to the following points: (1) to

measure the full expression of the corresponding knowledge and evidence of the degree of uncertainty; (2) the specified measurement range should be estimated for users and experts in the field of uncertainty of evidence or knowledge; (3) the amount of uncertainty to facilitate the inference and calculation, the conclusions of the uncertainty within the range should be defined in the uncertainty measure; (4) the measure should be determined directly, at the same time there should be a corresponding theoretical basis.

The method of credibility

Credibility is the Stanford University E.H. Shortliffe *et al* in the deterministic theory (Theory of Confirmation) on the basis of an uncertain reasoning method is proposed based on probability theory etc.

It was first applied in the expert system MYCIN in 1976. It is one of the earliest, simple and effective methods used in the uncertain reasoning method. On the basis of giving the concept of credibility, this section gives a reasoning method based on the uncertainty of the reliability representation. In the process of uncertainty reasoning, the measurement, representation and reasoning of uncertainty are the basic problems to be considered. So in the discussion of the following sections, it will be closely linked to the idea: how do the knowledge (rules) with uncertainty be expressed? How does the evidence of uncertainty be expressed? How to carry out the reasoning calculation, that is, how to transfer the uncertainty of the evidence and the uncertainty of knowledge to the conclusion?

The concept of credibility

The so-called credibility is the degree of belief that people believe in a certain event or phenomenon in real life according to their own experience or observation. For example, Sun Xiaoqiang didn't come to class yesterday. His reason was because he had a stomachache. For this reason, there are only two possibilities: one is Sun Xiaoqiang's stomach ache, that is, the reason is true; the other is Sun Xiaoqiang doesn't have stomach ache at all, he just asks for an excuse instead of coming to class, that is, the reason is false. For the hearer, the reasons for Sun Xiaoqiang may be fully believed, and may be completely unbelieving, and may be believed to some extent. This is related to the usual performance of Sun Xiaoqiang and the extent to which people usually believe in his words. The degree of belief here is credibility. Credibility can also be called deterministic factor, which is used to measure the uncertainty of knowledge and evidence in the expert system MYCIN, which takes production as knowledge representation. It is obvious that credibility has greater subjectivity and empiricism, and its accuracy is difficult to grasp. However, for a specific field, because the experts in this field have rich professional knowledge and practical experience, it is entirely possible to give credibility to the knowledge in this field. In addition, the problems faced by AI are difficult to be described by accurate mathematical models, and the determination of prior probabilities and conditional probabilities is also difficult. Therefore, it is still a feasible method to express knowledge and evidence uncertainty by credibility.

The representation of knowledge uncertainty

In the uncertainty based reasoning model based on credibility, knowledge is expressed in the form of production rule, and the uncertainty of knowledge is expressed by the credibility CF (H, E). The general form is IFETHENH (CF (H, E)): (1) E is the precondition of knowledge or evidence. It can be either a simple condition or a complex condition consisting of several simple conditions that are connected by AND and OR. For example, E = E1ANDE2AND (E3ORE4). (2) H is the conclusion, it can be a single conclusion, and it can be a multiple conclusion. (3) CF (H, E) is the credibility of the knowledge, which is called the credibility factor (Certainty Factor) or rule strength. In the expert system in MYCIN, CF (H, E) is defined as CF (H, E) = MB (H, E) MD (H, E) (1). Among them, MB (Measure Belief) is called the growth of trust. It represents the appearance of the evidence matching with the precondition E and makes the conclusion H true trust growth. MD (Measure Disbelief) is called the growth of distrust. It represents the appearance of the evidence matching with the precondition E, and does not trust the growth degree of the conclusion H.

MB (H, E)=1

If P(H)=1, otherwise (2)

$$\max\frac{\{P(H/E),P(H)\}-P(H)}{1-P(H)} \quad \text{If } P(H)=0$$

MD (H, E)=1

$$\frac{\min\{P(H/E),P(H)\}-P\{H\}}{-P(H)}$$

otherwise (3)

Here, P (H) represents the prior probability of H; P (H / E) indicates the conditional probability of H when the evidence corresponding to the precondition E corresponds. From the definition of MB and MD, we can see that when MB (H, E) > 0, there is P (H / E) > P (H), which indicates that the evidence corresponding to E increases the trust degree to the trust.
In addition, when MD (H, E) > 0, there is P (H / E) < P (H), which indicates that the evidence corresponding to E increases the distrust degree of H. Obviously, one evidence can not increase the trust degree of H, but also increase the distrust degree of H. Therefore, MB (H, E) and MD (H, E) are mutually exclusive. That is, when MB (H, E) > 0, MD (H, E) = 0. When MD (H, E) > 0, MB (H, E) = 0. The range of MB and MD is (0, 1). According to the definition of CF (H, E) and the mutual exclusion of MB (H, E) and MD (H, E), we can get the formula of CF (H, CF).

$$\begin{aligned} CF(H,E) &= MB(H,E)-0=\frac{P(H/E)-P(H)}{1-P(H)} \quad whenP\ (H/E)>P(H)\\ &0 \quad whenP\ (H/E)=P(H)\\ &0-MD(H,E)=\frac{P(H/E)-P(H)}{P(H)} \quad whenP\ (H/E)<P(H) \end{aligned} \tag{4}$$

Among them, P (H / E) = P (H) indicates that the evidence corresponding to E has nothing to do with H. CF (H, E) in the range of 1, 1. When 0 < CF (H, E) = 1, P (H / E), P (H). It shows that the emergence of the evidence E increases the probability that the conclusion H is true, that is, increasing the true credibility of the H. The greater the value of CF (H, E) is, the greater the credibility of increasing H is true. If CF (H, E) = 1, P (H / E) = 1 can be introduced, that is, the appearance of the evidence E makes the conclusion H true. When - 1 = CF (H, E < 0), P (H / E) P (H).

It shows that the emergence of evidence E reduces the probability that the conclusion H is true, that is, increasing the reliability of the false H. The smaller the value of CF (H, E), the greater the credibility of adding H to the false. If CF (H, E) = 1, launch P (H / E) = 0, which is due to the evidence of E, makes the conclusion H is false. When CF (H, E) = 0, there is P (H / E) = P (H). It shows that H is independent of E, that is, the appearance of evidence E has no effect on H. To use equation (4) to calculate CF (H, E), you need to know P (H) and P (H / E). However, it is difficult to obtain the values of P (H) and P (H / E) in practical applications. Therefore, the values of CF (H, E) are generally given by the domain experts. In CF (H, E) the specified value, should follow this principle: if the evidence of E, which makes the conclusion H true credibility has increased, the CF (H, E) > 0, and this support is stronger, makes CF (H, E) the value of the on the contrary, if the evidence is large; the emergence of E, so that the conclusion is false credibility H increased, the CF (H, E < 0), and this support is stronger, makes CF (H, E) the smaller the value; if the evidence of the presence of H and CF (independent of the H, E = 0).

A representation of the uncertainty of the evidence

In addition to knowledge that may be uncertain, evidence for uncertain reasoning may also be uncertain, and here is a discussion of ways to express the uncertainty of evidence. 1. method of obtaining uncertainty for single evidence. If the support evidence of only one, is to determine the value of evidence credibility are divided into two kinds: the first one is that evidence for the initial evidence, the credibility of the value provided by the general evidence directly to the user specified, the specified method is used to determine the credibility factor of evidence of representation, such as CF (E) = 0.8 E said evidence credibility is 0.8. The second thing is to use the previously concluded conclusion as the evidence of the current reasoning. The credibility of this case is calculated by the uncertainty transfer algorithm when the conclusion is introduced. CF E (E) the credibility of evidence is in the 1, a value of 1.

An indeterminate calculation of reasoning

The reasoning computation of uncertainty is based on the uncertain initial evidence. By using the relevant uncertain knowledge, the final conclusion is deduced and the credibility value of the conclusion is obtained. 1. the method of calculating the reliability of the conclusion only when the single knowledge supports the conclusion. If there is only one support the conclusions of the knowledge, and the reliability of CF E (E) given the evidence and rules (knowledge) the reliability of CF IFETHENH (H, E), then the conclusion H the credibility of the calculation formula is as follows: CF (H) = CF (H, E) * Max {0}, CF (E) (5). From the equation (5), we can see that if CF (E) < 0, that is, the corresponding evidence is false to some extent, then CF (H) = 0, which means that the influence of the false evidence on the conclusion H is not considered in the model. In addition, when the evidence is true (i.e. CF (E) = 1), by equation (5) launch CF (H) = CF (H, E) this shows that the strength of CF rules in knowledge (H, E), is actually in the premise of the corresponding evidence is true conclusion H credibility. Or, when the evidence corresponding to the premise of knowledge exists and is true, conclusion H has the credibility of the size of CF (H, E). When more than 2. knowledge supports the same conclusion, the synthetic calculation method of the uncertainty of the conclusion is given. If the same conclusions are introduced from many different knowledge, but the reliability is different, the synthetic reliability of the conclusion can be obtained by the synthetic algorithm. Since the synthesis of multiple knowledge can be achieved by 22 synthesis, the following two knowledge is considered. The following knowledge is provided:

IF E1 THENH (CF (H, E1))
IF E2 THENH (CF (H, E2))

It is concluded that the comprehensive reliability of H can be divided into two steps as follows:

the confidence CF (H) of the conclusion of each knowledge is calculated by using the equation (5), respectively:

CF1 (H) = CF (H, E1) ×max {0, CF (E1)}

CF2 (H) = CF (H, E2) ×max {0, CF (E2)}

using the equation (6) to find the reliability CF1, 2 (H), formed by the comprehensive influence of E1 and E2 on H.

$$CF_{1,2}(H)\mathrm{l} = \begin{cases} CF_1(H)+CF_2(H)-CF_1(H)\times CF_2(H) & \text{if } CF_1(H)>=0.CF_2(H)>=0 \\ CF_1(H)+CF_2(H)-CF_1(H)\times CF_2(H) & \text{if } CF_1(H)<0,\ CF_2(H)<0 \\ \dfrac{CF_1(H)+CF_2(H)}{1-\min(|CF_1(H)|,|CF_2(H)|)} & \text{if } CF_1(H)\text{与}CF_2(H) \text{ opposite sign} \end{cases} \quad (6)$$

This is actually a formula for calculating the uncertainty used in the famous expert system MYCIN

In the case of the original credibility of the known conclusions, the renewal calculation method of the conclusion credibility. In some cases, if known evidence E has an effect on H and IFETHENH conclusion, knowledge credibility is CF (H, E), while the conclusions of the original H CF (H), the credibility of how to seek evidence in E conclusion H credibility to update the value of CF (H / E)? That is, the known rules IFETHENH (CF (H, E)) and CF (H), and find CF (H / E). It is discussed in three cases. when CF (E) = 0, IFETHENH rules can not be used, no influence on the credibility of the conclusion of H. In fact, the provisions in the MYCIN system, when CF (E) = 0.2, IFETHENH rules can not be used. This paper introduces the synthesis algorithm and update algorithm of the credibility of the conclusions. The two methods are essentially the same. But different ways of solving different preconditions require different solutions. Some problems are easier to be solved by the synthesis method, and some problems need to use the update method.

The subjective Bayes method

The subjective Bayes method called subjective probability theory (R.O.Duda) proposed by Duda *et al* in 1976 of an uncertainty reasoning model, which is improved on the basic Bayes formulas in theory of probability, a method based on probabilistic logic. The method has been successfully applied to the geological and mineral exploration expert system (PROSPECTOR). Since the subjective Bayes method is an improvement of the basic Bayes formula in probability theory, before introducing the subjective Bayes uncertainty reasoning model, we first review the basic Bayes formula in probability theory.

The basic Bayes formula

In real life, there are often such problems, assuming that there are several kinds of diseases A1, A2,... An, the symptoms they may cause are B. If a patient is suffering from a disease, the symptom is B. What kind of disease does he suffer from? What is the extent of its credibility? This is a problem of uncertainty, which can be solved by direct reference to the Bayes theorem in the theory of probability. Bayes formula: set events B1, B2,... Bn, are independent of each other, incompatible events, B1, B2... U Bn = omega (complete), and P (Bi), 0 (I = 1, 2,... N). For any event A can and can only be with B1, B2,... One of Bn happens at the same time, and P (A) > 0, then there is

$$P(B_i / A) = \frac{P(A / B_i)P(B_i)}{\sum_{j=1}^{n} P(A / B_j)P(B_j)}, i = 1,2,...n$$

Among them, P (Bi) is the prior probability of event Bi; P (A / Bi) is conditional probability of event A under the condition of event Bi; P (Bi / A) is conditional probability for event occurrence under the condition of event occurrence. In this formula, when the disease A occurs, the probability calculation of the disease Bi is converted to the computation problem of P (A / Bi) and P (Bi), that is, the probability of symptom A and the probability of disease Bi are shown when the disease is Bi. If we take the uncertainty measurement of Bi as a case of A appearing as a conditional probability P (Bi / A), we can calculate it based on the Bayes formula. If we use the precondition E in the production rule IFETHENHi instead of A in the Bayes formula, we can get Bi with Hi instead of Bi in the formula.

$$P(H_i / E) = \frac{P(E / H_i)\ P(H_i)}{\sum_{j=1}^{n} P(E / H_j)P(H_j)}, i = 1,2,...n$$

That is to say, when the prior probabilities of Hi are known, P (Hi) and the known conclusion Hi (I = 1, 2,... When n is established, the conditional probability P (E / Hi) corresponding to the conditional E corresponds to the conditional probability P of the conclusion of Hi when the corresponding evidence appears, P (Hi / E).

The subjective Bayes method and its reasoning network

The subjective Bayes method is an uncertain reasoning model put forward by Duda (R.O. Duda) and others in 1976, and has been successfully applied in the geological prospecting expert system PROSPECTOR. In the PROSPECTOR system, for the uncertain reasoning, all the rules (or decision) connected to a directed graph, each node in the graph represents the hypothesis, the arc represents the rules, and the introduction of two values (LS, LN) associated with each arc, with sufficient the necessity and measures the rules established. The adequacy of the LS expression rules, the necessity of the establishment of the LN expression rules, and such a directed graph as a reasoning network. As shown in Figure 7, it is an inference network. The reasoning network connects some of the evidence to some important hypothesis conclusions. The endpoint or "leaf" node in the graph is the evidence for the user to ask questions, and the other nodes are the conclusion hypothesis. Although the conclusion is assumed to be truly false statements, under given conditions, they always have a true or false degree of determination.

At the beginning of the reasoning, the true and false of each statement is unknown. When an evidence is obtained, some of the conclusions are clearly established. And other conclusions also have a certain degree of approximation. Generally, each probability H is attached to a probability value P (H), which is called a priori probability. The connection in inference network is actually how to determine the probability change of a conclusion and how it affects other conclusions.

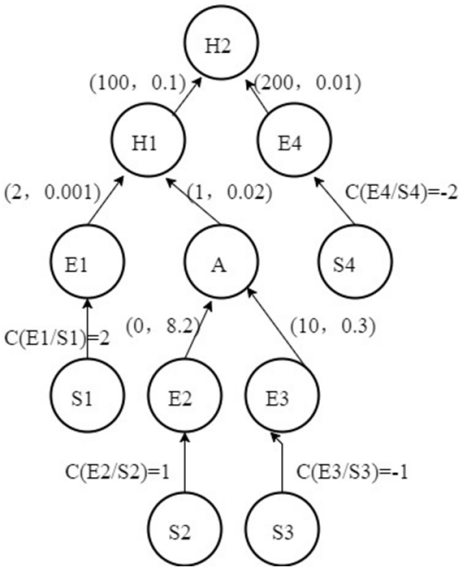

Figure 7. The inference network of the subjective Bayes method

In reasoning network, evidence and conclusion are relative. A conclusion can be regarded as evidence for further reasoning, and an evidence can be regarded as a conclusion for its inferences at the next level. Every node in inference network H has a prior probability P (H). Every rule has a numerical pair (LS, LN) to indicate the rule intensity. The value of each rule (LS, LN) and the priori probability of each node, P (H), are given by the domain experts.

The representation of knowledge uncertainty

In the subjective Bayes method, knowledge (rule) is an arc in inference network, and its uncertainty is described by a numerical pair (LS, LN). If expressed in the form of a production rule, it is specifically IFETHEN (LS, LN) H (P (H)) in which: (LS, LN) is a set of numerical generative rules for measurement uncertainty are introduced, LS said fully established rules, for E to H for the conclusion that the evidence support degree really; and LN represents the necessity for establishment of rules, that the evidence of E on H level conclusion really necessary. They are defined as follows:

$$LS = \frac{P(E / H)}{P(E / -H)}, LN = \frac{P(-E / H)}{P(-E / -H)} = \frac{1 - P(E / H)}{1 - P(E / -H)} \quad (7)$$

The range of LS and LN was [0, +∞). Their specific values are given by the field experts according to the actual experience. E is a prerequisite for the knowledge of this article. It can be either a simple condition or a complex condition that connects several simple conditions with AND or OR. H is the conclusion. P (H) is a priori probability of H, which points out the probability that H is true without any special evidence.

The value of P (H) is given by the field experts in the light of previous practice and experience. A representation of the uncertainty of the evidence. A representation of the uncertainty of a single evidence. In the subjective Bayes method, the uncertainty of the evidence is expressed in probability. A method for determining the uncertainty of combined evidence. An indeterminate calculation of reasoning. In the reasoning network of the subjective Bayes method, some arcs (knowledge rules) are used to connect some of the evidence to some important conclusion hypotheses. These evidence and conclusions are the nodes in the network, and the knowledge rules are the arcs that connect the evidence and the conclusions. The apriori probability P (E) and P (H) of the evidence nodes E and the conclusion node H in the reasoning network are given by the experts. The value of LS (LN) of knowledge is also given by experts. With the acquisition of new evidence, the degree of trust in the conclusion of H should be changed. The subjective reasoning task is based on the Bayes method to calculate the probability of P evidence E (E) and the influence of the knowledge of the rule conclusion intensity (LS, LN), the prior probability P (H) H update for posterior probability P (H / E) or P (H / E). In a reasoning network, the influence of a knowledge on the conclusion is dependent on the evidence. The appearance of evidence is different, and the inference method of the H trust degree is different. 1. definite evidence. Deterministic evidence is the affirmation of the appearance of evidence, which is divided into two cases: the evidence is affirmative and the evidence certainly does not appear.

- The evidence is positive.
- There must be no evidence of evidence.
- Discussion about the meaning of LS (LN).
- Evidence of uncertainty.
- The uncertainty of the evidence is expressed by probability.
- To express the uncertainty of evidence with reliability.

Conclusion the synthesis and updating algorithm of uncertainty, the synthetic algorithm of uncertainty, and the updating algorithm of uncertainty. The application of subjective Bayes method, evidence theory and evidence theory, also known as D S theory, is a theory of uncertainty which is first proposed by A.P. Dempster and developed by G.Shafer. This theory satisfies the axiom less than probability theory. It can distinguish the difference between "uncertainty" and "do not know", and it can handle uncertainty caused by "ignorance", which has great flexibility. The mathematical basis of D-S theory. In the credibility method and the subjective Bayes method, knowledge is expressed in the form of production. In the method of credibility, the uncertainty of evidence, conclusion and knowledge is measured by "credibility". In the subjective Bayes method, the uncertainty of evidence and conclusion is measured in the form of probability, while the uncertainty of knowledge is measured by numerical value (LS, LN). When using production to express knowledge, evidence can be a single proposition or a compound proposition that is connected by AND and OR. In the D-S theory, knowledge is generative representation, but the evidence and conclusions to set said. For example, suppose that D is a collection of all possible diseases. All kinds of examinations performed by doctors for diagnosis are the process of obtaining the required evidence. The result is the evidence obtained, which constitutes the evidence set E. According to the evidence set in the E, the patient's disease can be judged. Usually, some evidence supports more than a disease, but a variety of diseases. These diseases, of course, are all elements in D. They can form a subset of D H, H is the conclusion set. In the D-S theory, the uncertainty of knowledge is represented by a set of forms of "credibility factor", but the evidence and conclusions of the uncertainty measure is used to represent the belief function and the likelihood function. Therefore, we first introduce the concept of probability distribution function, trust function and likelihood function. It is also pointed out that the theory of evidence is a set of propositions. Let D be the sample space of variable y, which contains n elements. All values of variables y are in D. The number of subset of elements in D is 2n, and at any time, the value of variable y will fall into a subset. That is to say, every subset of A corresponds to a proposition about y, "the value of Y in A". So, we use the set A to represent the proposition. Probability distribution function, trust function, likelihood function, orthogonal function of probability assignment function, specific probability assignment function, and uncertain reasoning model based on specific probability assignment function. The representation of the uncertainty of evidence, the representation of the uncertainty of knowledge, the calculation method of the uncertain transitive reasoning, and the example of the problem of evidence theory.

DISCUSSION

Machine learning

Automatic acquisition of knowledge of machine learning is the computer, it is the three branch of Knowledge Engineering (knowledge acquisition, knowledge representation, knowledge), is an important research field in artificial intelligence, has attracted widespread attention in artificial intelligence and cognitive psychologists. Machine learning involves many subjects, such as computer science, brain science, physiology, psychology and so on. It involves a wide range of problems. Many theoretical and technological problems are still in the research stage. In recent years, with the development and popularization of the Internet and database, the emergence of the "data explosion but lack of knowledge", in order to find useful knowledge from the vast data ocean, the technology of knowledge discovery and data mining, so that through the analysis of a large number of data that contains knowledge. Knowledge discovery and data mining should also belong to the category of machine learning. This chapter only discusses some concepts, significance and current development and research status of machine learning, so that readers have a preliminary understanding of machine learning.

What is the concept of learning, machine learning, machine learning, machine learning, machine learning research significance, the history of the development of machine learning, neural model and decision theory research, acquisition of the symbolic concept, knowledge enhancement and domain special learning, learning of a connection, the main strategy of machine learning machine learning teach, learning, deductive learning, inductive learning, learning by analogy. The basic model of machine learning system environment, learning, knowledge base, implementation process of machine learning, machine learning process, consider the problem of machine learning system, teaching learning, learning, learning new concepts, methods to solve learning problems, inductive learning, learning from examples,

two examples of learning space model the question to consider examples of space, space to observe and discover rules, learning, concept clustering, discovery learning, explanation based learning, the working principle of explanation based learning, explanation learning example based on the perfection of the domain knowledge. Artificial neural network, and the composition characteristics of the nerve network basic concept, structure and function characteristics of biological neurons, the structure of biological neurons, functional properties of neurons, the composition and structure of artificial neural network, composed of artificial neural network, the working process of artificial neurons. The structure of artificial neural network, the classification of artificial neural network and its main characteristics, the rise and development of artificial neural network. The study of artificial neural networks can be traced back to 1940s. From the 1943 American physiologist MacCulloch (W.McCulloch) and mathematical logician Pitts (W.Pitts) founded the brain model -- M P model has been for decades, in the past few decades, the research of artificial neural network has experienced many twists and turns, generally can be divided into four stages. The period of production, the period of high tide, and the period of low tide are from the end of 1960s to the early 1980s. Because neural network research is different from the prevailing research methods of symbolic artificial intelligence, it has attracted wide attention and has also been controversial.

Minsky and Pebert of Massachusetts Institute of Technology in the United States at the time (S.Papert) function and limitations of the perceptron in mathematics has been studied, in 1969 published the famous work "Perceptrons" (sensor), points out the limitations of the double sensor, made a pessimistic conclusion on artificial neural network. Due to Minsky's limitations in the artificial intelligence community prestige and percepton itself, many people believe that the future of artificial neural network, which makes the research of artificial neural network in low tide. Fortunately, even in this extremely difficult condition, there are still some scholars in the study. At the end of the 1970s, along with the progress of artificial intelligence in terms of logical thinking simulation of human intelligence computer studies attention, this is people feel deeply the system of artificial intelligence and human intelligence than traditional has great disparity, especially in the sense of knowledge and ability of image thinking etc.. Human beings are self-adaptive, self-learning and innovative. They can easily identify all kinds of complex things, quickly find the information they need from a large amount of information in memory, and react quickly to external stimuli.

These are not solved by traditional artificial intelligence based on symbolic processing at that time. At this time, people turn their attention to the research of neural network. We hope to narrow the gap by studying the structure and working mechanism of human brain. At the same time, the academic research on complex systems and brain science has made great progress and neuropsychological studies. It is precisely because of these many reasons that it has opened the way for the revival of artificial neural networks. In the period of vigorous development, the perceptron model, its learning algorithm, the perceptron model, and the perceptron are the artificial neural network model which was first designed and realized. The learning algorithm of the single layer perceptron model. It has been pointed out that the difference between M and perceptron model P model proposed by Rosenblatt is the connection weights between neurons is variable, how to set or adjust the connection weights between neurons, in order to make the network output for any input can be expected, has become the key to establish the perceptron model. The linear inequalities, the learning theorem of perceptron proposed by Rosenblatt, shows that perceptron can learn anything that it can express. The multilayer perceptron, in late 1960s, people understand the linearly inseparable problems, understand the defects of single-layer perceptron, through research, people know that by increasing the number of linear network can overcome the single-layer perceptron encountered problems can not be separated. Back propagation model and learning algorithm, back propagation model and network structure, also known as B P back propagation model (Back - Propagation) model, which is used for a forward back propagation multilayer neural network learning algorithm, BP network algorithm, B-P algorithm learning objective is to adjust the weights the network output makes the adjusted network for any input can be expected. The learning process is composed of positive and reverse communication. Figure 8 shows a flow chart of the B - P learning algorithm.

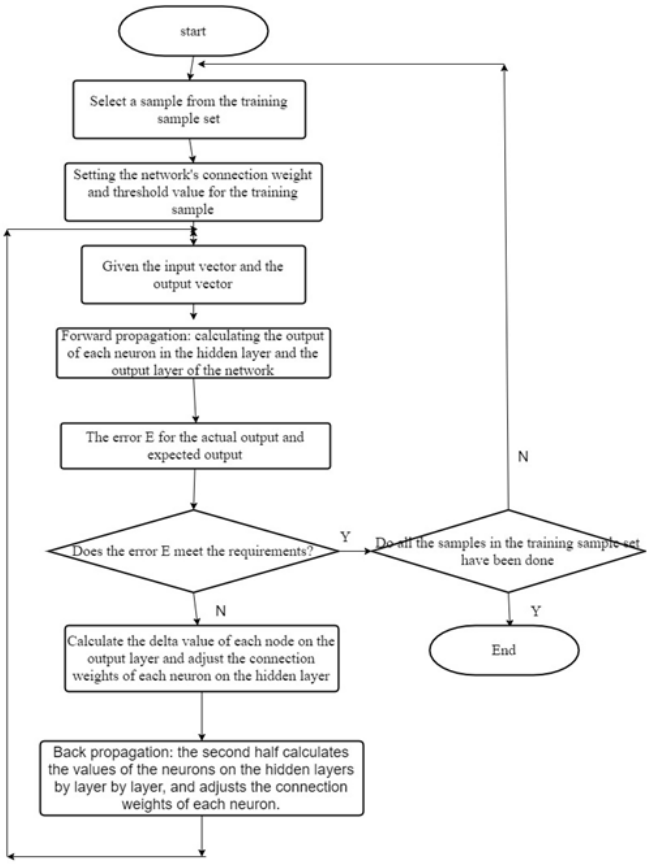

Figure 8. Flow chart of B-P learning algorithm

P is a very effective algorithm to solve practical problems. Because of its strong theoretical foundation, rigorous derivation process, clear physical concept and good universality, it is a good algorithm for training forward multilayer networks. However, the B P algorithm also has some shortcomings, mainly in the following aspects: (1) the learning algorithm's convergence speed is slow, and it often needs thousands of iterations. Moreover, with the increase of training example dimension, the network performance will become worse. (2) the number of nodes in the network selection there is no theoretical guidance. (3) from a mathematical point of view, the B P algorithm is a gradient maximum descent method, which may lead to the problem of local minima.

When there is a local extreme hour, the error meets the requirement on the surface, but the solution is not necessarily the real solution of the problem. So the B-P algorithm is incomplete. The completeness of the so-called algorithm means that if the problem has solutions, the solution can be obtained by using the algorithm. For these shortcomings of the B P algorithm, some solutions have been put forward, and the research on the B P algorithm is still in progress. Examples of back propagation computation, Hopfield model and learning algorithm, Hopfield model, and Hopfield network learning algorithm are presented.

Data mining and Agent technology, with the development of science and technology, communication, computer and network technology is changing the human and society, information society is coming to us, in today's era, the first problem we face is: how to solve the "data and information overload, but knowledge poor" problem. A lot of information on the network brings convenience to people, but also brings a lot of problems: it is difficult to digest; it is hard to distinguish true and false; hidden dangers are difficult to deal with. At the same time, with the rapid development of database technology and widely used, people accumulate more and more data, but because of the lack of data mining hidden knowledge means that people can not find the relationship of data and rules, can not predict the future development trend according to the existing data, led to the "data explosion but lack of knowledge" the phenomenon of. The second problem we face is: in today's highly developed network technology, how to integrate distributed in heterogeneous hardware and software platforms and semantic incompatible software, which is set in the heterogeneous networks and heterogeneous hardware and software platform application is cross platform interoperability, and improve these applications and software can reusability. In the face of the first problem, data mining and knowledge discovery (DMKD) technology emerge as the times require, and become a hot spot of research in artificial intelligence in recent years. Faced with the second problem, intelligent Agent and multi Agent system are emerging as an important technology for AI in distributed computing environment. The application of data mining, data mining and knowledge discovery, data mining concepts and research contents, the definition of data mining, data mining is an interdisciplinary research is from different areas of all concerned, there are many different terms, in addition to the usual "data mining", "KDD" and other titles there are several kinds of method, said: "the knowledge extraction" (Information Extraction), "information discovery" (Information Discovery), "knowledge discovery" (Knowledge Discovery), intelligent data analysis (Intelligent Data Analysis), "exploratory data analysis" (Exploratory Data Analysis, Information Harvesting, Data Archeology and so on. Data mining and online analysis processing (OLAP). The essential difference between data mining and traditional online analysis is that data mining is to excavate information and discover knowledge on the premise that there is no definite hypothesis. The research contents of data mining, the data mining and knowledge discovery. The main research contents include basic theory, discovery, data warehouse, visualization technology, qualitative and quantitative exchange model, knowledge representation, knowledge discovery, maintenance and reuse of semi-structured and unstructured data in knowledge discovery and data mining online. Data mining classification, data mining is an interdisciplinary field, affected by many disciplines, so data mining research has generated a lot of data mining methods or algorithms, it is necessary to classify these methods. The research status at home and abroad, since the end of 1980s, the research of data mining and knowledge discovery in foreign countries to carry out more, International Symposium on KDD has opened several times, the focus of the study also gradually from the discovery method to system application. The function and role of data mining, data mining and prediction that, as in the data mining "mountain" on the search for knowledge, gold "if you do not use powerful tools, these" gold "is very difficult to find, even if found will take a very high price, like the sea fishing needle. However, whether it is looking for "gold" or "needle", it is only one of the functions of data mining, that is, the discovery of functions. In fact, data mining includes forecast, with a vivid metaphor, the use of data mining in the data, not only can be found in the mountain "to" gold ", but also can help us to predict the new gold or silver in what to mountain, to make us as soon as possible to find a new gold mine, the to predict the future trend of the function of information is called prediction. Data mining, through analyzing and summarizing large databases, automatically searches for predictive information in large databases. In the past, those problems that need a lot of manual analysis can be drawn quickly and directly by data mining. A typical example is the market prediction problem, for example, if you want to use data mining system to predict which customers will be canceling your business contract for some time in the future. An important foundation is that you have the customer information that used to cancel the contract. You can analyze the information of these customers through data mining technology, find out the reason why the customer cancels the contract, and predict the reduction of customers in the future time. Of course, you can also use data mining technology to analyze the past sales promotion data to find a profit model that will maximize the future investment. The use of data mining technology can also predict economic and social problems such as bankruptcy, population growth speed and so on. Association rules mining. Data clustering. Concept / class description. Data classification. Deviation analysis. Visual processing. Evolution analysis.

Data mining model and algorithm, artificial neural network, decision tree, regression analysis. Regression analysis is used to predict the value of other variables by using variables with known values. In the simplest case, the regression is a standard statistical technique, such as linear regression, which is the least square. But the problems in most real world can not be predicted by simple linear regression. The sales of goods, such as stock prices, the rate of qualified products, it is difficult to find a simple and effective method to predict, because to describe the change of these events required variables often more than hundreds, and these variables themselves are nonlinear. So many new methods have been invented to try to solve this problem, such as logistic regression, multiple regression, logarithmic regression, Poisson regression, etc.
Genetic algorithm, genetic algorithm, is called GA (Genetic Algorithm). In essence, it is a direct search method that does not depend on specific problems. It is an optimization technique based on evolutionary theory and adopts the design methods of natural selection, genetic cross (or combination) and genetic variation. The genetic algorithm represents the solution of a problem into a "chromosome", which is also a binary coded string in the algorithm. Adjacent algorithms, adjacent algorithms are a method of classifying each record in a set of data.

Fuzzy logic, in daily life and scientific experiments, often encountered some fuzzy concepts or data. Regular reasoning, rule reasoning is a statistical sense of the "if - then" rules in the data to find and deduce. It is mainly used to excavate all association rules from the database, and it is the most effective method for discovering regular knowledge. A tool for data mining, a tool based on neural networks, a tool based on rules and decision trees, and a tool based on fuzzy logic to integrate a multi method tool.

The common technology comparison of data mining, business evaluation, application evaluation, and algorithm evaluation. The process of data mining, determine the business object, data preparation, data mining, evaluation and visualization, the interpretation of knowledge assimilation, hot data research and development, mining research, with the rapid development of network technology and data mining technology, from the application point of view, at present there are some research hotspots: Web data mining analysis of biological information, and DNA data mining, text data mining etc.. Data mining of e-commerce website, data mining of bioinformatics and DNA data analysis, text data mining, data mining for financial data analysis. The development trend of Agent technology and its application, the formation and development of Agent technology, the definition and architecture of Agent Agent, the definition and basic characteristics, although the Agent technology has been widely used in related fields, but what is it Agent, and what are the characteristics? So far it is difficult to give a widely accepted, strict definition. The architecture of Agent, the system structure is the construction method of Agent theory, the need to solve the problem which is Agent module, the interaction module between how, how Agent perceived information affect its behavior and the internal state of Agent, and according to the change of internal state to act on the environment, and how to these modules use software or hardware are combined to form an organic whole, realize the intelligent Agent.

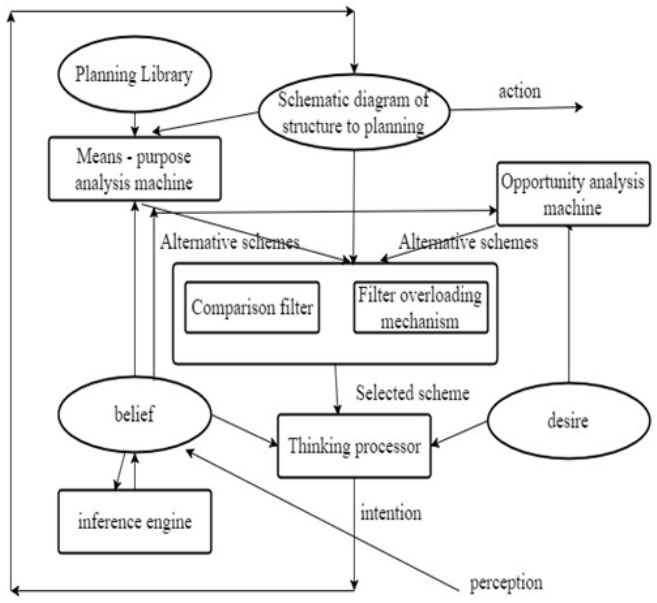

Figure 9. The Agent structure of IRMA

Thinking type Agent. In 1988 Bratman Agent IRMA typical structure design based on the BDI model (Intelligent Resource Bounded Machine Architecture). IRMA defines 4 key symbol data structure, namely a plan library (Plan Library); symbols used to represent beliefs (Belief), desire and intention (Desire) (Intention).

The behavior of IRMA by the joint operation planning of 5 units to achieve the 5 parts: Objective reasoning, means (Means Ends) analysis machine, opportunity analysis machine, filtering processor (Filtering Process), thinking processor (Deliberation Process). The reasoning machine -- for reasoning about the world; "means" intention analysis machine -- decided to choose which planning can be used to complete the Agent; opportunity analysis machine -- change monitoring environment to provide decision-making opportunities; action sequence filtering processor - decision Agent will be carried out and whether the current Agent intent; thinking processor -- in the conflict between planning and can choose to make the necessary choices in a sequence. Figure 9 shows the Agent structure of IRMA.

Reactive Agent

Mixed Agent

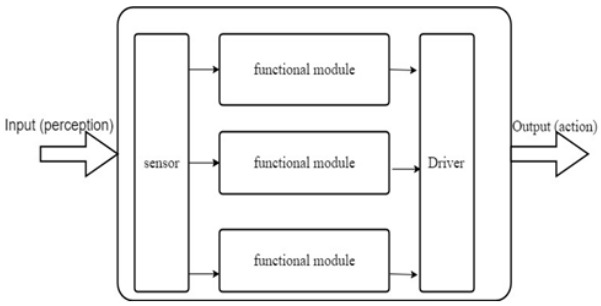

Figure 10. The structure of reactive Agent

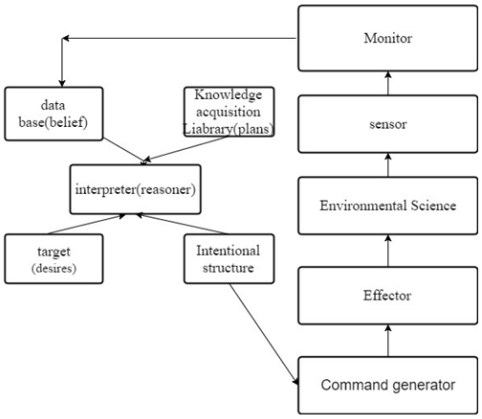

Figure 11. The structure of PRS

The behavior theory of Agent, multi Agent system, multi Agent system and is responsible for the joint model, multi Agent negotiation, multi Agent planning, Agent oriented programming, software development method, Agent oriented programming, calculation model based on the distribution of Agent, Agent technology faces challenges.

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