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Coordination of Legal Protection of Algorithms and Intellectual Property System

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Abstract

In the context of the intelligent revolution, the algorithm is increasingly becoming an important tool for assisting decision-making and regulating order. Because of the professionalism and opacity of the algorithm, a series of challenges of legal rules and legal order will occur if there is no market access mechanism and post-mortem supervision. Based on the analysis of the intellectual property protection of the algorithm and the essence of the intelligent society, this paper reveals that the algorithm is the endogenous power of the intelligent society. The intellectual property protection of the algorithm is in line with the value needs of the essence of the intelligent society, which is the necessary system for the rapid development of the intelligent society in the future. The existing algorithm protection methods include copyright, trade secrets, and patent rights. The current coverage is not wide enough, the protection effect is weak, and it is easy to trigger new social problems, which can hinder the protection of social benefits and the promotion of technological progress. The authors believe that the patent law "public change protection" mechanism can not only alleviate the contradiction between "algorithm power" and public interest but also stimulate the development of algorithm technology. An algorithm is a technical solution, and it is also a rule of thinking. The algorithm has the characteristics of technical solutions and thinking rules, which is different from pure thought rules and can produce "changes in the physical state". Therefore, it should be protected as an object of the patent law. It is necessary to determine the patent-ability standard of the algorithm as soon as possible. The algorithm acts as a new type of object protected by the patent law directly, and at the same time, it sets the algorithm value evaluation mechanism. Finally, through the system construction of algorithm protection, the intellectual property law can be used to promote the innovation of algorithms, so that the algorithm can be developed in a more rational, ethical and legal direction to boost the rapid development of intelligent society.

Key words: Algorithm; Patent; Intellectual property; Intelligent society

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The algorithm in the traditional sense means "to solve a particular process step mathematical problems," such as mathematical formulas, theorems, logical analysis, belong to the category of abstract thought rule, which is excluded from the scope of protection of patent law.[1]

The task of artificial intelligence is to understand the

[1] The term "algorithm," as it is used here, means a finite, clearly defined series of steps describing a procedure for accomplishing a specified mathematical or data-manipulation task to be performed by means of a computer or other machine. See generally Diamond v. Diehr, 450 U.S. 175,186 n.9, 209 U.S.P.Q. (BNA) 1, 7-8 n.9 (1981) (stating several definitions of 'algorithm"). Other definitions of "algorithm" are found in the following dictionaries and similar authorities: ACADEMIC PRESS DICTIONARY OF SCIENCE AND TECHNOLOGY 75 (C. Morris ed., 1992) (abstract procedure to carry out operation by following series of precise, unambiguous steps); ALAN FREEDMAN, COMPUTER GLOSSARY 10 (1993) (set of ordered steps for solving problem).

working principle and the working mechanism of natural intelligence and to develop machines with similar human intelligence. The main simulation is the information transformation and intelligent creation principle that supports human thinking. The realization of artificial intelligence mainly relies on two important factors. One is big data provided for artificial intelligence for deep learning; the other is algorithm technology for making instructions and decisions. It can be said that big data is the basis of artificial intelligence, and algorithm technology is the soul of artificial intelligence. The "wisdom" in the process of artificial intelligence applications needs to be revealed by algorithms. Nowadays, artificial intelligence technology can realize the bionic algorithm by creating a model, imitating the process found in nature, letting the algorithm has the ability to self-evolve, and even copy the characteristics of the human brain, such as Genetic Programming (GP) and Artificial Neural Network (ANN) A series of artificial intelligence products and technical solutions based on bionic algorithms are all used to promote new modes and new forms of business in the business field, forming new profit points for business and enabling the public to develop new consumer behavior habits. Therefore, the algorithm is not only a new type of technology, but also represents a new business model and method, which challenges the traditional business, and becomes the guarantee of commercial competition and market position in the intelligent society. This also determines that the protection of the algorithm will become the key to the commercial competition of the intelligent society. However, the current intellectual property system has institutional obstacles to the algorithm technology in terms of the protection path, protection strength and value orientation, which is not conducive to the form of a new business order of the intelligent society and the establishment of a legitimate standard of competition behavior. In order to standardize and promote the development of intelligent society, the algorithm as the core of future commercial competition should be protected and regulated by law. The intellectual property system should adjust and clarify the path, scope, and content of algorithm protection as soon as possible in response to the social reform driven by the intelligent revolution.

1. NON-PATENT PATH AND PROBLEM ANALYSIS OF ALGORITHM INTELLECTUAL PROPERTY PROTECTION

At present, there is no special legal system for the algorithm to regulate and set rights. Because the algorithm has technical attributes, it is often used as a creative technology to assign and guarantee rights. The legal systems of all countries are basically completed by the intellectual property legal system. Therefore, algorithm technology has a natural compatibility with the intellectual property legal system. As a right with the "right bundle" feature, the intellectual property provides multiple paths to regulate and protect algorithms. The most closely protected paths with algorithms include copyrights, trade secrets, and patents. However, these kinds of intellectual property protection paths have not clearly protected the algorithm, and even there are protection obstacles. To choose the optimal path, it is necessary to analyze the comparative advantages of various institutional paths.

1.1 Algorithm's Copyright Law Protection Path and Defects

Among the various protection paths of the existing intellectual property system, the closest to the algorithm is the copyright law. In Copyright Law, computer software is also defined as an object of rights.[2] The "Computer Software Protection Regulations" also have relevant regulations.[3] Software is a combination of computer programs and algorithms, that is, a combination of programs, algorithms, and data structures. Any software requires at least one executable program, and the program is a part of the software. The algorithm is the method and step of the program and is the soul of the program. Therefore, the algorithm can protect copyright by externalizing "methods and steps" into "expressions." However, the algorithm becomes the core competitiveness in the commercial competition of the intelligent society, but it does not really depend on the core components of its externalization as expression, but more importantly, the idea and solution to achieve a certain purpose. Therefore, the protection of copyright law and algorithm is seemingly in harmony but actually at variance.

First, copyright generally adopts automatic protectionism. Once the work is completed, it automatically acquires copyright and forms an existing right. If the content of the protected work violates the facts of social justice or infringement of the rights of others, the rights holders must go through certain procedures. For literary and artistic works, automatic authorization does not cause universal or non-directional damage even if an error occurs. Ordinary computer software is only a tool for the realization of human thought, and even if

[2] According to article 3 of the copyright law of the People's Republic of China, "works mentioned in this law include works of literature, art, natural science, social science and engineering technology created in the following forms: (1) written works; (2) oral works; (3) music, drama, quyi, dance and acrobatic works; (4) works of art or architecture; (5) photographic works; (6) cinematographic works and works created in a manner similar to cinematography; (7) engineering drawings, product drawings, maps, schematic drawings and other graphic works and model works; (8) computer software; (9) other works as stipulated by laws and administrative regulations."

[3] According to article 2 of China's regulations on the protection of computer software, the term "computer software" in these regulations refers to computer programs and related documents.

it is authorized, it will not cause universal damage. The software that contains the intelligent algorithm is mixed with the algorithm decision. Therefore, it contains the value judgment in addition to the value of the tool. Once the algorithm decision and the formation of the order itself have problems, the challenge is universal and non-directional. The public who applied the algorithm may become the infringer of the algorithm. Therefore, without prior review procedures, any algorithm is presumed to be a legitimate rights protection object due to the external conditions of the software, which will conflict with the principle of social public interest of copyright law.

Secondly, the external representation of the algorithm is computer software. China's copyright law requires originality for "works" and can be copied and preserved in the form of materialization. It can be said that copyright law focuses on the protection of the expression of the work. In international conventions or domestic laws of other countries, copyright cannot be extended to the ideas and principles of the work. They are generally not protected by copyright law. The algorithm is essentially a method, and the copyright can only protect the tangible carrier that the algorithm relies on, that is, the arrangement of the codes.[4] But the algorithm and the code are essentially different.[5] The system design of the copyright law makes it difficult to protect the design ideas in the minds of developers. Only when the program can be expressed in some objective way and can be promoted and recognized by the public can it be in the scope of legal protection. Therefore, simple algorithms cannot be protected by copyright law.

Thirdly, the registration review of software copyrights is based on the repetitive review of the expression of copyright protection. It is only required to be duplicated with the code that has already been registered, and even if the software runs in the same way, the software copyright registration can be obtained. Therefore, the nature of copyright protection and the protection objectives of copyright law are inconsistent with the interests of the software. The copyright law can only protect the carrier of the algorithm, but the core benefit of the algorithm is not the code itself, but more importantly, the program ideas and processes that are displayed through the code. Therefore, this provides the infringer with a loophole that is free from legal accountability. If they use other similar code to interpret the same algorithm, it is not in the scope of infringement. With the rapid development of information networks, the code form is also more abundant, and the traditional algorithm protection-related system has been unable to completely avoid the risk of infringement. The same algorithm can be expressed in different permutations and combinations. Other developers create works based on the algorithm developed by the original developer and use a different computer language to form a distinction between the work and his work in an external form. The developers of the original algorithm cannot claim their perfect protection and independent control based on copyright law.

1.2 Algorithmic Trade Secret Protection Path and Drawbacks

The intelligent society is beginning to emerge, and the commercial entities are scrambling to invest in the new business competition with algorithms as the core. Algorithm R&D and holding become the key to market competitiveness. For artificial intelligence products currently in use, most creators and owners choose to use trade secrets to protect algorithms. Therefore, the public can only enjoy the products or services of artificial intelligence. What is presented to the public is only the result of algorithmic decisions and solutions, but nothing is known about the process and the basis of the process.

The key to trade secrets is to keep others secret, and trade secrets have economic value. This kind of practical technical information or business secrets allows the technician to keep the monopoly position on technology for a longer period . Before the intellectual property law sets the optimal protection path, the algorithm's developers usually strictly enforce the algorithm, so it is not known to the public. The algorithm has certain technical applicability and relative independence, and it has high commercial value and usually can meet the constituent elements of trade secrets and adopt trade secret protection. However, from the current application of algorithm products or algorithm technology in the commercial field, the protection of trade secrets also has many drawbacks.

First of all, the technical benefits of the trade secret protection algorithm make the "black box of the algorithm" legal, and it is easy to form a shelter for "algorithm discrimination." The algorithms in the field of artificial intelligence usually include the design of artificial neural networks, which makes the algorithm have the functions of intelligent decision-making and judgment. The methods and materials of judgment and decision-making will guide the public to form new standards of behavior. If the algorithm software of the

[4] The concept of software abstraction or intellectual infringement is worth studying because traditional intellectual property law is increasingly likely to be modified to provide rights in software abstraction. It is recognized that most, if not most, of the value of computer program software products lies in their abstract aspects, not in their literal code.

[5] See, e.g., Lotus Dev. Corp. v. Paperback Software Int'l, 740 F. Supp. 37, 56, 68, 15 U.S.P.Q.2d (BNA) 1577, 1581, 1589-90 (D. Mass. 1990) (finding that bulk of creative work in creating computer program is in conceptualization of the program and its user interface, rather than in coding program, and that user interface is a very substantial factor causing success of 1-2-3 program); Richard H. Stem, Legal Protection of Screen Displays and Other User Interfaces for Computers: A Problem in Balancing Incentives for Creation Against Need for Free Access to the Utilitarian, 14 COLUM.-VLA J. L. & ARTs 283,291,298-300 (1990) (collecting comments on economic value of nonliteral aspects of computer programs).

network car increases the customer charge with a low complaint rate and the customer charge with a high complaint rate is reduced, once the algorithm is known by the public, the public will be guided to minimize the complaint. Therefore, the algorithms of the intelligent era all contain value judgments and incorporate the algorithm-based evaluation principle in the subtle. But whether they will fully integrate the law, ethics, and ethics into the process is still in doubt. The Algorithmic Bias must be highly valued, especially the bias of decision-making artificial intelligence, which may affect its benefits to society, and even to public order. For example, in New Orleans security company Palantir used artificial intelligence to predict criminal activity for police stations, bringing racial prejudice into the decision-making process. Algorithms are affected by multiple factors. Technical errors and designer biases can lead to algorithmic errors and discriminatory automated decisions.

In the case of State v. Loomis in Wisconsin, the court chose to protect the algorithm by means of trade secrets and denied the lawyer's requirement to disclose the decision-making basis of the algorithm and the rules of the algorithm, forming an "algorithm black box" in the application process. It not only provides cover for possible algorithmic discrimination but also deprives the relative of the right to self-reliance.

In the State v. Loomis case, the judge used the COMPAS (a piece of software based on evidence to measure the future criminality of the offender and provide decision support for the correctional agency) in the judgment of the judge to assess the possibility of recidivism by the offender Loomis. Loomis believes that on the one hand, COMPAS improperly used gender as the basis for evaluation, and the inaccuracy of the evaluation results made it impossible to use as a basis for judgment; on the other hand, the court judged that there was a procedural violation of the law and did not meet the principle of case handling. In this regard, the Wisconsin Supreme Court made three points: (1) If used properly, the Circuit Court's consideration of the COMPAS risk assessment in the sentencing does not violate the defendant's due process rights, and the use of gender as a reference factor improves the accuracy of the risk assessment. (2) The Circuit Court's use of the COMPAS risk score, in this case, is not abusive discretion; (3) The Circuit Court did not abuse discretion when writing the allegations in the past guilty plea in the software. In the end, the court unanimously ruled that the claim was rejected. However, ProPublica's research on the COMPAS system found that the system design was biased against race. In this system, blacks are almost twice as likely to commit crimes as whites, which is also considered an unfair design. So after the end of this case, many scholars still believe that the trial of the case is unfair because the algorithm of the risk assessment system used by the judge is not made public. In addition, the process by which judges use the system is not well known. So in this case, the algorithm has neither a prior review step nor a post-relief approach.

After some scholars' research, it is found that many enterprises and institutions rely on computer systems for automatic decision-making based on algorithms and big data analysis. As a result, many people are ignored and abandoned by algorithms, and they cannot enjoy the same insurance and loan services. As an individual judged by an algorithm, it is difficult to know the information discriminated by the algorithm, and there is no evidence. In general, the algorithms for automated decision-making are not made public, and detailed explanations are not given, so the public cannot question this. In the event of inequality, most people can only choose to accept it. Therefore, some scholars also believe that there is "algorithm tyranny." The discriminatory results of the algorithm are largely related to the secrecy method. Based on the secrecy method, the judgment standard, operation process and decision process of the utilization algorithm are in an opaque state. When the data based on the algorithm implies ethnic, racial and gender biases, the opaque algorithmic process will make the discrimination more difficult to stop. From the perspective of the basic value of law, the distribution of social resources, interests, and burdens representing substantive justice faces unfairness; the resolution of social interest conflicts representing formal justice is also challenged by the gradual involvement of algorithms in judicial procedures.

Secondly, the protection of trade secrets is weak, and passive defense strategies are not the best policy. Once a trade secret is revealed, it may lose the possibility of making up. It is difficult to obtain adequate relief. The trade secret of the algorithm does not prohibit others from taking commercial secret rights protection for the self-designed algorithm. At the same time, if other people apply for patent protection for the trade secret, the original algorithm holder will lose his trade secret rights.

Based on this, the way to protect the algorithm by using trade secrets will cause new social problems, and its protection is weak. Therefore, it is not the optimal path to protect the algorithm.

2. THE PATENT SYSTEM ADVANTAGE OF ALGORITHM PROTECTION AND THE PATENT-ABILITY ANALYSIS OF THE ALGORITHM

In the context of increasingly fierce technological competition, many innovative entities in the field of artificial intelligence in China are accelerating the pace of research and development. According to relevant data, the growth rate of Chinese artificial intelligence patent applications has reached 20% every year, much higher

than in other countries. However, even though Chinese application volume in the field of artificial intelligence is the highest in the world, the authorization amount is still behind the United States and Japan, and the authorization rate is generally low. In 2017, the number of artificial intelligence patents in China was 17,477. From the perspective of the three major technology branches, the number of basic hardware patents granted in 2017 was 428, accounting for 2.4%; the number of vertical application patents was 15,671, accounting for 89.7%; The number of basic algorithm patents granted was 1,378, accounting for only 7.9%. Further narrowing down the discussion, taking image processing (H04N), digital information transmission (H04L), and wireless communication (H04W) as an example, comparing the application volume and authorization amount of the above three fields for five consecutive years in the CNABS library, the five-year licensing rate is also only 18.2%, 7.4%, and 14.3%.

This shows that the existing patent system does not completely exclude the protection of the algorithm, but the authorization rate for successfully applying for the invention patent is not high. The current algorithm application for patents basically applies for patents in the way of algorithmic "mutation". For example, an algorithm for a vehicle automatic identification system that patents by focusing on program software. There is also a well-known application - Baidu "a method and equipment for sorting search results" patent, generally sorted by the relevance of search terms and articles. Present the results of the previous sort to the user. Although the result is fast, there is a defect that the information at the top position is not necessarily the search result that the user needs. Therefore, Baidu developed the patented method to correct the results. It mainly adopts the variation method combined with equipment to form a machine with novelty, creativity, and practicability, so it provides a possibility for the patent application to become a patent.

In fact, the problem of applying for algorithm patents can be divided into two categories: The first category is the general issue of patent applications. These problems are mainly related to the characteristics of patents, such as the uniqueness and practicability of patent applications. The second category is a special issue that is related to the nature of the algorithm. When applying for an algorithm patent, if the entire content of the claim is an "algorithm" feature, in short, the patent protects the entire content. If it is only a simple algorithm itself, then it belongs to the "intellectual activity rules and methods."

For example, in the biochip error detection method based on the Markov decision process model, after detecting the operation process of the system, it is found that it only relies on a simple way to combine a "model algorithm" with the biochip's error detection process. However, the whole decision-making model is very abstract, and there is no specific internal connection and a technical description. This kind of algorithm is still classified as "rules and methods of intellectual activity" in the Patent Law, and it is not a protection scope of patent law. However, if the limitations of the claims include both algorithmic features and technical features, in the real world of production, such as industry and agriculture, their claims are not pure rules and methods of intellectual activity, so they should be retained in the patent law.

In the context of artificial intelligence technology, algorithms can keep learning and artificial neural networks. They are generally considered to be a bionic technique of human thinking processes. Because they can replace human thinking and decision-making at the functional level, they are generally considered to be bionic intellectual activity. Thus algorithms are often attributed to "a rule and method of intellectual activity." If the algorithm is classified as Article 25 of the Patent Law, "Rules and Methods of Intellectual Activities", it will be directly excluded from the scope of patent protection, and patent examiners may not even consider the substantive conditions of patentability. However, if we carefully analyze the algorithmic techniques of artificial intelligence, we can find that the algorithm is a technical solution or method to achieve intelligent purposes in addition to making decisions and judgments instead of the human brain. The algorithm itself belongs to the technical category of artificial intelligence. In the case of both the intellectual activity rule and the technical program's dual attribute, simply excluding the algorithm from the scope of authorization under Article 25 of the Patent Law will not be beneficial to the protection of the technical interests of the algorithm, thus it is not conducive to the construction of the rights and interests of the intelligent society.

Therefore, the biggest obstacle to the patent protection of the algorithm comes from the application conflict of the law caused by its dual attribute. There is no clear regulation on how to apply the law to such an "overlap of articles". The core of the problem lies in the fact that the algorithm, as a feature of the artificial intelligence technology solution, is at a critical position in its commercial application or is a key position in mimicking the "intelligent" feature of the human thinking process. This is closely related to the status of the artificial intelligence legal subject that the academic circles have been arguing in recent years. Artificial intelligence can replace human thinking for decision-making. If the subjective status of artificial intelligence is recognized, the thinking rule characteristics of the algorithm will dominate. If artificial intelligence is still placed in the scope of technology and is in the position of the legal object, the algorithm is closer to the technical solution to achieve a certain intelligent purpose. Judging from the current legal situation, the law has gradually calmed down from the concerns of "alternative humanity", "independent decision-making", "anti-humanity" and "intelligence beyond human control" in the early stage

of the artificial intelligence revolution. The research direction has gradually changed from the legal subject status of artificial intelligence to the legal regulation of artificial intelligence technology, including ethical value regulation and application mode and responsibility regulation. Under the theoretical premise of this jurisprudence, artificial intelligence is more prominent as the essence of technology. The algorithm is a technical solution to simulate the human thinking process through certain procedures and steps in order to achieve the goal of intelligent technology. It is a technology to solve a certain intelligent demand. Therefore, the algorithm should not be limited by the exclusion rule of the patent protection scope. When the algorithm does not have the limitation of the exclusion rule, there is no universal violation of the content characteristics of the patent. As long as a specific algorithm has a strong practicality and uniqueness in solving the technical requirements of intelligent requirements, it should be accepted into the scope of patent protection. In this way, from the technical nature of the algorithm, the algorithm is legally consistent with the basic characteristics of the patent-ability that the patent object should have.

While the patent system can provide effective protection for the algorithm, it also has the institutional advantages that non-patent other intellectual property protection paths do not have. In addition to effectively protecting the technical interests of the creators and holders of the algorithm, it can effectively solve social risks.

First of all, through the patent system protection algorithm, the "expression" restriction of copyright protection can be overcome, and the core content of the technology-generating benefits of the algorithm can be included in the protection object, thus providing the most complete intellectual interest protection for the technology creators and holders of the algorithm. Thereby promoting the development of an intelligent society. In the intelligent society, the highly developed level of informatization puts higher demands on the computer to improve the accuracy and storage capacity, and requires more efficient algorithms to improve the speed of computer processing problems, and thus meet the needs of people for computer information processing, and ultimately advance the pace of advancement of the intelligent revolution. The algorithm belongs to the technical design of computer programs. This non-text form logic design and conception is the most creative part of computer program development. What the technology inventor really wants to protect is the algorithm behind the program, not the code. The patent system protects not the carrier of technology or its expression, but the algorithm technology itself, which can effectively solve the problem that the copyright system is not protected in software form.

Secondly, through the patent system protection algorithm, the ethical value of the algorithm can be pre-evaluated in the process of patent authorization review, and the "public interest" principle in the patent law can be used to prevent problems such as "algorithm discrimination" and "algorithm power".In this way, these problems are prevented from causing social risks due to the unencumbered application of algorithmic techniques. For example, data mining technology of algorithms is gradually being incorporated into the field of education. Due to record bias in traditional capability grouping, the United States began to explore data-driven ability grouping. But research shows that algorithmic decisions may create new groups that are systematically unfair. If for some reason, color-blind students or students participating in extracurricular sports activities are unlikely to succeed on computerized tasks, algorithm predictions are not good for their educational prospects. Algorithmic decision-making, DDDM (data-driven decision- Making) may discriminate against them in the process of capacity grouping and pose a challenge to educational equity. In addition, in the intelligent society, due to the asymmetric position formed by data controllers and data subjects in the long-term data collection and analysis, a power based on algorithm technology has been gradually derived. Some scholars have proposed the concept of "algorithm power". On the one hand, this kind of power is embodied in the functions of the algorithm, including classification, filtering, and recommendation. On the other hand, it is embodied in the cultural connotation of the concept of the algorithm itself. The decision made on the basis of the algorithm is equal and credible. However, the algorithm builder will also add his ideas in the algorithm design, and enjoy the space to edit the algorithm freely. However, if there is no legal intervention, setting the market access mechanism for the algorithm will make it difficult to supervise the legitimacy and rationality of the algorithm itself.

The intelligent society realizes the intelligent transformation of machinery. The essence lies in the use of algorithms to help people rationally evaluate and select values, and realize the decision to replace the manual by the algorithm. At this time, the algorithm is the behavior rule. Therefore, traditional technology neutralism can no longer satisfy the value presumption of intelligent algorithms, because the traditional algorithm such as fairness and justice exists in the application process of technology, but the value judgment of intelligent algorithms exists in the algorithm itself. On the one hand, the protection of the algorithm through the patent system can guarantee the "monopoly" of technical interests. On the other hand, the examination of patent authorization inevitably takes into account the public interest effect of technology, thus setting an ethical threshold for the market access of the algorithm in a legal way.

Finally, through the patent system protection algorithm, the "algorithm black box" problem of trade secret protection can be overcome, and the rights relief obstacles of the infringed person caused by the professionalism

and opacity of the algorithm can be eliminated. For many companies, algorithms are often treated as trade secrets, and it is often difficult to make the public aware of the actual operation of the algorithm. Since the algorithm technology itself is concealed, if the patent of intellectual property is used for protection, not only the patentability of the algorithm can be examined, but also the value evaluation of the algorithm can be reviewed in advance. In this process, it can be judged whether the design of the algorithm itself violates the public interest, whether there are social risks and hidden dangers, whether it conforms to the principle of justice, and both suppresses the logic of "capital" and prevents the "logic of technology" from doing whatever it wants. It is possible to set thresholds for the application of the algorithm in advance and use the patent disclosure principle to reduce the difficulty of proof for the after-the-fact relief.

In summary, the patent system has a natural institutional advantage in the intellectual property protection of algorithms, which can effectively overcome the shortcomings and obstacles of other intellectual property protection paths. As a technology to achieve a specific intelligent goal, the algorithm does not have insurmountable obstacles in patentability. It is only necessary to make the system clear in terms of the essential attributes and legal status of the algorithm, and the existing institutional problems of the patentability of the algorithm can also be solved. Therefore, the legal analysis is needed to guide the patent system rules to respond to intelligent algorithms.

3. THE LEGITIMACY OF ALGORITHM PATENT PROTECTION UNDER THE ESSENCE OF ARTIFICIAL INTELLIGENCE "TECHNOLOGY"

The object of the patent right, also known as the object of patent law protection, refers to the invention and creation of patent rights that should be granted according to law. According to the provisions of Article 2 of the Patent Law of China, the object of the patent law includes three kinds of inventions, utility models and designs. "Invention refers to a new technical solution proposed for a product, method, or improvement." One of the negative conditions for granting a patent stipulates that the rules and methods of intellectual activity cannot be patented. It is considered an abstract idea. Unprotected thoughts are indeed based on the examination of the connotation of thoughts because the content of thoughts is extremely uncertain for others. If the invisible rules of thinking are protected, the scope of patent protection may be expanded indefinitely, resulting in the monopoly of many ideas, and the protection of patent rights is too widespread. And as a norm of behavior, laws cannot regulate norms in essence but should regulate behavior. The patent law excludes the protection of abstract thinking rules with certain rationality.[6]

However, the traditional method of patent examination of invention patents [7] relies too much on the external manifestation of the state change of the substance, and excludes a variety of objects from the scope of protection, including computer program algorithms. Under this method, although the computer program can effectively analyze the data and obtain the corresponding objective results, the public cannot understand the changes in the material and the processing flow in all the processing steps. Therefore, under the provisions of the traditional patent law, the algorithm of computer programs is not protected by patent law. In this case, it is especially important to know whether the algorithm belongs to an abstract thinking method or a technical solution. As early as 2010, the National Patent Office of China gave relevant explanations on this issue in the "Guidelines for Patent Examination", focusing on how to effectively distinguish between "technical solutions" and "intellectual rules." (Huang, 2010, pp.260-270)

Table 1
Differentiation Between Technical Solutions and Intellectual Rules

No.	The name of the different technology	Attributes
1	A method for solving pi by a computer program	Intellectual rule
2	A method for automatically calculating dynamic friction coefficient	Intellectual rule
3	A method of computer games	Intellectual rule
4	A method for controlling the rubber molding process	Technical solutions
5	A method for the expanding storage capacity of mobile computing devices	Technical solutions
6	A method for removing image noise	Technical solutions
7	A method for measuring liquid viscosity by using a computer program	Technical solutions
8	A universal conversion method for global language characters	Technical solutions

Through the comparative analysis of the eight methods in the above table, the first three rules of pure intelligence

[6] As the Supreme Court has said, one cannot get a patent on the idea that rubber sticks to wood, Rubber-Tip Pencil Co. v. Howard, 87 U.S. (20 Wall.) 498, 506-07 (1874), or that some bacteria will not inhibit the growth of other bacteria. Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 132, 76 U.S.P.Q. (BNA) 280, 282 (1948). The Court has insisted that patents must be tied to particular machinery for implementing an idea, or some other concrete anchor. See Brenner v. Manson, 383 U.S. 519, 534-35 (1966); O'Reilly v. Morse, 56 U.S. (15 How.) 62, 113 (1853), or preempt the access of software practitioners to the necessary tools of their trade, see Parker v. Flook, 437 U.S. 584,589, 198 U.S.P.Q. (BNA) 193, 197 (1978); Gottschalk v. Benson, 409 U.S. 63, 67, 175 U.S.P.Q. (BNA) 673, 675 (1972)

[7] The thinking process theory, the two-part test method or the whole theory all require the combination of method patents and traditional technological processes to meet the requirements of traditional patent law on method invention -- the implementation of method invention can produce realistic physical effects, leading to changes in physical state.

neither use natural rules nor specifically solve specific technical problems, and do not obtain technical effects, while the latter five methods address five problems of practical application. To solve different technical problems and achieve satisfactory technical results. Therefore, these methods are included in the protection of patent law.

In terms of intelligent algorithms, first of all, theoretical algorithms still belong to the "rules and methods of intellectual activity" cannot be protected by patent law,[8] such as the invention "a support vector machine classifier training method based on semi-supervised learning" (application number 2013101212544). Second, the Patent Reexamination Decision (No. 54350) states that the invention "a model-independent adaptive controller and its control method" (Application No. 2007101952990) should be rejected because the algorithm is independent of the physical quantity of the specific technical field. Third, if the intelligent algorithm is related to the specific technical field, but does not form a technical solution and produces technical effects, it cannot be a patent law protection object, such as the invention "a dynamic tolerance setting method based on scan line algorithm" (application number 200710179581X).

But the algorithm is designed to achieve a certain purpose. It will be separated from the subjective thinking of the human being and rely on the computer for data calculation and processing, thus obtaining effective conclusions. This method cannot be called an absolute abstraction. It can change the state of matter and achieve technical effects. Theoretically, the algorithm is different from the pure abstract idea mentioned above, which can essentially constitute a technical solution to solve specific problems, and has the dual attributes of technical solutions and thinking rules. Therefore, the algorithm is both patented and non-patentable. Today's patent law is mainly mechanical innovation in the traditional sense, which is inconsistent with the Internet innovation model of the modern era. As the influence of the Internet on human society will gradually deepen, the algorithm should not use pure thinking rules as its essential definition but should take the technical solution as the essential attribute and the patent-ability as the main aspect. Based on the above analysis, the object status of the patent law of the algorithm is justified.

[8] Under present law, an invention relating to a mathematical abstraction may be claimed only as a process carried out in accordance with the abstraction or as an apparatus operating in accordance with it. See In re Alappat, 33 F.3d 1526, 31 U.S.P.Q.2d (BNA) 1545 (Fed. Cir. 1994); In re Schrader, 22 F.3d 290, 22 U.S.P.Q.2d (BNA) 1455 (Fed. Cir. 1994); Algorithm Conundrum, supra note 4, at 177-78; see also In re Chatfield, 545 F.2d 152, 159, 191 U.S.P.Q. (BNA) 730, 736 (Fed. Cir. 1976) (Rich, J., dissenting) ("It has never been otherwise than perfectly clear to those desiring patent protection on inventions which are new and useful programs for general purpose computers (software) that the only way it could be obtained would be to describe and claim .. .the invention as a 'process' or a 'machine.'"), cert. denied, 434 U.S. 875, 195 U.S.P.Q. (BNA) 465 (1977).

4. THE SYSTEM DESIGN OF ALGORITHM PATENT PROTECTION UNDER THE DEVELOPMENT OF INTELLIGENT SOCIETY

The essence of the patent law is "monopoly for publicity". This model is a fair mechanism for the social interests of all parties in the artificial intelligence industry. The intellectual property system is a very important social system. How to determine the scope of intellectual property protection and how to protect intellectual property rights is a systematic choice and arrangement, which should be confirmed according to the actual situation and the needs of future development. The key to the transformation of the US business method patent policy is to actively seek the best positioning in line with industry interests and national interests. In the process of finding a public policy for patent rights, a virtuous circle of technological development and patent protection is formed, and the dialogue between the two should be tolerant and open. In response to a new wave of scientific and technological revolution, under the leadership of China's national intellectual property strategy, China must determine the basis of the intelligent society's operation as soon as possible - the patent-ability standard of the algorithm. The authors propose the following system ideas.

4.1 Clearly Incorporate the Algorithms in Artificial Intelligence Into the Patent Law to Protect the Object

According to the current regulations of the patent system, only objects of invention patent protection include method inventions. As a technical method, the technical solution generally requires a patent application for patent protection. Therefore, if the algorithm is the object of patent protection, it needs to be included in the object of the invention patent. However, some scholars in the process of studying the patentability of business methods, the artificial intelligence algorithm technology is usually closely related to the new business model and advocates that the artificial intelligence algorithm should be used as a commercial method to obtain patent protection. Whether the commercial method should be included in the scope of the object of patent law protection is still unclear in the system, and there are many controversies in theory.

Although the 2010 patent examination guidelines [9] have limited recognition of the patentability of business methods, the degree of association and equivalence between algorithmic techniques and business methods

[9] At present, there are no specific provisions on commercial methods in China's patent law and detailed rules for the implementation of the patent law. However, according to article 2 (2) of the patent law, "an invention means a new technical solution to a product, method or improvement thereof". This indicates that a business method invention should be a new "technical solution" to obtain a patent.

is still debatable. In general, business methods involve purely business methods and business methods that rely on physical technology tools such as computers. People often regard commercial methods that do not rely on external tools or means as an abstract thinking rule that is not an object of patent law protection. Protecting the algorithm with a business method that was originally in a fuzzy zone can cause the setting of the algorithm protection system to become more chaotic. Therefore, it is not advisable to use a commercial method to protect the algorithm. We need to create a space for protection from the system level of the patent law.

The fourth revision of the Patent Law changed the second appearance patent "shape of the product" to "the overall or partial shape of the product", but did not amend the definition of "invention". "Invention refers to the product. The method, or the improvement of the proposed new technical solution," the authors believe that can be extended to "new technical solutions proposed for products, methods, algorithms that can achieve artificial intelligence or their improvements."

It is clearly stated in the Patent Examination Guidelines that the scope of inventions encompasses innovations in methods, products, equipment, and materials that encompass the methods of operation and means of use associated with these technologies. For example, the "method" includes the fermentation, forming and conveying of products, the development, and testing of food, the operation of equipment and its operation, the processing and transmission of information, etc. The focus is on traditional industry application methods, and the above patent law is accepted. The idea is to add "algorithms for achieving artificial intelligence purposes" in addition to the four technical topics.

4.2 Amend the Exclusion Rule of Article 25 of the Patent Law

In the Chinese patent law, there are six kinds of intellectual achievements that cannot be granted patent rights, and the algorithm is included in the second item, namely "rules and methods of intellectual activities".[10] Patent protection scheme should be applied in the actual industry solutions to promote the progress of science and technology, for does not involve some rules and methods of industry application does not belong to the scope of patent protection, but the problem statement of this clause, is difficult to accurately define intellectual activity rules and methods defined extension, easy will be able to realize intelligent effect technology solutions or methods to exclude outside the scope of protection. Based on this, except the rules should be amended as "does not include the intelligence rules and algorithm of artificial intelligence technology content", the limit is set by the autonomous rule and method, think its main function is to people's thinking, judging and express to provide direction, did not take special techniques or follow some kind of natural law. Therefore, it has no technical characteristics and is an exception rule of patent protection, which enables the algorithm with technical characteristics to be protected and provides legal protection for new intelligent methods that may be produced in the future.

Patent review guide 2010 further elaborates on "rules and methods of intellectual activity". In terms of algorithm and mathematical calculation rules, if the computer program belongs to the internal program or the rules or methods of a certain game, then this kind of algorithm will belong to the rules and methods of intellectual activities and cannot enjoy patent protection. After that, in 2017, the relevant instructions put forward again for the algorithm problem. If the algorithm belongs to the computer program itself, it cannot enjoy patent protection. But inventions related to computer programs can be patented. In addition, the "medium + computer program flow" approach is recognized. Therefore, in this context, the algorithm can clarify the new combined protection mode of "technology applicability + algorithm", indicating that the algorithm under the nature of "technology" can be protected in this way.

4.3 Formulate Legal Standards for Algorithm Public Interest Review

In China's patent law, it is clearly stated that an invention will not enjoy patent protection if it harms the public interest and violates laws and regulations. Therefore, if the invention is not in compliance with laws and regulations and violates social ethics, it will not be protected by patent. Similarly, there are similar provisions in the patent examination guide. Therefore, if the algorithm design violates laws and regulations, and will harm the public interest in the process of use, we must resist this and veto this behavior, so as to safeguard the interests of the broad masses of the people.

However, in the practice of review, there is no uniform standard for correctly understanding "social public interest" and measuring whether a certain behavior violates public order and good customs. Therefore, on the basis of the general principle, it is necessary to formulate additional public interest review standards for the algorithm. The authors focus on the following aspects.

First, the principles of fairness and justice, public order and good customs are incorporated into article 5 of the patent law as the legal standard for algorithm review. Second, the patent enforcement rules do not provide for inventions that violate the public interest. In the author's opinion, it should be pointed out in the patent implementation rules that higher examination requirements should be put forward on key factors such

[10] Article 25 of the Patent Law does not grant patent rights to: (1) scientific discovery; (2) rules and methods of intellectual activity; (3) methods for diagnosis and treatment of diseases; (4) animal and plant varieties; (5) Substances obtained by atomic nuclear transformation; (6) Designs that are mainly used for marking the pattern, color or combination of the two.

as content, audience, and region for algorithms involving basic human rights issues such as race and gender and major social interests. Finally, after the algorithm is granted the patent, uphold the patent "disclosure principle", the application of the algorithm not only needs to carry out patentable three review, but also set up the public interest review process, it is suggested to strengthen supervision according to the characteristics of different industries, industry standards can be developed, and regularly declare to the regulatory department. This algorithm introduces the necessary intervention and supervision mechanism. Both algorithms should be brought into the scope of protection of the patent law in order to promote the stability of the technology upgrade and improve, and guide the correct development direction for algorithm development, under the joint effort of the state, enterprises, public and develop social value criterion of the algorithm in the consciously abide by the algorithm based on the value assessment of the specification, implementation algorithm of the virtuous circle of social development.

4.4 Monopoly Review of Algorithm Business Model

Algorithms have become increasingly powerful tools for business decision making and promotion, but companies with core algorithms are prone to abuse their dominant position and may form a monopoly. The fourth draft amendment to the patent law makes a more comprehensive and substantial amendment, proposing to set up an open patent licensing system. This system can enable organizations with patent technology needs to use patents in an open, reasonable and non-discriminatory way, and reduce the problem of information asymmetry. In essence, this system can be combined with the patent protection of the algorithm, and the content of its business model can be set open license when the patent protection of the algorithm business model is granted. The authors think that paragraph 3 can be set on the basis of Article 50 of the draft, that is, if the algorithm is applied for patent protection as a business model, it should timely apply to the patent administration department for public announcement and open license. Under the premise of determining the usage cost and usage rules, the algorithm is agreed to be used by any required unit. In this way, we can adjust the monopoly problem caused by the algorithm business model and promote the docking of supply and demand, which not only encourages the transformation of the algorithm business model but also helps to maintain the interests of the broad masses of people and is conducive to social harmony and stability.

CONCLUSION

With the wave of intelligent revolution coming, the only way for social development is to regard an algorithm as the object of patent law protection. In the field of intellectual property, there are many drawbacks in the existing protection path of the algorithm, and the effectiveness of protection is not enough to meet the challenges of an intelligent society. The algorithm has a value judgment because of its principles and is always associated with a particular value. When algorithms become decision-making tools for intelligent society, we need to constantly reflect on the ethical value basis behind them to avoid some unfair algorithms violating human rights and undermining social stability. Due to its concealment, the algorithm needs to conduct prior access and value evaluation. After an in-depth analysis of the internal driving force of patent law protection, we find that the principle of "open for protection" of patent law can to some extent resolve the hidden danger of the algorithm and adjust its contradiction with social public interests. Through the analysis of the object of patent law protection, the authors think that the algorithm can be classified as the third object of patent law protection, that is, the object of patent law protection includes three types: technical scheme, business method, an algorithm implemented by technical means. In addition, the algorithm value evaluation mechanism should be added to ensure the legitimacy of the algorithm. Finally, through the system construction of algorithm protection, the incentive effect of intellectual property law on algorithm innovation can be better played, and the algorithm can be developed in a more reasonable, ethical and legal direction, so as to promote the rapid development of intelligent society.

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