

COMPARATIVE STUDY ON AI-RELATED INVENTIONS

REPORT

2023 JPO and CNIPA

This report was prepared by the JPO and the CNIPA.

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I. Introduction

The JPO and the CNIPA are long-standing partners whose co-operation efforts aim at improving the levels of service they provide to their stakeholders. In recent years, there have been rapid technological advances in the area of "AI-related inventions" which have resulted in significant increases in AI-related patent applications. This represents a challenge to patent offices and applicants alike, as does the increasing penetration of AI technologies into other areas of innovation. A further challenge for applicants is the fact that different patent offices operate under different legal codes and therefore may apply different approaches to the examination of AI-related patent applications.

In response to these challenges, the JPO and the CNIPA have jointly conducted a comparative study on AI-related inventions, with the aim of providing applicants and practitioners insights into their respective examination practices. The results presented illustrate the similarities and differences of approach taken and provide guidance on how to draft valid patent claims that fulfil the patentability requirements at both offices.

In general, patents on AI-related inventions are granted at both the JPO and the CNIPA. The laws applied by the JPO and the CNIPA impose broadly similar substantive requirements on obtaining patents for AI-related inventions. In both jurisdictions, three requirements are of particular relevance. First, an AI-related invention must be a statutory "invention" in the sense that it is not excluded/ineligible subject-matter. Second, the claimed subject-matter must be novel and involve an inventive step (i.e. is non-obvious). Third, description and claims must satisfy the following requirements: Enablement requirement/Sufficiency of disclosure, Claims supported by the description. These legal requirements are assessed by the two offices with overlapping yet different sets of criteria, leading to overall outcomes which are not always aligned. (The reader is referred in particular to section III, "Comparative study of example cases".)

With this clear and detailed comparison of the JPO's and the CNIPA's AI-related inventions practices, both offices aim to promote innovation for the benefit of their stakeholders and provide their users with a better understanding of what to expect when filing AI-related patent applications. It is hoped that a better and clearer understanding of the JPO and the CNIPA legal requirements and working practices will support applicants in drafting their applications with a higher degree of confidence of achieving a positive outcome.

The results of this comparative study have only indicative meaning and are not legally binding on the two offices.

Glossary

JPO	Japan Patent Office
JPA	(Japan) Patent Act
JP Guidelines	Examination Guidelines for Patent and Utility Model in Japan
JPHB	Examination Handbook for Patent and Utility Model in Japan
AI-related invention	AI-related invention (JPO) Invention relating to AI (CNIPA)
Software-related invention	Computer software-related invention (JPO) Invention relating to computer programs (CNIPA)
CNIPA	China National Intellectual Property Administration
Chinese Patent Law	Patent Law of the People's Republic of China
CNIPA Guidelines	Guidelines for Patent Examination 2010,2019 Update

II. Comparative study of laws, regulations and guidelines

A. Eligibility

1. Non-excluded/eligible subject-matter

(JPO)

At the JPO, Article 2(1) JPA¹ defines an eligible "invention" as "the highly advanced creation of technical ideas utilizing the laws of nature". An invention which does not comply with this definition is rejected based on the main paragraph of Article 29(1) JPA.² It is also noted that Article 2(3) JPA³ stipulates that a computer program, etc., is included in the term "a product", which is one of the categories of inventions.

With regard to the JPO, a list of ineligible subject-matter not falling under the definition of a statutory "invention" is described in JP Guidelines, Part III, Chap. 1, 2.1.

At the JPO, an AI-related invention that also falls under a software-related invention is examined based on the examination method for software-related inventions. At the JPO, in addition to the ineligible subject-matter described above, specific subject-matter regarding software-related inventions is not regarded as a statutory "invention"; it is described in JPHB, Annex B, Chap. 1. Details are described in the section below headed "3. Approach for assessing whether an AI-related invention is a statutory 'invention' or excluded/ineligible subject-matter".

(CNIPA)

At the CNIPA, Article 2.2 Chinese Patent Law gives a specific definition of "invention". "Invention" means any new technical solution relating to a product, a process or improvement thereof.

Furthermore, the CNIPA Guidelines, Part II, Chap. 1, Section 2, state:

¹ Article 2(1) JPA:

"Invention" in this Act means the highly advanced creation of technical ideas utilizing the laws of nature.

² Article 29(1) JPA:

An inventor of an invention that is industrially applicable may be entitled to obtain a patent for the said invention, except for the following: ...

³ Article 2(3) JPA:

"Working" of an invention in this Act means the following acts:

(i) in the case of an invention of a product (including a computer program, etc., the same shall apply hereinafter), producing, using, assigning, etc. (assigning and leasing and, in the case where the product is a computer program, etc., including providing through an electric telecommunication line, the same shall apply hereinafter), exporting or importing, or offering for assignment, etc. (including displaying for the purpose of assignment, etc., the same shall apply hereinafter) thereof;

(ii) in the case of an invention of a process, the use thereof; and

(iii) in the case of an invention of a process for producing a product, in addition to the action as provided in the preceding item, acts of using, assigning, etc., exporting or importing, or offering for assignment, etc. the product produced by the process.

A technical solution is an aggregation of technical means applying the laws of nature to solve a technical problem. Usually, technical means are embodied as technical features. A solution that does not adopt technical means to solve a technical problem and thereby does not achieve any technical effect in compliance with the laws of nature does not constitute a subject matter as defined in Article 2.2 Chinese Patent Law.

Article 25.1 Chinese Patent Law lists the subject-matter excluded from patent protection. Further explanations and examples of the subject-matter excluded are provided in the CNIPA Guidelines, Part II, Chap. 1, Section 4. The CNIPA Guidelines also provide a non-exhaustive list of rules and methods which are regarded as mental activities. The examples include:

- mathematical theories and methods of conversion;
- rules and methods of various games or entertainment;
- methods of deduction, inference, or operations;
- methods and systems of managing organization, production, commercial activities or the economy, etc.;
- computer programs per se; and
- methods of presenting information.

The table below summarises the type of subject-matter excluded from patentability at both patent offices.

JPO	CNIPA
<p>In JP Guidelines, Part III, Chap. 1, 2.1, the following are not regarded as "inventions":</p> <ul style="list-style-type: none"> (a) a law of nature as such (b) mere discoveries and not creations (c) those contrary to a law of nature (d) those in which a law of nature is not utilised, e.g. <ul style="list-style-type: none"> (i) any laws other than a law of nature (e.g. economic laws), (ii) arbitrary arrangements (e.g. a rule for playing a game as such), (iii) mathematical formula, (iv) mental activities of humans or (v) those utilising only (i) to (iv) (e.g. methods for doing business as 	<p>Article A25.1 Chinese Patent Law reads: For any of the following, no patent right shall be granted:</p> <ul style="list-style-type: none"> (1) scientific discoveries; (2) rules and methods for mental activities; (3) methods for the diagnosis or for the treatment of diseases; (4) animal and plant varieties; (5) substances obtained by means of nuclear transformation; (6) designs of two-dimensional printing goods, made of the pattern, the color.

<p>such)</p> <p>(e) those not regarded as technical ideas, e.g. personal skill, mere presentation of information or mere aesthetic creations</p> <p>(f) those for which it is clearly impossible to solve the problem to be solved by any means presented in a claim</p>	
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2. Claim formats

(JPO)

At the JPO, the statement in the claims must comply with each of the following requirements: an invention for which a patent is sought is disclosed in the description; an invention for which a patent is sought is clear; the statement for each claim is concise (Article 36(6)(i), (ii) and (iii) JPA).

At the JPO, an applicant can state the following as an "invention of a method" or an "invention of a product" in the claims (JPHB, Annex B, Chap. 1, 1.2.1.1):⁴

(1) Invention of a method

When a software-related invention can be expressed as a series of processes or operations which are connected in terms of a time series, more specifically, as "steps", an applicant can state the software-related invention as an "invention of a method" (including an "invention of producing a product") in the claims, by identifying the "steps".

(2) Invention of a product

(i) A "program" that identifies a plurality of functions a computer serves.

Example 1: A program for causing a computer to execute a step A, a step B, a step C ...

Example 2: A program for causing a computer to function as means A, means B, means C ...

Example 3: A program for causing a computer to implement a function A, a function B, a function C ...

⁴ With regard to the JPO, see JPHB, Annex B, Chap. 1, 1.2.1.2. If it is clear in consideration of description and drawings as well as the common general knowledge as of the filing that the claimed invention is a "program" even though the claimed subject-matter is any word other than the "program" (for example, "module", "library", "neural network", "support vector machine" or "model") the claimed invention is handled as the "program."

When the claim is a computer program product, the claimed invention is handled as what it means, as long as it is clear in consideration of the detailed description of the invention that it means any of (a) - (c) below. If this is not the case, the claimed invention will breach clarity requirement, because the scope of the invention is unclear.

(a) A "program" itself

(b) A "recording medium in which a program is recorded"

(c) A system into which a program is read, such as a "computer system into which a program is read"

(ii) "Structured data" or a "data structure" in which information processing to be performed by a computer is prescribed by a structure of data.

Example 4: Structured data including a data element A, a data element B, a data element C ...

Example 5: A data structure including a data element A, a data element B, a data element C ...

(iii) A computer-readable recording medium which records the "program" in (i) above or the "structured data" in (ii) above.

Example 6: A computer-readable recording medium which records a program for causing a computer to execute a process A, a process B, a process C ...

Example 7: A computer-readable recording medium which records a program for causing a computer to function as means A, means B, means C ...

Example 8: A computer-readable recording medium which records a program for causing a computer to implement a function A, a function B, a function C ...

Example 9: A computer-readable recording medium which records structured data including a data element A, a data element B, a data element C ...

At the JPO, "Structured data ..." or "A data structure ..." is an acceptable claim format regardless of whether the structured data or a data structure is stored on a medium or not.

More than one independent claim is acceptable as long as those claims meet the requirement of unity.

(CNIPA)

At the CNIPA, the claims of a software-related invention may be drafted as either process or product claims, i.e., the apparatus for executing the process, the computer-readable storage medium. The following claim formats are acceptable:

(1) A method for ..., comprising: step a, ...; step b, ...; step c, ...

(2) A system for ..., comprising: means for implementing step a; means for implementing step b; means for implementing step c⁵.

⁵ Each component in the apparatus claim shall be regarded as program modules which are required to be built to realize each step in the said computer program flow or each step in the said method. The apparatus claim defined by such a group of program modules shall be regarded as the program module architecture to realize the said solution mainly through the computer program described in the description rather than entity devices to realize the said solution mainly through hardware.

(3) A computer apparatus, including a memory in which a computer program is stored, and a processor, characterized in that the computer program can carry out the following steps when implemented by the processor ...

(4) A computer-readable storage medium, on which a computer program is stored, characterized in that the computer program can carry out the following steps when implemented by a processor ...

(5) A computer program product⁶, including computer programs/instructions, characterized in that the computer programs/instructions can carry out the following steps when implemented by a processor ...

3. Approach for assessing whether an AI-related invention is a statutory "invention" or excluded/ineligible subject-matter

(JPO)

At the JPO, an AI-related invention that also falls under a software-related invention is examined based on the examination method for software-related inventions.

The JPO's approach for assessing whether a software-related invention is an "invention" within the meaning of Article 2(1) JPA is described in JPHB, Annex B, Chap. 1, 2.1.

There are up to two steps for making that assessment: firstly the determination based on JP Guidelines, Part III, Chap. 1, and secondly the determination according to the "idea based on the standpoint of software" in JPHB, Annex B, Chap. 1, 2.1.

First of all, the examiner reviews whether or not the claimed software-related invention is a "creation of a technical idea utilizing a law of nature", based on JP Guidelines, Part III, Chap. 1.

The examiner does not review according to the "idea based on the standpoint of software" if a determination on whether or not the claimed software-related invention is a "creation of a technical idea utilizing a law of nature" is made based on JP Guidelines, Part III, Chap. 1. In other words, during this review, the examiner does not need to take into consideration whether the claimed invention is in fact implemented in software.

If not, the examiner makes a determination according to the "idea based on the standpoint of software".

When making the determinations, the examiner reviews whether or not the claimed invention as a whole is a "creation of a technical idea utilizing a law of nature", irrespective of some recitations in the claims.

⁶ Computer program products should be regarded as software products that implement the solutions primarily through computer programs.

Regarding the determination based on JP Guidelines, Part III, Chap. 1, claimed inventions utilising a law of nature as a whole and being considered a "creation of a technical idea utilizing a law of nature" irrespective of whether computer software is utilised (e.g. (i) or (ii) shown below) constitute a statutory "invention" without being examined from the viewpoint of computer software.

Computer software for causing a computer to execute a method which is a "creation of a technical idea utilizing a law of nature" and thus constitutes a statutory "invention", or a computer or system for executing such method, is normally a creation of a technical idea utilising a law of nature as a whole, and thus it constitutes a statutory "invention".

(i) Those concretely performing control of an apparatus (e.g. rice cooker, washing machine, engine, hard disk drive, chemical reaction apparatus, nucleic acid amplifier) or processing with respect to the control.

(ii) Those concretely performing information processing based on the technical properties, such as the physical, chemical, biological or electric properties, of an object (e.g. rotation rate of engine, rolling temperature, relation between gene sequence and expression of a trait in a living body, physical or chemical relation of bound substances).

When the claimed software-related invention falls under any type of subject-matter not corresponding to a statutory "invention" in JP Guidelines, Part III, Chap. 1, 2.1, the claimed invention is not a "creation of a technical idea utilizing a law of nature".

Regarding the determination according to the "idea based on the standpoint of software", if it is not determined based on JP Guidelines, Part III, Chap. 1, whether or not the claimed software-related invention falls under the "creation of a technical idea utilizing a law of nature", the examiner makes a determination on the requirements of "creation of a technical idea utilizing a law of nature" depending on whether or not "information processing by software is specifically implemented by using hardware resources" in a software-related invention – that is to say, whether or not a specific information processor or an operation method thereof depending on the intended use is constructed through co-operation of software and hardware resources.

With this specific determination approach, the examiner may determine based on the statement of the claims whether or not specific calculation or processing of information depending on the intended use is implemented by specific means or procedures on which software and hardware resources co-operate.

With regard to the handling of structured data or a data structure, the examiner determines whether structured data or a data structure is equivalent to a program, that is, whether structured data or a data structure has characteristics similar to a program in that the structure of the data specifies the processing of the computer. Structured data or a data structure is determined to be software when it is equivalent to a program. Even if it is data having structure or a data structure, it is not determined to be software when it is not equivalent to a program.

Regarding whether structured data (including a computer-readable recording medium on which structured data is recorded) or a data structure falls under a "creation of a technical idea utilizing a law of nature" or not, the examiner makes a determination according to the approach mentioned above.

When a determination on the eligibility of structured data or a data structure according to the "idea based on the standpoint of software" is made, the examiner makes a determination on the requirements of a "creation of a technical idea utilizing a law of nature" according to whether or not information processing specified by a structure that data has is specifically implemented by using hardware resources.

(CNIPA)

At the CNIPA, the approach for assessing whether a software-related invention is an "invention" within the meaning of Article 2.2 Chinese Patent Law is described in CNIPA Guidelines, Part II, Chap. 1, Section 4.2, and Chap. 9. The specific provisions for the examination characteristics of an AI-related invention are presented in CNIPA Guidelines, Part II, Chap. 9, Section 6.

Examination shall focus on solutions for which protection is sought for, i.e., solutions defined by each claim. An AI-related invention generally contains rules and methods for mental activities such as algorithms or rules and methods for business. The examination shall not separate the technical features from the algorithmic features or features of rules and methods for business, but shall take all the contents described in a claim as a whole, analyze the technical means involved, the technical problems solved and the technical effects obtained, and apply Articles 2.2 and 25.1 Chinese Patent Law.

If a claim merely relates to an algorithm, or mathematical computing rules, or computer programs per se, or computer programs recorded in mediums (such as tapes, discs, optical discs, magnetic optical discs, ROM, PROM, VCD, DVD, or other computer-readable mediums), or rules or methods for games, etc., it falls into the scope of the rules and methods for mental activities and does not constitute the subject matter for which Chinese patent protection may be sought.

If a claim involves abstract algorithms or pure rules and methods for business, and does not contain any technical feature, the claim belongs to the rules and methods for mental activities as provided for in Article 25.1(2) Chinese Patent Law, and shall not be granted a patent right. For example, a method of establishing a mathematical model based on an abstract algorithm that does not contain any technical feature belongs to the rules and methods for mental activities as provided for in Article 25.1(2) Chinese Patent Law.

If all the contents of a claim, except its title of the subject matter, merely relate to an algorithm, or mathematical computing rules or programs per se, or rules or methods for games, etc., the claim essentially merely relates to rules and methods for mental activities, and does not constitute the subject matter of patent protection.

If all the contents of a claim include not only rules and methods for mental activities but also technical features, for example, a claim to a device for a computer game, including

rules for the game and technical features as well, then the claim as a whole is not rules and methods for mental activities, and shall not be excluded from patentability in accordance with Article 25 Chinese Patent Law.

If a claim contains technical features in addition to algorithmic features or features of rules and methods for business, the claim as a whole is not rules and methods for mental activities, and shall not be excluded from patentability in accordance with Article 25 Chinese Patent Law.

In accordance with Article 2.2 Chinese Patent Law, "invention" means any new technical solution relating to a product, a process or improvement thereof.

If a claim for which protection is sought as a whole does not fall into the circumstances mentioned in Article 25.1(2) Chinese Patent Law, it shall to be examined whether it is the technical solution as provided for in Article 2.2 Chinese Patent Law. Therefore, an AI-related invention can be eligible only if it constitutes a technical solution.

When determining whether the solution is a technical solution as provided for Article 2.2 Chinese Patent Law, technical means, technical problems, and technical effects are three important factors, and should be considered as a whole.

If the solution of an invention application relating to computer programs involves the execution of computer programs in order to solve technical problems, and reflects technical means in conformity with the laws of nature by computers running programs to control and process external or internal objects, and thus technical effects in conformity with the laws of nature are obtained, the solution is a technical solution as provided for in Article 2.2 and is the subject matter of patent protection.

If the solution of an invention application relating to computer programs involves the execution of computer programs not in order to solve technical problems, or does not reflect technical means in conformity with the laws of nature by computers running programs to control and process external or internal objects, or the effect obtained is not restrained by the laws of nature, the solution is not a technical solution as provided for in Article 2.2, and is not the subject matter of patent protection.

If the solution of an invention application relating to computer programs involves execution of computer programs in order to process a kind of external technical data, completes a series of technical process on the technical data in accordance with the laws of nature through execution of a kind of technical data process program by a computer, and thus technical data process effects in conformity with the laws of nature are obtained, the solution is a solution as provided for in Article 2.2 and is the subject matter of patent protection.

If the solution of an invention application relating to computer programs involves execution of computer programs in order to improve the internal performance of a computer system, completes a series of setting or configuration to parts of a computer system in accordance with the laws of nature through execution of a kind of system internal performance improvement program by a computer, and thus internal performance improvement effects of the computer system in conformity with the laws of nature are obtained, the solution is a solution as provided for in Article 2.2 and is the subject matter of patent protection.

When examining whether a claim containing algorithmic features or features of rules and methods for business is a technical solution, all the features described in the claim should be considered as a whole. If the claim states technical means applying the laws of nature to solve technical problems, and thereby obtain technical effects in conformity with the laws of nature, the solution defined by the claim is the technical solution as provided for in Article 2.2 Chinese Patent Law.

If each step refer to an algorithm involved in a claim is closely related to the technical problem to be solved, for example, the data processed by the algorithm is the data with exact technical meanings in a technical field, and the execution of the algorithm can directly reflect the process of solving a technical problem by applying the laws of nature and obtain technical effects, the solution defined in the claim generally is the technical solution as provided for in Article 2.2 Chinese Patent Law.

If the solution of a claim involves the improvement of deep learning, classification, clustering and other artificial intelligence, big data algorithm, the algorithm has specific technical associations with the internal structure of computer systems, and can solve the technical problems on how to improve the hardware computing efficiency or execution effects, including reducing the amount of data storage, reducing the amount of data transmission, improving the speed of hardware processing, etc., so as to obtain the technical effects of improving the internal performance of computer systems in conformity with the laws of nature. Thus, the solution defined in the claim is the technical solution as provided for in Article 2.2 Chinese Patent Law.

If the solution of a claim deals with big data in a specific application field, mines the internal association relationships in the data in conformity with the laws of nature, using classification, clustering, regression analysis, neural network, etc., so as to solve technical problems on how to improve the reliability or accuracy of big data analysis in a specific application field, and obtain corresponding technical effects, then the solution defined in the claim is the technical solution as provided for in Article 2.2 Chinese Patent Law .

B. Novelty

(JPO)

At the JPO, an AI-related invention that also falls under a software-related invention is examined based on the examination method for software-related inventions. And, as described in JPHB, Annex B, Chap. 1, 2.2.1, when specifying a software-related invention, it is appropriate to understand an invention as a whole, while it is not appropriate to specify it by dividing it into arbitrary arrangements or the like and systemisation methods, since the examiner should always consider the matters or terms described in the claims and should not ignore them, as with other kinds of inventions.

Note that the matter which the examiner should take into consideration in examining novelty concerning a claimed invention including specific expressions is described in JP Guidelines, Part III, Chap. 2, 4. For example, as for a sub-combination invention that includes an expression in an attempt to specify it by means of elements relevant to another sub-combination, the examiner should consider elements relevant to "another sub-combination" stated in the claim and not ignore them in specifying the claimed invention. The examiner should also understand the role which the elements have in specifying the sub-combination invention in terms of its shape, structure, constituent elements, composition, operation, function, property, characteristics, method (an act or action), use, etc. (hereinafter referred to as "a structure, function, etc.") when they specify the claimed sub-combination invention. In this regard, the examiner takes into account the statements of the description and drawings as well as common general knowledge at the time of filing.

In cases where an element relevant to "another sub-combination" has a role in specifying a structure, function, etc. of the claimed sub-combination invention, the examiner understands that the claimed sub-combination invention has such a structure, function, etc. If there is a difference between a sub-combination invention and cited prior art, the examiner determines that the sub-combination invention involves novelty.

In cases where an element relevant to "another sub-combination" specifies only "another sub-combination" and does not specify a structure, function, etc. of the claimed sub-combination invention at all, the examiner specifies the invention on the premise that the element relevant to "another sub-combination" does not have a role in specifying the claimed sub-combination invention. If no differences exist except for a difference between elements relevant to "another sub-combination" and elements specifying cited prior art in view of a description or an expression, there are no differences between the claimed sub-combination invention and the cited prior art in terms of structure, function, etc. Therefore, the examiner determines that the sub-combination invention does not involve novelty.

(CNIPA)

At the CNIPA, in accordance with Article 22.1 Chinese Patent Law, any invention or utility model for which patent right may be granted must possess novelty, inventiveness and practical applicability.

According to Article 22.2 Chinese Patent Law, novelty means that, the invention or utility model does not form part of the prior art. According to Article 22.5 Chinese Patent Law, the prior art means any technology known to the public before the date of filing in China or abroad.

The following principles shall be complied with during the examination of novelty. (1) Identical inventions or utility models. Comparing the application being examined with the relevant contents of the prior art, if their technical fields, technical problems to be solved, technical solutions, and their expected effects are substantially the same, they shall be regarded as identical inventions or utility models. (2) Separate comparison. When determining novelty, the examiner shall compare each claim of the application separately with the relevant technical contents disclosed in each item of the prior art, rather than with a combination of the contents disclosed in several items of the prior art or with a combination of several technical solutions disclosed in one reference document.

When examining the novelty of an invention application containing algorithmic features or features of rules and methods for business, all the features described in the claims shall be considered. The said all the features include both technical features, and algorithmic features or features of rules and methods for business.

C. Inventive step

(JPO)

At the JPO, specifying the claimed invention is described in JP Guidelines, Part III, Chap. 2, 3.

The examiner specifies the claimed invention and the prior art, and then compares both in determining novelty and inventive step.

Regarding the claimed invention, the examiner specifies it based on the claim. The examiner takes the description, drawings and common general knowledge at the time of filing into consideration in interpreting the meanings of words in the claims. The examiner should always consider the matter or terms described in the claims and should not ignore them.

Also, at the JPO, an AI-related invention that also falls under a software-related invention is examined based on the examination method for software-related inventions. When specifying a software-related invention, it is appropriate to understand an invention as a whole, while it is not appropriate to specify it by dividing it into arbitrary arrangements or the like and systemisation methods, as described in JPHB, Annex B, Chap. 1, 2.2.1.

At the JPO, during the inventive step assessment, no distinction is made between features which are technical and those which are not.

The JPO examiner selects the prior art most suitable for the reasoning (hereinafter referred to as "the primary prior art") and determines whether it is possible to reason that a person skilled in the art would easily arrive at the claimed invention from the primary prior art by following steps (1) to (4) below. The examiner should not regard the combination of two or more independent pieces of prior art as the primary prior art.

(1) The examiner determines whether or not the reasoning is possible based on the various factors in support of the non-existence of an inventive step for the differences between the claimed invention and the primary prior art by adopting other pieces of prior art (hereinafter referred to as "secondary prior art") or considering common general knowledge.

(2) If the examiner determines that the reasoning is impossible based on the above step (1), the examiner determines that the claimed invention involves an inventive step.

(3) If the examiner determines that the reasoning is possible based on the above step (1), the examiner determines whether the reasoning is possible by comprehensively assessing various factors which include factors in support of the existence of an inventive step.

(4) If the examiner determines that the reasoning is impossible based on the above step (3), the examiner determines that the claimed invention involves an inventive step. If the examiner determines that the reasoning is possible based on the above

step (3), the examiner determines that the claimed invention does not involve an inventive step (JP Guidelines, Part III, Chap. 2, 3).

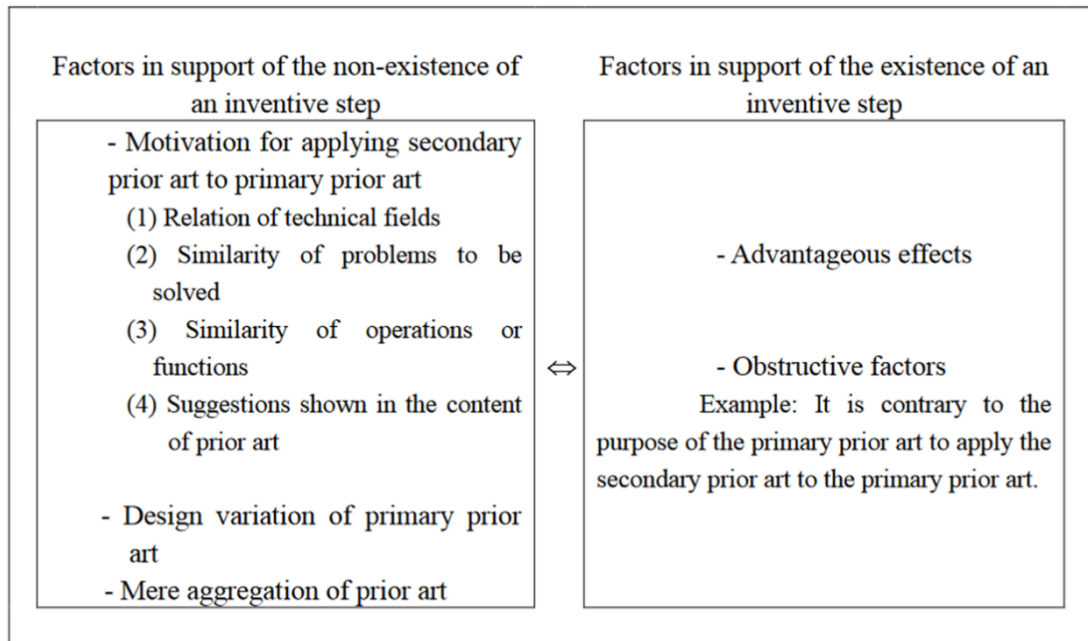


Figure 1: Main factors for reasoning

(CNIPA)

At the CNIPA, according to Article 22.3 Chinese Patent Law, inventiveness means that, as compared with the prior art, the invention has prominent substantive features and represents a notable progress. That an invention has prominent substantive features means that, having regard to the prior art, it is non-obvious to a person skilled in the art. That an invention represents notable progress means that the invention can produce advantageous technical effect as compared with the prior art.

Usually the following three steps are followed to determine whether a claimed invention is obvious as compared with the prior art.

(1) Determining the closest prior art.

(2) Determining the distinguishing features of the invention and the technical problem actually solved by the invention.

(3) Determining whether or not the claimed invention is obvious to a person skilled in the art. For this step, the examiner shall make a judgment, starting from the closest prior art and the technical problem actually solved by the invention, as to whether or not the claimed invention is obvious to a person skilled in the art. In the course of judgment, what is to be determined is whether or not there exists such a technical motivation in the prior art as to apply said distinguishing features to the closest prior art in solving the existing technical problem (that is, the technical problem actually solved by the invention), where such motivation would prompt a person skilled in the

art, when confronted with the technical problem, to improve the closest prior art and thus reach the claimed invention. If there exists such a technical motivation in the prior art, the invention is obvious and thus fails to have prominent substantive features.

Under the following circumstances, it is usually thought there exists such a technical motivation in the prior art.

(i) The said distinguishing feature is a common knowledge.

(ii) The said distinguishing feature is a technical means related to the closest prior art, such as a technical means disclosed in other part of the same reference document, the function of which in the other part is the same as the function of the distinguishing feature in the claimed invention in solving the redetermined technical problem.

(iii) The said distinguishing feature is a relevant technical means disclosed in another reference document, the function of which in that reference document is the same as the function of the distinguishing feature in the claimed invention in solving the redetermined technical problem.

When examining the inventive step of an invention application that contains both technical features and algorithmic features or features of rules and methods for business, the algorithmic features or features of rules and methods for business that functionally support each other and have an interaction relationship with the technical features should be considered together with the technical features as a whole. "Functionally support each other and have an interaction relationship" means that the algorithmic features or features of rules and methods for business are closely combined with technical features, which together constitute a technical means to solve a technical problem, and can obtain corresponding technical effects.

For example, if the algorithm in the claim is applied to a specific technical field and can solve a specific technical problem, then it can be considered that the algorithmic features and the technical features functionally support each other and have an interaction relationship, and the algorithmic features become a part of the technical means adopted. In the inventiveness examination, the contribution of the described algorithmic features to the technical solution shall be considered.

If the algorithm in a claim has specific technical relationships with the internal structure of computer systems, realizes the improvement of the internal performance of the computer systems, improves the hardware computing efficiency or execution effects, including reducing the amount of data storage, reducing the amount of data transmission, improving the speed of hardware processing, etc., then it shall be considered that the algorithmic features and the technical features functionally support each other and have an interaction relationship. In the inventiveness examination, the contribution of described algorithmic features to the technical solution shall be considered.

If the implementation of features of rules and methods for business in a claim requires an adjustment or improvement of technical means, then it shall be considered that the features of rules and methods for business and the technical

features functionally support each other and have an interaction relationship. In the inventiveness examination, the contribution of described features of rules and methods for business to the technical solution shall be considered.

If the solution of an invention application shall bring about an improvement in user experience, and the improvement of user experience is brought about or generated by technical features, or by a combination of technical features and algorithmic features or features of rules and methods for business that functionally support each other and have an interaction relationship with the technical features, it shall be considered in the inventiveness examination.

D. Enablement requirement/Sufficiency of disclosure, Claims supported by the description
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The patent system is designed to promote protection of inventions by granting an exclusive right, i.e. a patent right, under predefined conditions for a predefined period of time to a person who has developed and disclosed novel technology or techniques, and to give third parties an opportunity to gain access to the inventions by virtue of disclosure of technical details of the inventions. As such, the requirement that an invention be sufficiently disclosed is one of the fundamental underpinnings of the patent system.

(JPO)

At the JPO, Article 36(4) JPA stipulates that the description serves as the technical document which gives third parties an opportunity to gain access to the invention. If the statement in the description is not clear, its role of disclosure is undermined, which in turn undermines the very purpose of the patent system. In particular, Article 36(4)(i) JPA requires that "the statement shall be clear and sufficient in such a manner as to enable any person ordinarily skilled in the art to which the invention pertains to work the invention". This requirement is known at the JPO as "the enablement requirement".

In addition, Article 36(6)(i) JPA provides that a claimed invention shall be disclosed in the description. The purpose of this requirement, which is known as "support requirement" in the JPO, is to prevent a patent from being granted for an invention which is not disclosed to the public.

In the JPO, the determination on "enablement requirement" (Article 36(4) JPA) and "support requirement" (Article 36(6)(i) JPA) for AI-related inventions shall be made in accordance with "JP Guidelines, Part II, Chap.1, Section 1: enablement requirement" and "JP Guidelines, Part II, Chap.2, Section 2: support requirement" as with the determination on "enablement requirement" and "support requirement" for other inventions.

The examiner determines the "enablement requirement" for each claim. In making that determination, if a person skilled in the art who intends to carry out the claimed invention cannot understand how to carry out the invention on the basis of teachings in the description and drawings relevant to the invention as well as the common general technical knowledge at the time of filing, such a description is determined as being insufficient for the person skilled in the art to carry out the invention.

Also, if it is necessary to make trials and errors, and/or complicated and sophisticated experimentation beyond the extent to which a person skilled in the art should be reasonably expected to do so as to find out how to carry out the invention, then such a description is regarded as not being described to such an extent that the person skilled in the art can carry out the invention.

Several types of violation of the enablement requirement exist (see JP Guidelines, Part II, Section 1, 3.2), and one of the types of "violation of enablement requirement because of part of claimed invention, which cannot be carried out, other than embodiments" exists "cases where a claim is directed to a generic concept but embodiments only of a part of more specific concepts encompassed by the generic concept are stated in the description in a manner that only the specific concepts can be carried out"(see JP Guidelines, Part II, Section 1, 3.2.1(1)).

In this case, if both (i) and (ii) below apply, the statements in the description do not satisfy the enablement requirement when:

(i) a claim is directed to a generic concept but embodiments only of a part of more specific concepts encompassed by the generic concept are stated in the description in a manner that only the specific concepts can be carried out;

and (ii) there is a well-founded reason to find that other specific concepts encompassed by the same generic concept are not stated clearly and sufficiently in such a manner as to enable a person skilled in the art to carry out the invention of the other specific concepts based solely upon the embodiments directed to the specific concepts stated even in light of the common general knowledge at the time of filing. It should be noted that methods of experimentation and analysis may be included in the common general knowledge.

In addition, it is determined whether the statement in the claims satisfies the support requirement by comparing the claimed invention and the invention stated in the description. In performing this comparison, the examiner examines a substantial correspondence between the claimed invention and the invention stated in the description regardless of the consistency of expression.

Then, the consideration of the substantial correspondence done by the examiner is to examine whether or not the claimed invention exceeds "the extent of disclosure in the description to which a person skilled in the art would recognize that a problem to be solved by the invention would be actually solved". When it is determined that the claimed invention exceeds "the extent of disclosure in the description," the claimed invention and the invention disclosed in the description do not substantially correspond with each other, and thus, the statement in the claims does not satisfy the support requirement.

Here, in the JPO, it is common that a training data containing multiple types of data for machine learning of AI is used in inventions taking advantage of AI-related technology in various technical fields. Any of the following conditions is essential for such cases to be determined to satisfy the description requirements of description and claims (enablement requirement and support requirement):

the condition where it can be recognized that there is a certain relation such as a correlation among the multiple types of data based on the disclosure in the description (hereinafter referred to as "correlation, etc."),

the condition where it can be presumed that there is a certain relation such as a correlation among the multiple types of data in view of common general technical knowledge⁷.

In addition, inventions of product which is presumed to have a certain function because of AI cannot satisfy the description requirements without an embodiment in which an evaluation on the function is made using a product that has actually been made, unless an estimation result by AI can be a substitution for an evaluation on a product that has actually been made⁸.

(CNIPA)

At the CNIPA, Article 26.3 Chinese Patent Law provides that the description shall set forth the invention or utility model in a manner sufficiently clear and complete so as to enable a person skilled in the art to carry it out.

The description shall set forth the invention or utility model in a manner sufficiently clear and complete to such an extent that a person skilled in the art can carry it out. In other words, the description shall comply with the requirement of disclosing the invention or utility model sufficiently.

The description shall enable a person skilled in the art to carry out the invention or utility model. It means that the person skilled in the art can, in accordance with the contents of the description, carry out the technical solution of the invention or utility model, solve the technical problem, and achieve the expected technical effects.

The description shall clearly set forth the technical solution of the invention or utility model, describe in detail the specific modes for carrying out the invention or utility model, and entirely disclose the technical contents necessary for understanding and carrying out the invention or utility model, to such an extent that a person skilled in the art can carry out the invention or utility model. The following are examples of the circumstances in which the technical solution described in the description is regarded as unable to be carried out due to lack of technical means to solve the technical problem:

(1) the description sets forth only a task and/or an assumption, or simply expresses a wish and/or a result, providing no technical means that a person skilled in the art can implement;

(2) the description sets forth a technical means, but the means is so ambiguous and vague that a person skilled in the art cannot concretely implement it according to the contents of the description;

(3) the description sets forth a technical means, but a person skilled in the art cannot solve the technical problem of the invention or utility model by adopting said means;

⁷ See ["Case Examples on AI-Related Technologies."](#) However, the description does not necessarily need to disclose a certain relation such as a specific correlation among multiple types of data (see Case 46, Case 47, Case 48, Case 49, and Case 50 of "1. Description Requirements" of [Annex A in the JPHB](#) for the relevant case examples).

⁸ See Case 51 of "1. Description Requirements" of [Annex A in the JPHB](#)

(4) the subject matter of an application is a technical solution consisting of several technical means, but one of the means cannot be implemented by a person skilled in the art according to the contents of the description; and

(5) the description sets forth a concrete technical solution but without experimental evidence, while the solution can only be established upon confirmation by experimental result. For example, in general, the invention of a new use for a known compound requires experimental evidence in the description to validate the new use and effects thereof; otherwise, the requirement of enablement cannot be met.

At the CNIPA, Article 26.4 Chinese Patent Law provides that the claims shall be supported by the description and shall define the extent of the patent protection sought for in a clear and concise manner.

"The claims shall be supported by the description" means that the technical solution for which protection is sought in each of the claims shall be a solution that a person skilled in the art can reach directly or by generalization from the contents sufficiently disclosed in the description, and shall not go beyond the scope of the contents disclosed in the description.

Claims are usually generalizations from one or more embodiments or examples as set forth in the description. The generalization of a claim shall not go beyond the scope of the contents disclosed in the description. If the person skilled in the art can reasonably predict that all the equivalents or obvious variants of the embodiments set forth in the description have the same properties or uses, then the applicant shall be allowed to generalize the protection extent of the claim to cover all the equivalents or obvious variants.

For claims generalized in generic terms or by parallel options, the examiner shall examine whether the generalization can be supported by the description. Where the generalization of a claim includes contents speculated by the applicant and the effect thereof is difficult to determine or evaluate beforehand, the generalization shall be regarded as going beyond the scope of the contents disclosed in the description. If the generalization of a claim is such that the person skilled in the art can reasonably doubt that one or more specific terms or options included in the generic terms or parallel options cannot solve the technical problem aimed to be solved by the invention or utility model and achieve the same technical effects, then it shall be taken that the claim is not supported by the description.

Technical feature defined by function in a claim shall be construed as embracing all the means that are capable of performing the function. For claim containing a feature defined by function, whether the definition by function can be supported by the description shall be examined. If the function is carried out in a particular way in the embodiments of the description, and the person skilled in the art would not appreciate that the function could be carried out by other alternative means not described in the description, or the person skilled in the art can reasonably doubt that one or more means embraced in the definition by function cannot solve the technical problem aimed to be solved by the invention or utility model and achieve the same technical effect, then the definition by function as embracing the other alternative means or means incapable of solving the technical problem shall not be allowed in the claim.

Furthermore, if the description merely states in vague terms that other alternative means may be adopted, but the person skilled in the art cannot understand what they might be or how they might be used, then definition by function in the claims is not permitted. In addition, claim of pure functional definition cannot be supported by the description, and therefore is not permitted.

At the CNIPA, the specific requirements for drafting the description and the claims of an invention application relating to computer programs are described in CNIPA Guidelines, Part II, Chap. 9, Section 5.

In principle, the requirements for drafting the description and the claims of an invention application relating to computer programs are the same as those for drafting the description and the claims of invention applications in other technical fields.

The description of an invention application relating to computer programs shall, in addition to outlining the technical solution of the invention as a whole, illustrate the concept of design and the technical features of the computer program concerned and the mode of exploitation to produce the technical effect in a clear and complete manner. In order to outline the main technical features of the computer program clearly and completely, the principal flow chart of the computer program shall be presented in the drawings of the description. An explanation of every step of the computer program shall be made in the description in natural language based on the said flow chart in chronological order. The main technical features of the computer program shall be described in the description to such extent that a person skilled in the art can, on the basis of the flow chart presented in the description and explanation thereof, produce the computer program capable of producing the technical effect as described in the description. In order to describe clearly, where necessary, the applicant may briefly extract some important parts from the computer source program, in marked program language that is customarily used, to serve as a reference, but it is not necessary to provide the whole source program.

If an invention application relating to computer programs includes contents concerning changing the hardware structure of computer devices, the hardware entity structure graph of the said computer devices shall be presented in the drawings of the description, and the component parts of the hardware of the said computer devices and the mutual relationships thereof shall be described in the description, based on the said hardware entity structure graph, in clear and complete manner so as to enable a person skilled in the art to carry out the invention.

The claims of an invention application relating to computer programs may be drafted as process claim or product claim, i.e., the apparatus for executing the process. No matter what kind of claim it is drafted as, the claim shall be supported by the description, represent the technical solution of the invention in its entirety and outline the essential technical features for resolving the technical problems, and do not only describe resumptively the functions of the computer program and the effects produced by the functions. If it is drafted as a process claim, the various functions to be performed by the computer program and the way to perform the functions shall be described in detail according to the steps of the process. If it is drafted as an apparatus claim, the various component parts which can include hardware and software and the connections among them shall be specified.

If an apparatus claim is drafted on the basis of computer program flow completely and according to the way completely identical with and corresponding to each step in the said computer program flow, or according to the way completely identical with and corresponding to the process claim reflecting the said computer program flow, i.e., each component in the apparatus claim completely corresponds to each step in the said computer program flow or each step in the said process claim, then each component in the apparatus claim shall be regarded as program modules which are required to be built to realize each step in the said computer program flow or each step in the said method. The apparatus claim defined by such a group of program modules shall be regarded as the program module architecture to realize the said solution mainly through the computer program described in the description rather than entity devices to realize the said solution mainly through hardware.

Further detailed requirements for the drafting of the description and claims of an invention application that contains algorithmic features or features of rules and methods for business are presented in CNIPA Guidelines, Part II, Chap. 9, Sections 6.3.1 and 6.3.2.

Description of an invention application that contains algorithmic features or features of rules and methods for business shall clearly and completely set forth the adopted technical solution to solve its technical problem. On the basis of containing technical features, the solution may further contain algorithmic features or features of rules and methods for business that functionally support each other and have an interaction relationship with the technical features.

Description shall set forth how the technical features and algorithmic features or features of rules and methods for business that functionally support each other and have an interaction relationship with the technical features work together to produce advantageous effects. For example, when algorithmic features are included, the abstract algorithm should combine with the specific technical field, and the definition of at least one of the input parameters and related output results should be corresponded to the data of the specific technical field; when features of rules and methods for business included, the entire process to solve the technical problem shall be described and explained in detail, so that the person skilled in the art shall, in accordance with the contents of the description, carry out the technical solution of the invention.

The description shall clearly and objectively set forth the advantageous effects of the invention compared with the prior art, e.g. improvements in quality, accuracy or efficiency, improvement in the internal performance of the system, etc. If the user experience is objectively improved from the user's perspective, it shall also be stated in the description. At this time, the description shall also set forth how the improvement of the user experience is jointly brought about or produced by the technical features that constitute the invention and the algorithmic features or features of rules and methods for business that functionally support each other and have an interaction relationship with the technical features.

The claims of an invention application containing algorithmic features or features of rules and methods for business shall be supported by the description and shall define the extent of patent protection in a clear and concise manner. The claims shall record the technical features, the algorithmic features or features of rules and methods for business

that functionally support each other or have an interaction relationship with the technical features.

E. General characteristics of examination results

In general, patents on AI-related inventions can be granted by both the JPO and the CNIPA. The laws applied by the JPO and the CNIPA impose similar substantive requirements on obtaining patents for AI-related inventions.

This chapter compares the general characteristics of examination results in the JPO and the CNIPA for determination of each patent requirement.

(1) Eligibility

(JPO)

Article 2(1) JPA defines an invention as "the highly advanced creation of technical ideas utilizing the laws of nature". In essence, whether a software-related invention is an invention within the meaning of Article 2(1) JPA is assessed by having regard to the claim as a whole.

As a result of this positive definition of what constitutes an invention, the manner in which the JPO examines whether a claimed software-related invention satisfies this definition is conducted by the following two steps (for details, see (JPO) of "A. Eligibility" in Chapter II.)

For the first step, if the claim as a whole does not utilize the laws of nature, it is not an invention within the meaning of Article 2(1) JPA. Also, since the claim is considered as a whole, it may be that a claim is not eligible, i.e., excluded from patentability, even if some parts of the claimed subject-matter could be said to utilize the laws of nature. However, the claimed subject-matter can be considered a creation of a technical idea utilizing the laws of nature, for example, when an invention processes information based on either the control of another apparatus or based on the technical properties of an object. If the outcome of this first step is positive, the JPO continues with the examination on novelty and inventive step.

For the second step, even if an invention is not acknowledged at the first step, there can still be an invention within the meaning of Article 2(1) JPA. Here, the JPO performs a review of the claimed subject-matter according to "the idea based on the standpoint of software". This criterion is satisfied as long as the claim defines "information processing by software that is specifically implemented using hardware resources".

In other words, computing or processing of specific information must be implemented with specific means or a specific process whereby software and hardware cooperate in accordance with the purpose of use of the claimed subject-matter. Where it cannot be clearly identified which hardware resource specifically enables information processing for each function mentioned in the claim, the JPO could assess that the claimed subject-matter does not constitute an invention, even if the claim explicitly refers to hardware resources, such as a "computer".

If the outcome of the second step is positive, the JPO continues with the examination on novelty and inventive step. And, if the outcome of the first step or the second step is

negative, the JPO may exclude the claimed subject matter from the examination on novelty and inventive step⁹.

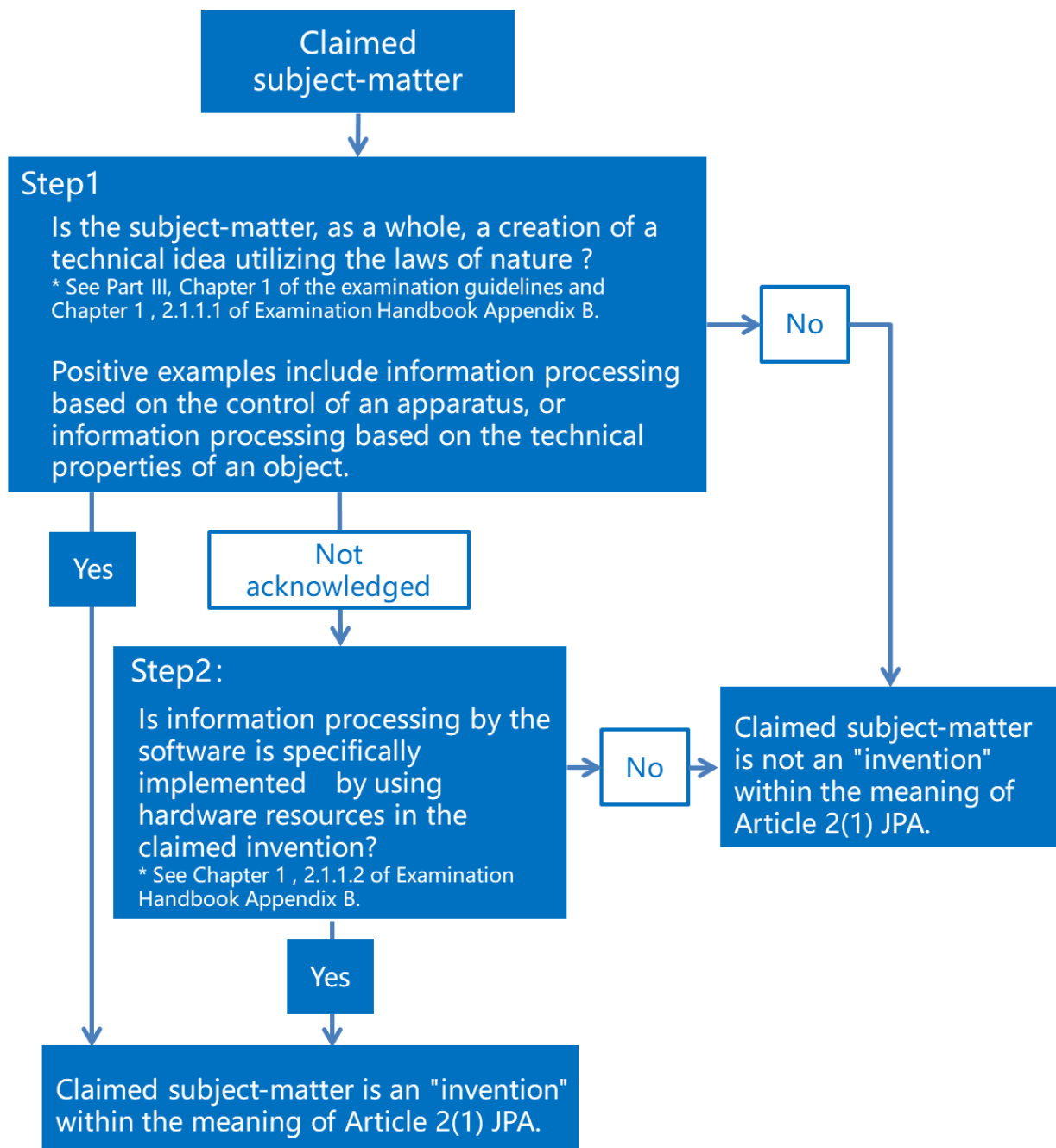


Figure 1: JPO's process for determining whether an AI-related invention is a statutory "invention"

(CNIPA)

⁹ For the points that may be excluded from the examination on novelty and inventive step, see JP Guidelines Part I, Chap. 2, Section 2, 2.3 "Inventions that may be excluded from the subject of search".

In the CNIPA, Article 25.1 CPL (Chinese Patent Law) lists the subject matter excluded from patent protection. The subject matter about the rules and methods for mental activities is provided by Article 25.1(2). Further explanations and examples are provided in the CNIPA Guidelines, Part II, Chap. 1, Section 4. The CNIPA Guidelines also provide a non-exhaustive list of rules and methods which are regarded as mental activities. The examples include: mathematical theories and methods of conversion; rules and methods of various games or entertainment; methods of deduction, inference, or operations; methods and systems of managing organization, production, commercial activities or the economy, etc.; computer programs per se; and methods of presenting information.

Article 2.2 CPL defines "invention". "Invention" means any new technical solution relating to a product, a process or improvement thereof. The CNIPA Guidelines, Part II, Chap. 1, Section 2, state: a technical solution is an aggregation of technical means applying the laws of nature to solve a technical problem. Usually, technical means are embodied as technical features. A solution that does not adopt technical means to solve a technical problem and thereby does not achieve any technical effect in compliance with the laws of nature does not constitute a subject matter as defined in Article 2.2 CPL.

For AI-related inventions, If the data processed by AI algorithm is the data with exact technical meanings in a technical field, and the execution of the algorithm can directly reflect the process of solving a technical problem by applying the laws of nature and obtain technical effects, or the algorithm has specific technical associations with the internal structure of computer systems, and can solve the technical problems on how to improve the hardware computing efficiency or execution effects, including reducing the amount of data storage, reducing the amount of data transmission, improving the speed of hardware processing, etc., so as to obtain the technical effects of improving the internal performance of computer systems in conformity with the laws of nature; or if the solution of a claim deals with big data in a specific application field, mines the internal association relationships in the data in conformity with the laws of nature, using classification and clustering, regression analysis, neural network, etc., so as to solve technical problems on how to improve the reliability or accuracy of big data analysis in a specific application field, and obtain corresponding technical effects, then the solution defined in the claim is the technical solution as provided for in Article 2.2 CPL¹⁰.

The approach for determining whether an AI-related invention is the subject matter for which patent protection may be sought is as follows: an AI-related invention generally contains features of algorithms, so it is necessary to first determine whether it belongs to

¹⁰ The relevant examination standards to determine whether the solution of a claim involving Big data, AI is a technical solution are presented in Section 6.1.2, Chapter 9, Part II, CNIPA Guidelines. The specific content is as follows:

If the solution of a claim involves the improvement of deep learning, classification and clustering and other artificial intelligence, big data algorithm, the algorithm has specific technical associations with the internal structure of computer systems, and can solve the technical problems on how to improve the hardware computing efficiency or execution effects, including reducing the amount of data storage, reducing the amount of data transmission, improving the speed of hardware processing, etc., so as to obtain the technical effects of improving the internal performance of computer systems in conformity with the laws of nature. Thus, the solution defined in the claim is the technical solution as provided for in Article 2.2 CPL.

If the solution of a claim deals with big data in a specific application field, mines the internal association relationships in the data in conformity with the laws of nature, using classification and clustering, regression analysis, neural network, etc., so as to solve technical problems on how to improve the reliability or accuracy of big data analysis in a specific application field, and obtain corresponding technical effects, then the solution defined in the claim is the technical solution as provided for in Article 2.2 CPL.

the rules and methods for mental activities as provided for in Article 25.1(2) CPL. When a claim as a whole includes not only rules and methods for mental activities but also technical features, it does not belong to the rules and methods for mental activities as provided for in Article 25.1(2) CPL.

The CNIPA should further consider the three important elements of technical issue, which are technical problem, technical means, and technical effect, and judge whether the invention belongs to the technical solution described in Article 2 (2) of the CPL as a whole.

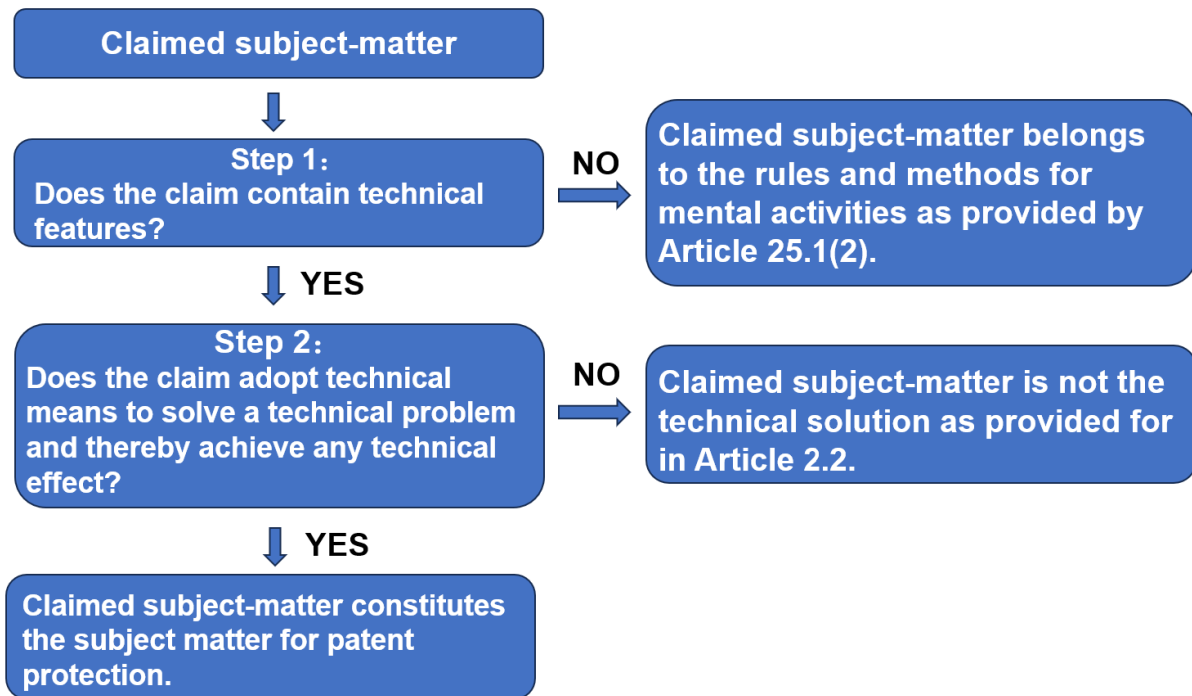


Figure 2: The CNIPA's process for determining whether an AI-related invention is a subject-matter for patent protection.

(The JPO and the CNIPA comparison results)

Both the JPO and the CNIPA give positive definitions of the term "invention", relating to Article 2(1) JPA and Article 2.2 CPL respectively. Moreover, in both jurisdictions, a claim is regarded as a whole when assessing whether AI-related invention is a statutory "invention". As comparing the usual approaches for determining eligibility to an AI-related inventions in the JPO and the CNIPA, it is found as follows:

In the JPO, in the second step above, if it is recognized that a specific information processor or an operation method thereof depending on the intended use is constructed through cooperation of software and hardware resources, then eligibility shall be recognized without determining whether the intended use is technical or not.

In the CNIPA, firstly, the unpatentable subject-matter is listed through Article 25.1 CPL, and then the "invention" is further defined from the positive aspect. However, in the JPO, the assessment is only made from the positive definition of the statutory "invention" of Article 2(1) JPA¹¹ (see Figures 1 and 2 for a comparison of the specific approaches of assessment in the JPO and the CNIPA).

In the CNIPA, the presence of "technical features" is considered crucial, and if no "technical features" exists, eligibility is determined to be denied according to Article 25.1 CPL. In addition, if the invention does not have "technical problem", "technical means" or "technical effect", eligibility will be determined to be denied according to Article 2(2) CPL.

This difference is particularly prominent in Case A-3. The JPO has determined, for this case, that specific calculation or processing of information depending on the intended use has been implemented by concrete means or procedures on which software and hardware resources cooperate based on considering "establishing a mathematical model consisting of target classification model and target feature extraction model" as its intended use and thus has found eligibility.

The CNIPA, however, has determined that this solution does not constitute the subject matter for patent protection. The reason for the determination is that it does not solve a technical problem, does not apply technical means in conformity with the laws of nature, and does not obtain a technical effect. Although the establishment of a mathematical model is processed by a computer in this solution, the computer is just a device to carry out the solution, and the establishing process of the model neither improves the internal performance of the computer nor causes any technical change to the composition or function of the computer.

* For details on claims pertaining to data, please refer to "Eligibility of Claims Pertaining to Data" in "(4) Other Special Notes".

(2) Novelty and Inventive Step

Comparing the approaches to determining novelty and inventive step in the JPO and the CNIPA, there are noticeable similarities between the approaches of both offices. That is, for specifying software-related inventions as well as other inventions, in determining novelty and inventive step, both the JPO and the CNIPA always take into account the statements described in the claims.

(JPO)

Regarding the approach for determining inventive step, the JPO considers the claims as a whole, no matter whether the features disclosed in the claims contribute to the

¹¹ Based on the definition, with regard to the JPO, a list of ineligible subject-matter not falling under the definition of a statutory "invention" is described in JP Guidelines, Part III, Chap. 1, 2.1. See the table of Part II, Chap. A.

technical features of the invention. The JPO examiner selects the prior art most suitable for the reasoning (referred to as "the primary prior art") and determines whether it is possible to reason that a person skilled in the art would easily arrive at the claimed invention from the primary prior art by four steps (See Chapter II . C.).

(CNIPA)

Regarding the approach for determining inventive step, the CNIPA needs to evaluate whether the invention has prominent substantive features and represents a notable progress as compared with the prior art. Usually the following three steps are followed to determine whether a claimed invention has prominent substantive features. (1)Determining the closest prior art. (2)Determining the distinguishing features of the invention and the technical problem actually solved by the invention.(3)Determining whether or not the claimed invention is obvious to a person skilled in the art. When evaluating whether an invention has a notable progress, the main consideration is whether the invention can produce advantageous technical effect.

When examining the inventive step of an invention that contains both technical features and algorithmic features or features of rules and methods for business, the algorithmic features or features of rules and methods for business that functionally support each other and have an interaction relationship with the technical features should be considered together with the technical features as a whole. "Functionally support each other and have an interaction relationship" means that the algorithmic features or features of rules and methods for business are closely combined with technical features, which together constitute a technical means to solve a technical problem, and can obtain corresponding technical effects.

(The JPO and the CNIPA comparison results)

Therefore, a comparison of the usual approach for determining inventive step for AI-related inventions in the JPO and the CNIPA shows that the difference is that the JPO considers all the claimed features without being divided it into technical and algorithmic features while assessing inventive step, and in cases B-1 to B-5 concerning inventive step, there is no mention in the JPO's explanation about dividing the claimed features into technical and algorithmic features.

The CNIPA considers all the features recorded in the claims, including technical and algorithmic features. The CNIPA also considers the relationship between algorithmic features and technical features. If algorithmic features are closely combined with technical features to form technical means to solve a certain technical problem, and can achieve corresponding technical effect, then the algorithmic features become a component of the adopted technical means, and the contribution of the algorithmic features to the technical solution should be considered. Therefore, compared to the JPO, the CNIPA's inventive step judgment is more complicated.

However, if claimed subject matters are all considered as technical features in the CNIPA, the determination on inventive step is unlikely to differ significantly for AI-related inventions, or for other inventions. The examiner starts from an prior art that is most suitable/closest for reasoning, further judges inventiveness based on the differences between the claimed invention and the prior art, analyzes inventive step on the basis of other prior arts or common knowledge, etc. In the process of inventive-step judgment, the following aspects are all considered: the motivation to apply other prior art to the most suitable/closest prior art, advantageous effect, and whether there is technical barrier.

Both the JPO and the CNIPA consider the relevance of the technical fields and the similarity of problem solved when selecting reference documents and motivation to combine. In fact, for all cases from B-1 to B-5, the results as to inventive step were consistent between the JPO and the CNIPA.

Here, the similarities between determinations on inventive step for AI-related inventions in both offices include at least the following:

[Types that involve an inventive step]

Both the JPO and the CNIPA tend to determine the following types as involving inventive step.

➤ To solve a certain technical problem, the addition of the training data used for learning is not disclosed in reference documents, nor is it common knowledge (see Pattern 1 of Claim 2 in Case B-1).

➤ New AI-related technologies not found in prior art search are used (see Case B-3 and B-5).

[Types that do not involve an inventive step]

Both the JPO and the CNIPA tend to assess AI-related inventions that fall under the following types as lacking inventive step.

➤ Mere a modification of method for estimating output data based on input data , and the method is disclosed in reference documents, or it is common knowledge(see Claim 1 in Case B-1).

➤ Addition of training data used for machine learning is mere a combination of known data, and the technical effect achieved can be expected by the person skilled in the art (see Pattern 2 of Claim 2 in Case B-1, and see Case B-2).

➤ The person skilled in the art has the motivation to replace the AI-related technology of the cited invention with other known AI-related technology, and can expect the technical effect achieved(see Case B-4).

(3) Description/claims requirements (Enablement requirement/Sufficiency of disclosure, Claims supported by the description)

For a detailed explanation of the laws, regulations, and examination standards of both offices regarding description and claims requirements, see Chapter II, D " Enablement requirement/Sufficiency of disclosure, Claims supported by the description ". While similarities are found in legal requirements and results of the cases with respect to Enablement requirement (JPO) /sufficiency of disclosure (CNIPA), Claims supported by the description, some differences exist as follows:

(3-1) Enablement requirement/Sufficiency of disclosure

(JPO)

Article 36(4)(i) JPA provides that the statement shall be clear and sufficient in such a manner as to enable any person ordinarily skilled in the art to which the invention pertains to work the invention.

The JPO determines for each claim whether "a person skilled in the art who intends to carry out the claimed invention cannot understand how to carry out the invention on the basis of teachings in the description and drawings relevant to the invention as well as the common general technical knowledge at the time of filing" and decides whether to notify reasons for refusal on the enablement requirement for each claim.

Then, in determining the enablement requirement, if "cases where a claim is directed to a generic concept but embodiments only of a part of more specific concepts encompassed by the generic concept are stated in the description in a manner that only the specific concepts can be carried out," i.e. if the following conditions are met, the description in the detailed description of the invention is determined not to satisfy the enablement requirement.

(i) a claim is directed to a generic concept but embodiments only of a part of more specific concepts encompassed by the generic concept are stated in the description in a manner that only the specific concepts can be carried out;

and (ii) there is a well-founded reason to find that other specific concepts encompassed by the same generic concept are not stated clearly and sufficiently in such a manner as to enable a person skilled in the art to carry out the invention of the other specific concepts based solely upon the embodiments directed to the specific concepts stated even in light of the common general technical knowledge at the time of filing. It should be noted that methods of experimentation and analysis may be included in the common general technical knowledge.

(CNIPA)

Article 26.3 CPL provides that the description shall set forth the invention in a manner sufficiently clear and complete so as to enable a person skilled in the art to carry it out. “enable a person skilled in the art to carry it out “ means that the person skilled in the art can, in accordance with the contents of the description, carry out the technical solution of the invention, solve the technical problem, and achieve the expected technical effects.

(The JPO and the CNIPA comparison results)

Article 36(4)(i) JPA corresponds to Article 26.3 CPL, and both of which relate to the requirements for the description, which requires that description shall be clear and sufficient to the extent that the invention can be realized.

Such a difference between the JPO and the CNIPA is particularly prominent in Case C-2 "Body Weight Estimation System" and in Case C-3 "Method for Estimating Allergy Incidence Rate of Test Substance".

The JPO determines the enablement requirement for each claim. Regarding claim 1 of Case C-2, if a specific claim (Claim 1) is directed to a generic concept (body weight estimation using any feature value representing a face shape) but only embodiments of a part of more specific concepts encompassed by the generic concept, which is estimation of body weight using face line angles, are described in the description in a manner that only the specific concepts can be carried out, and other specific concepts encompassed by the same generic concept are not stated clearly and sufficiently in such a manner as to enable a person skilled in the art to carry out the invention of the other specific concepts based solely upon the embodiments directed to the specific concepts (estimation of body weight using face line angles) stated even in light of the common general technical knowledge at the time of filing, the JPO determines that the enablement requirement is not satisfied.

However, in practice of the CNIPA, the main consideration is whether the content of the description related to the solutions claimed by claims is sufficiently disclosed. The description in Case C-2 clearly records that there is a statistically significant correlation between a cosine of a face-outline angle and BMI (defined as a body weight divided by the square of a body height), and on the premise that a cosine of a face-outline angle is presumptively statistical correlated with BMI of a person, a person skilled in the art can

realize the technical solution of the invention in accordance with the specific mode for carrying out the invention described in the description, solve said technical problem, and conveniently estimate a body weight without a body weight scale, thus achieve the expected technical effects. Therefore, description is sufficiently disclosed.

The same reason for the difference arises for Case C-3.

As to the experimental data submitted by the applicant in Case C-4. When description discloses the invention insufficiently, the CNIPA needs to comprehensively determine whether to accept the experimental data submitted by the applicant based on the information given by the invention and the specific content of the supplementary experimental data submitted by the applicant, so as to further determine whether the insufficient disclosure in the description has been overcome.

In the JPO, when, due to an insufficient statement in the description, the statement in the description cannot be regarded to be clear and sufficient in such a manner as to enable a person skilled in the art to carry out the claimed invention even in light of the common general knowledge at the time of filing, the reason for refusal cannot be overcome even though the applicant submits a certificate of experimental results after filing of the application to make up for such a deficiency and thereby argues that the statement is clear and sufficient. On the other hand, the applicant may, in a written opinion, point out the common general knowledge, etc. at the time of filing other than those that were taken into account by the examiner when making a determination, and argue that, in light of such common general knowledge, the statement in the description can be regarded to be clear and sufficient enough for a person skilled in the art to carry out the claimed invention. The applicant may also submit a certificate of experimental results to support such an argument presented in the written opinion.

[Types that satisfy Enablement requirement/Sufficiency of disclosure]

Both the JPO and the CNIPA tend to determine the following types as satisfying enablement requirement/sufficiency of disclosure.

- Inventions in which a specific correlation, etc. among multiple types of data in a training data are not disclosed in the description, but it is presumable that there is such a correlation, etc. in view of the common general technical knowledge at the time of filing (see Case C-1).
- Inventions in which an explanation or statistic information in the description supports a correlation, etc. among multiple types of data in a training data (see Claim 2 in Case C-2).
- Inventions in which a performance evaluation of an actual AI model supports the presence of a correlation, etc. among multiple types of data in a training data (see Claim 2 in Case C-3).

[Types that does not satisfy Enablement requirement/sufficiency of disclosure]

- JPO: Inventions in which the description, etc. does not support the presence of correlation, etc. between multiple types of data included in the training data described as the generic concept, and it cannot be inferred that any such correlation, etc. exists between them in view of the common general technical knowledge at the time of filing (see Claim 1 in Case C-2, Claim 1 in Case C-3).
- JPO: A claimed invention of a product is estimated to have a certain function by AI, but the invention of the product is not evaluated by making the actual product, and an estimation accuracy of an estimated value indicated by the trained model is not verified, and it cannot be said that there is such common general technical knowledge that an estimation result by AI can be a substitution of an evaluation result on an actually-produced product at the time of filing (see Case C-4).
- CNIPA: The description sets forth a concrete technical solution but without experimental evidence, while the solution can only be established upon confirmation by experimental result (see Case C-4).

(3-2) Claims supported by the description

(JPO)

Article 36(6)(i) JPA provides that a claimed invention shall be disclosed in the description. If the claimed invention exceeds “the extent of disclosure in the description to which a person skilled in the art would recognize that a problem to be solved by the invention would be actually solved”, the claims do not satisfy the support requirement.

(CNIPA)

Article 26.4 CPL provides that the claims shall be supported by the description and shall define the extent of the patent protection sought for in a clear and concise manner. The technical solution for which protection is sought in each of the claims shall be a solution that a person skilled in the art can reach directly or by generalization from the contents sufficiently disclosed in the description, and shall not go beyond the scope of the contents disclosed in the description.

(The JPO and the CNIPA comparison results)

Article 36(6)(i) JPA corresponds to Article 26.4 CPL, and both of which relate to claims. Both the JPO and the CNIPA require that the claims shall not go beyond the scope of the contents disclosed in the description.

The similarities and differences in determination on “claims supported by the description” for AI-related inventions include at least the following:

In the JPO, enablement requirement and support requirement (claims supported by description) are different in their purposes and also in determination thereof. Therefore, the examiner should keep in mind that a violation of the enablement requirement does not necessarily mean a violation of the support requirement, nor does a violation of the support requirement necessarily mean a violation of the enablement requirement.

With these in mind, regarding AI-related inventions, if the description on a claim falls under the above types* and fails to satisfy the enablement requirement, it is highly likely determined that the claimed invention will also fails to satisfy the support requirement because it exceeds "the scope described so that a person skilled in the art can carry out the claimed invention in the detailed description of the invention" (see Claim 1 in Case C-2, Claim 1 in Case C-3, Case C-4).

* Types that are described in (3-1) [Types that does not satisfy Enablement requirement/Sufficiency of disclosure]

In the CNIPA, it is generally considered whether the claims are supported by the description only when the description discloses the invention sufficiently. If the description does not disclose the invention sufficiently, it is generally no longer considered whether the claims are supported by the description (see Case C-4).

➤ For claims generalized in generic terms, the examiner shall examine whether the generalization can be supported by the description. Where the generalization of a claim includes contents speculated by the applicant and the effect thereof is difficult to determine or evaluate beforehand, the generalization shall be regarded as going beyond the scope of the contents disclosed in the description. If the generalization of a claim is such that the person skilled in the art can reasonably doubt that one or more specific terms or options included in the generic terms cannot solve the technical problem aimed to be solved by the invention and achieve the same technical effects, then it shall be taken that the claim is not supported by the description (see Claim 1 in Case C-2, Claim 1 in Case C-3).

(4) Other Special Notes

➤ Eligibility of Claims Pertaining to Data

Both the JPO and the CNIPA do not necessarily exclude data from eligibility, but the practices of the examination on eligibility are different.

(JPO)

In the JPO, what is accepted as a software as equivalent to a program is not data itself, but data with a structure that has similar properties to a computer program, i.e., the data prescribe the processing performed by the computer¹².

And, if the structured data is recognized as equivalent to a program, it is, as described in (JPO) of (1) Eligibility, possible to evaluate whether the invention is an "invention" within the meaning of Article 2(1) JPA by using "the idea based on the standpoint of software", in Step 2, in addition to Step 1 of the JPO approach, and thus the invention is more likely to qualify as an invention than if it were not recognized as equivalent to a program, i.e., easier to be recognized as an "invention" within the meaning of Article 2(1) JPA.

However, if the data is not recognized as equivalent to a program and the subject matter of data is characterized only by the content of the information presented, then eligibility is not satisfied.

In addition, a "data structure" is an acceptable claim format regardless of whether the structured data or a data structure is stored on a medium or not.

(CNIPA)

In the CNIPA, for a claim in which the title of the subject matter is "data", if all the features of the claim only involve the "training data" itself (e.g. specific numerical values or feature values of the training data), which means the claim does not have any technical features, it is only a method of presenting information. Then it belongs to the rules and methods of mental activities as provided for in Article 25.1(2) CPL, and does not constitute the subject matter of patent protection.

However, except for the title of the subject matter, the features of the claim also contain technical feature, so the claim does not belong to the "training data" itself, and therefore does not belong to the rules and methods of mental activities as provided for in Article 25.1(2) CPL. Furthermore, if the claim states technical means applying the laws of nature to solve technical problems, and thereby obtains technical effects in conformity with the laws of nature, the solution defined by the claim is the technical solution as provided for in Article 2.2 CPL and constitutes the subject matter of patent protection.

¹² "Structured data" and "data structure" which have features similar to those of a program in that they define the processing of a computer. See Chapter II, A "Eligibility," "3. Approach for assessing whether an AI-related invention is a statutory "invention" or excluded/ineligible subject-matter" (JPO).

(JPO and CNIPA comparison results)

A notable case related to this difference between the JPO and the CNIPA is Case A-2 (Sugar Content Data of Apples and a Method for Predicting Sugar Content Data of Apples), in which both offices differ in their determination on eligibility of the inventions with regard to claims 1 and 2, in which the title of the subject matters of claims are "data".

In the JPO, the fact that the "sugar content data of apples" identified in claim 1 was measured by a portable sugar content sensor for apples which performs reflective near-infrared spectroscopic analysis, and the fact that the "sugar content data of apples" identified in claim 2 was received by a receiving unit of a server and stored in a memory unit of said server are recognized as explanation of the "content" of what the "sugar content data of apples" is like.

Therefore, the claimed subject matter is "sugar content data of apples," and is considered to be a mere presentation of information (those characterized only by the content of the information presented, and those whose primary purpose is to present information). Therefore, the claimed subject matter as a whole is not a creation of the technical idea utilizing the laws of nature and thus does not fall under an "invention" within the meaning of Article 2(1) JPA.

In the CNIPA, although the title of the subject matter of claim 1 is "data", the limited content states that the data was measured by a portable sugar content sensor for apples which performs reflective near-infrared spectroscopic analyses. They are technical features. So, claim 1 is not the data itself. Furthermore, for the whole of claim 1, it states technical means to solve a technical problem, and thereby obtains a technical effect, the solution defined by the claim is the technical solution.

For clarity on the categories of subject matter pertaining to "data," see the following section.

➤ Clarity of categories of "data", "computer programs" and "trained models"

Both the JPO and the CNIPA are similar in that they both require clarification of the categories of claimed inventions.

(JPO)

Here, in the JPO, Article 2(3) JPA stipulates that a computer program, etc. is included in the term a "product", which is one of the categories of inventions.

In addition, if it is clear in consideration of description and drawings as well as common general technical knowledge at the time of filing that the claimed invention is a "program" even though the claimed subject matter is any word other than the "program" (for example, "module", "library", "neural network", "support vector machine" or "model") the

claimed invention is handled as the "program" and the category is clear as an "invention of a product" (see JPHB Annex B, Chap. 1, 1.2.1.2).

Further, even if the claimed subject matter is "data," if it is "structured data" or "data structure" in which the information processing performed by a computer is prescribed by the structure possessed by the data, it is recognized as belonging to the category of "invention of a product" as "equivalent to computer programs" (see JPHB Annex B, Chap.1,1.2.1.1).

(CNIPA)

In the CNIPA, the titles of the subject matter of claims "data", "computer program" and "model" do not indicate clearly whether the claims are product claims or process claims. Therefore, the claims do not comply with the provisions of Article 26.4 CPL about clarity.

(The JPO and the CNIPA comparison results)

See Claims 1 and 4 (model, computer program) in Case A-1 and Claims 1 and 2 (data) in Case A-2 for these differences between both offices.

➤ General information for applicants

(JPO)

The applicant who intends to file a software-related invention with the JPO is required to explicitly disclose the invention as "the creation of technical ideas utilizing the laws of nature" or "information processing by the software realized using hardware resources concretely", which is utilizing the laws of nature as a whole to satisfy the requirement for eligibility in the claim.

In addition, an applicant who intends to file an application with the JPO may file a "program," "data structure," or "model," etc., as a subject matter in the category of an "invention of a product. If the subject matter of the claim is a "program", the category of invention is clearly recognized as an "invention of a product". And even if the subject matter of the claim is a "data structure" or a "model," etc., if it is recognized as "equivalent to a computer program" or a "computer program", the category of the invention is clearly allowed as an "invention of a product".

(CNIPA)

In the CNIPA, the applicant who intends to file an AI-related invention is required to explicitly disclose the invention as "an aggregation of technical means applying the laws of nature to solve a technical problem".

The filed claim can be written as a process claim such as a method for..., or a product claim such as a system for..., an apparatus for..., a computer-readable storage medium, a computer program product.

III. Comparative study of example cases

An overview of the results of the comparative study of example cases is shown below. In the following, O means not refused in terms of excluded or ineligible subject-matter, etc., X means refused.

When assessing inventive step, it is necessary to take the entire state of the art into consideration, but in this comparative study of example cases inventive step is assessed only working from the matter described under the heading "State of the art (prior art, well-known art, etc.)".

A. Eligibility

	Claim	JPO	CNIPA
Case A-1	CL1	O	O
	CL2	O	O
	CL3	O	O
	CL4	O	O
	CL5	O	O
Case A-2	CL1	X	O
	CL2	X	O
	CL3	O	O
Case A-3	CL1	O	X
Case A-4	CL1	O	O
Case A-5	CL1	O	O
Case A-6	CL1	O	O
Case A-7	CL1	O	O

* O : not refused, X : refused.

B. Inventive step

	Claim	JPO	CNIPA
Case B-1	CL1	X	X
	CL2	O/X	O/X
Case B-2	CL1	X	X
Case B-3	CL1	O	O
Case B-4	CL1	X	X
Case B-5	CL1	O	O

* O : not refused, X : refused.

C. Enablement requirement/Sufficiency of disclosure/Claims supported by the description

(Enablement requirement/Sufficiency of disclosure)

	Claim	JPO	CNIPA
Case C-1	CL1	O	O
Case C-2	CL1	X	O
	CL2	O	
Case C-3	CL1	X	O
	CL2	O	
Case C-4	CL1	X	X

* O : not refused, X : refused.

(Claims supported by the description)

	Claim	JPO	CNIPA
Case C-1	CL1	O	O

Case C-2	CL1	X	X
	CL2	O	O
Case C-3	CL1	X	X
	CL2	O	O
Case C-4	CL1	X	-

* O : not refused, X : refused.

A. Eligibility

1. Case A-1

(from JPHB, Annex B, Chap. 1, 3.2, Case 2-14)

Title of invention

Trained Model for Analyzing Reputations of Accommodations

What is claimed is:

Claim 1

A trained model for causing a computer to function to output quantified values of reputations of accommodations based on text data on reputations of accommodations, wherein;

- the model is comprised of a first neural network and a second neural network connected in a way that the said second neural network receives output from the said first neural network;
- the said first neural network is comprised of an input layer to intermediate layers of a feature extraction neural network in which the number of neurons of at least one intermediate layer is smaller than the number of neurons of the input layer, the number of neurons of the input layer and the number of the output layer are the same, and weights were trained in a way each value input to the input layer and each corresponding value output from output layer become equal;
- weights of the said second neural network were trained without changing the weights of the said first neural network; and
- the model causes the computer function to perform a calculation based on the said trained weights in the said first and second neural networks in response to appearance frequency of specific words obtained from the text data on reputations of accommodations input to the input layer of the said first neural network and to output the quantified values of reputations of accommodations from the output layer of the said second neural network.

Claim 2

A computer with the trained model as described in claim 1.

Claim 3

A method for analyzing reputations of accommodations comprising outputting quantified values of reputations of accommodations based on text data on reputations of accommodations by using the trained model as described in claim 1.

Claim 4

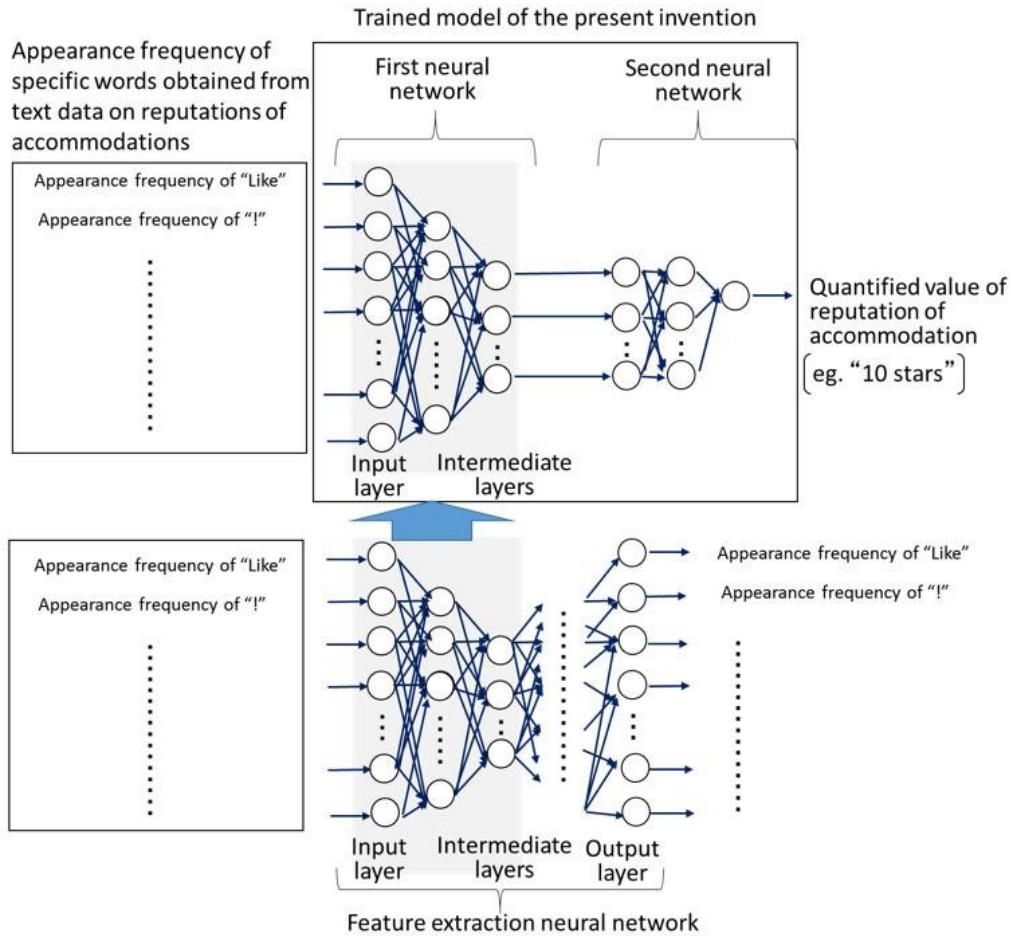
A computer program for causing a computer to function to output quantified values of reputations of accommodations based on text data on reputations of accommodations, wherein;

- the program is comprised of a first neural network and a second neural network connected in a way that the said second neural network receives output from the said first neural network;
- the said first neural network is comprised of an input layer to intermediate layers of a feature extraction neural network in which the number of neurons of at least one intermediate layer is smaller than the number of neurons of the input layer, the number of neurons of the input layer and the number of the output layer are the same, and weights were trained in a way each value input to the input layer and each corresponding value output from output layer become equal;
- weights of the said second neural network were trained without changing the weights of the said first neural network; and
- the program causes the computer function to perform a calculation based on the said trained weights in the said first and second neural networks in response to appearance frequency of specific words obtained from the text data on reputations of accommodations input to the input layer of the said first neural network and to output the quantified values of reputations of accommodations from the output layer of the said second neural network.

Claim 5

A computer-readable storage medium having stored thereon the computer program as described in claim 4.

Drawing



Overview of the description

(Note) The description is written on the premise of claim 1. For claims 4 and 5, please read the description on the assumption that "trained model" is replaced with "computer program". For claim 5, please also assume that the description discloses a computer-readable storage medium having stored thereon the "computer program".

Background art

A neural network, which has a computer function as a computing unit to calculate output in response to certain input, is capable of performing complicated information processing at high speed by being trained from a number of actual examples. Therefore, people use neural networks for various purposes in such fields as image recognition, voice recognition, voice synthesis and automated translation.

Generally, in cases where neural networks are utilised in new areas, in many cases it is not clear what should be input as the input feature values, and therefore it is necessary to carefully review what should be selected as the input feature values.

In order to analyse text data on the reputations of different accommodation, such as hotels, posted on travel review sites with neural networks, it is not straightforward to select the input feature values because the appearance frequencies of a variety of words ("Like", "!", etc.) included in the text data can be considered candidate input feature values.

Problems to be solved by the invention

The present invention has been conceived in view of the above problems and aims to accurately analyse the reputations of different accommodation even if the input feature values are not properly preselected.

Solution for the problem to be solved

The trained model of the present invention aims to cause a computer to function to output quantified values of the reputations of different accommodation based on text data on the reputations of different accommodation and is comprised of a first neural network and a second neural network connected in a way that the second neural network receives output from the first neural network. The trained model is supposed to be utilised as a program module which constitutes a part of artificial intelligence software.

The trained model of the present invention is utilised in a computer equipped with a CPU and a memory. Specifically, the CPU of the computer operates, in accordance with instructions from the trained model stored in the memory, in a way that it performs a calculation based on trained weights and response functions in the first and second neural networks in response to data input to input layers of the first neural network (appearance frequency of specific words obtained from text data on the reputations of different accommodation, e.g. by performing morphological analyses) and outputs results from output layers of the second neural network (quantified values of reputations, e.g. "10 stars").

The first neural network is comprised of an input layer to intermediate layers of a feature extraction neural network. This feature extraction neural network is generally called an autoencoder. In this network, the number of neurons in the intermediate layers is smaller than the number of neurons in the input layer. The number of neurons in the input layer and the number of neurons in the output layers are set to be equal. Moreover, a response function of each of the neurons in the input and output layers is a linear function, and other response functions of each of the neurons are sigmoid functions ($1/(1+\exp(-x))$).

The feature extraction neural network is trained by means of a well-known art called a back-propagation method and weights between neurons are updated. In the embodiment of the present invention, this neural network is trained to minimise mean square errors for overall input data so that data (appearance frequency of each of a plurality of words obtained from text data on the reputations of different accommodation by performing morphological analyses) is input in the input layers

and data the same as this input data is output from the output layers. Since sigmoid functions which are non-linear functions are utilised as neuron response functions, the weights between neurons are not symmetrical across the intermediate layer. As the feature extraction neural network is trained, it becomes possible for the intermediate layer to obtain feature values representing the characteristics of each set of input data. Although the feature values that appear in the intermediate layer do not necessarily have a clear physical implication, they are considered as compressed information to the extent that information input to the input layer can be restored via the intermediate layer to information output from the output layer, and the feature values that appear in the intermediate layer converge to similar values regardless of the feature values input to the input layer. Therefore, it is not necessary to properly preselect the feature values input to the input layer any more.

In the present invention, the part from the input layer to the intermediate layers in the feature extraction neural network in which weights were trained is connected to the second neural network as the first neural network. Weights of the second neural network are trained without changing weights of the said first neural network. The training is performed by a well-known art called a back-propagation method, as explained earlier.

Since the trained model of the present invention is comprised of the above first and second neural networks, it can accurately analyse the reputations of different accommodation without presetting of the feature values.

Conclusion (JPO)

The inventions of claim 1-5 falls under the term "invention".

Explanation (JPO)

- Claim 1

The trained model of claim 1 is what "causes a computer to function to output quantified values of reputations of accommodations based on text data on reputations of accommodations" as well as what "causes the computer function to perform a calculation based on the said trained weights in the said first and second neural networks in response to appearance frequency of specific words obtained from the text data on reputations of accommodations input to the input layer of the said first neural network and to output the quantified values of reputations of accommodations from the output layer of the said second neural network". Moreover, considering the description, which states that "the trained model is supposed to be utilized as a program module which constitutes a part of artificial intelligence software" and "the CPU of the computer operates, in accordance with instructions from the trained model stored in the memory, in a way that it performs a calculation based on trained weights and response functions in the first and second neural networks in response to data input to input layers of the first neural network (appearance frequency of specific words obtained from text data of reputations of

accommodations, e.g. by performing morphological analyses) and outputs results from output layers of the second neural network (quantified values of reputations, e.g. '10 stars')", it is clear that the trained model of claim 1 is a "program" even though the claimed subject-matter of claim 1 is described as a "model".

Moreover, it is determined, from the statement of claim 1, that specific calculation or processing of specific information depending on the intended use, which is accurate analysis of the reputations of different accommodation, is implemented by specific means or specific procedures on which software and hardware resources co-operate, namely for a computer to "function to perform a calculation based on the said trained weights in the said first and second neural networks in response to appearance frequency of specific words obtained from the text data on reputations of accommodations input to the input layer of the said first neural network and to output the quantified values of reputations of accommodations from the output layer of the said second neural network". For this reason, in the trained model of claim 1, a specific information processing system depending on the intended use is constructed through co-operation of software and hardware resources.

Therefore, since the information processing by software is specifically implemented by using hardware resources, the trained model of claim 1 is a creation of a technical idea utilising a law of nature and thus falls under the term "invention".

- Claim 2
- The same reasons apply as for claim 1.

- Claim 3
- The same reasons apply as for claim 1.

- Claim 4

It is determined, from the statement of claim 4, that specific calculation or processing of specific information depending on the intended use, which is accurate analysis of the reputations of different accommodation, is implemented by specific means or specific procedures on which software and hardware resources co-operate, namely for a computer to "function to perform a calculation based on the said trained weights in the said first and second neural networks in response to appearance frequency of specific words obtained from the text data on reputations of accommodations input to the input layer of the said first neural network and to output the quantified values of reputations of accommodations from the output layer of the said second neural network". For this reason, in the computer program

of claim 4, a specific information processing system depending on the intended use is constructed through co-operation of software and hardware resources.

Therefore, since the information processing by software is specifically implemented by using hardware resources, the computer program of claim 4 is a creation of a technical idea utilising a law of nature and thus falls under the term "invention".

- Claim 5

The same reasons apply as for claim 4.

CNIPA analysis

Conclusion (CNIPA)

Claims 1-5 constitute the subject matter for patent protection.

Claims 1 and 4 are not in conformity with the provisions of Article 26.4 Chinese Patent Law.

Explanation (CNIPA)

Claim 1 refers to a trained model for causing a computer to function to output quantified values of reputations of accommodations based on text data on reputations of accommodations, wherein the input data of the trained model and the data of the middle layer are involved in the text data on reputations of accommodations, and the text feature values of the input text data is extracted by the training of the first neural network, and then the quantified values of reputations of accommodations is obtained based on the text feature values and the training of the second neural network. What the solution solves is a technical problem on how to overcome the problem that it is necessary to input text feature values accurately when evaluating and analysing reputations of accommodations. What it utilizes is mining the correlation between the text data on reputations and the feature values by the first neural network and the corresponding training method and extracting the text feature values from the current text data on reputations of accommodations based on the correlation relationship, and then quantifying the text data on reputations based on the text feature values, and thus is technical means in conformity with the laws of natural. The solution enables to accurately analyse the reputations of accommodation even if the input feature values are not properly preselected. What is obtained is technical effect. Therefore, the solution is the technical solution as provided for in Article 2.2 Chinese Patent Law, and constitutes the subject matter of patent protection.

For similar reasons of claim 1, solutions of claims 2-5 constitute the subject matter of patent protection.

In addition, at the CNIPA, the type of each claim should be clear, and the title of the subject matter of should indicate clearly whether the claim is a product claim or a process

claim. The title of the subject matter of the claims of an AI-related invention may be drafted as: "A method for", "A system for", "A computer apparatus " or " A computer-readable storage medium", etc.

However, the titles of the subject matter of claim 1 and 4, " A trained model " , " A computer program", do not indicate clearly whether the claims are product claims or process claims. Therefore claims 1 and 4 do not define the extent of the patent protection sought for in a clear manner, and do not comply with the provisions of Article 26.4 Chinese Patent Law about clarity. Applicants can modify the title of the subject matter to " A Method for training model", or " A model training system/ apparatus ", etc.

2. Case A-2

(From JPHB, Annex A, Chap. 3, Case 3-2)

Title of invention

Sugar Content Data of Apples and a Method for Predicting Sugar Content Data of Apples

What is claimed is:

Claim 1

Sugar content data of preharvest apples on trees measured by a portable sugar content sensor for apples which performs reflective near-infrared spectroscopic analyses.

Claim 2

The sugar content data of apples as described in Claim 1 received by a receiving unit of a server and stored in a memory unit of the said server.

Claim 3

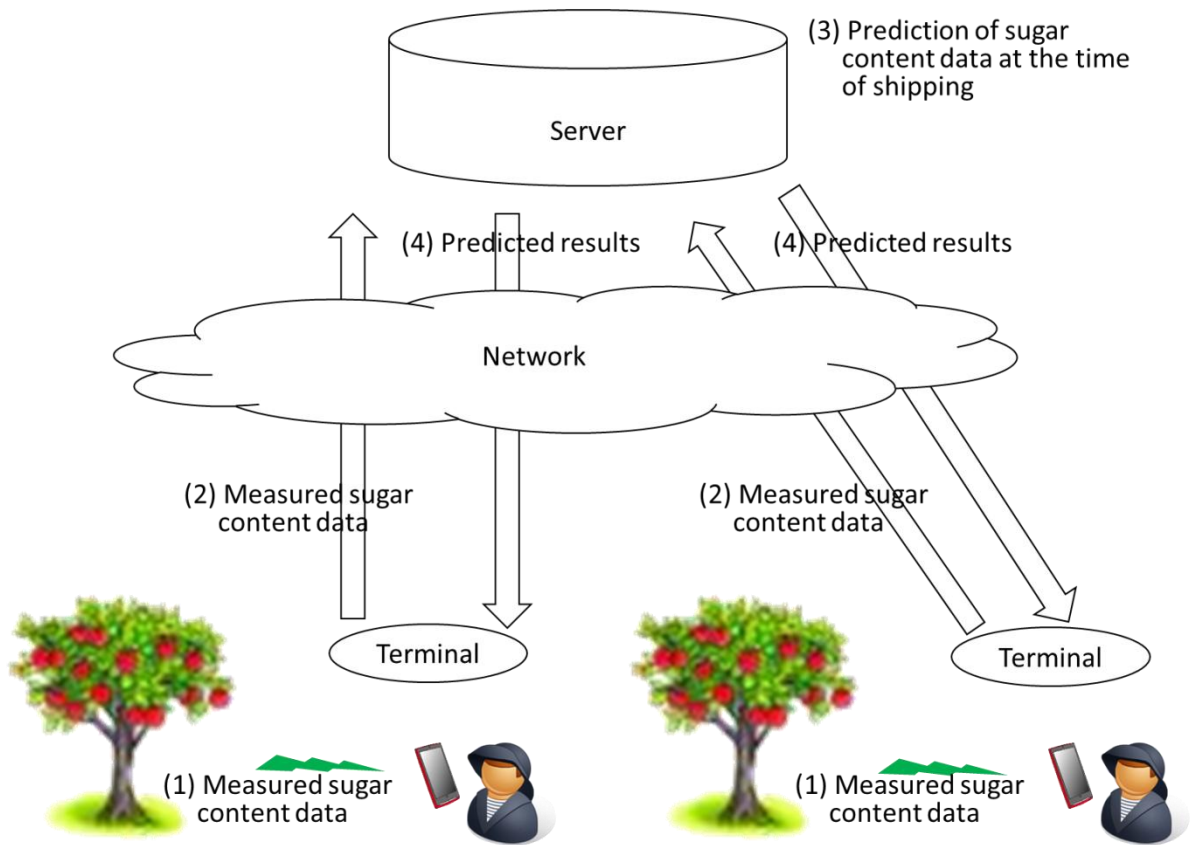
A method for predicting sugar content data of apples comprising;

a step in which an analyzing unit of the server analyzes the relationship between sugar content data of preharvest apples for specified periods and data on meteorological conditions, and sugar content data of apples at the time of their shipping by means of machine learning, based on past performance;

a step in which the receiving unit of the said server receives the sugar content data of apples for specified periods as described in Claim 1; and

a step in which a prediction unit of the said server predicts and outputs sugar content data of apples at the time of future shipping using the said received sugar content data of apples for specified periods and data on past and future meteorological conditions as inputs, based on the said analyzed relationships.

Drawing



Overview of the description

[Technical Field]

The present invention relates to sugar content data of apples and a method for predicting sugar content data of apples.

[Background Art]

The sugar content of apples is an important indicator at the time of shipping apples. Therefore, the sugar content of apples has been measured at the time of shipping. Apples are shipped after being graded based on measured sugar content and other conditions and the apple farmers change cultivation conditions of the following year as needed.

On the other hand, if sugar content data of preharvest apples on trees can be measured, it becomes possible to provide support for cultivation by predicting sugar content data of apples at the time of their shipping to push the sugar content of those apples closer to a desired level during their cultivation.

[Problems to be solved by the invention]

The present invention was created taking such circumstances into consideration and aims to provide support for cultivation based on the data to push the sugar content of those apples closer to a desired level by measuring sugar content data of preharvest apples on trees and by predicting sugar content data of apples at the time of their shipping.

[Solution for the Problem to be solved]

In the present invention sugar content data of preharvest apples on trees is measured with a portable sugar content sensor for apples. The said sugar content sensor for apples measures a sugar content of those apples by irradiating near-infrared lights on apples and performing spectroscopic analyses of reflected lights. Although this principle of measurement is the same as the conventional measurement of sugar content of apples performed at the time of their shipping, in the present invention sugar content data of preharvest apples on trees is measured since a portable sugar content sensor for apples has been developed in response to the progress of sensor technology. The said sugar content sensor for apples is equipped with the communication function and can transmit measured sugar content data to the server directly or via a terminal of an apple farmer.

This sugar content data of apples is used for analysis and prediction by the server.

The server makes analyses through the following steps (1) - (4).

(1) A step in which a receiving unit of the server receives during a specified period daily sugar content data of preharvest apples on trees from terminals of a plurality of apple farmers via the network.

(2) A step in which the receiving unit of the server receives data on meteorological conditions for specified periods before apples are harvested and sugar content data of apples at the time of their shipping. Meteorological conditions are selected arbitrarily from the amount of sunlight, temperature, the amount of rainfall, humidity, etc. Meteorological conditions may be those at a place where apples are cultivated or at a point or an area where the server is installed. If the place where apples are cultivated and the point where the server is installed are not so far as to cause differences in meteorological conditions, those at the point or area where the server is installed may be adopted. Moreover, sugar content data of apples at the time of their shipping is measured for grading as in the past.

(3) A step in which a memory unit of the server stores the received sugar content data of apples for specified periods and data on meteorological conditions, and the sugar content data of apples at the time of their shipping as one combination. The server accumulates a sufficient amount of data on the said combination as actual values in order to obtain adequate results of the analyses explained in (4).

(4) A step in which an analyzing unit of the server analyzes, based on the said data stored in the memory unit, the relationship between sugar content data of apples for specified periods before they are harvested and data on meteorological conditions, and sugar content data of apples at the time of their shipping by means of machine learning. An arbitrary technique such as deep learning of neural networks is used for this machine learning. For example, neural networks are configured in a way that sugar content data of apples measured prior to a point X days before their harvest and data on meteorological conditions before their harvest are input in the input layer and sugar content data of apples at the time of their shipping is output from the output layer. Weights between neurons of the neural networks are optimized by means of supervised learning using analytical data obtained by tagging the input data in the input layer and the output data from the output layer.

Then, a prediction by the server is made through the following steps (5) - (8).

(5) A step in which the receiving unit of the server receives sugar content data of preharvest apples on trees for specified periods from terminals of apple farmers via the network.

(6) A step in which the receiving unit of the server receives data on past meteorological conditions to date and data on predicted meteorological conditions for the future from the present to the date of shipping. Meteorological conditions are selected arbitrarily from the amount of sunlight, temperature, the amount of rainfall, humidity, etc. in the same manner as (2) above. However, the receiving unit receives predicted future meteorological conditions in this process for the purpose of making a prediction described later.

(7) A step in which the memory unit of the server stores the received data.

(8) A step in which a prediction unit of the server, based on the relationships obtained by performing the analyses described in the process (4), predicts sugar content data of apples at the time of future shipping using data stored therein by inputting the data on measured sugar content of apples for specified periods and the data on past and future meteorological conditions. In the case of the neural networks mentioned in (4), a prediction is made by inputting sugar content data of apples measured prior to the point of X days before the harvest and data on meteorological conditions prior to the point of X days before the harvest as well as data on meteorological conditions after the said point of X days before the harvest in the input layer and by outputting sugar content data of apples at the time of their shipping from the output layer.

Then, the server transmits predicted sugar content data of apples at the time of their shipping to terminals of apple farmers via the network. The apple farmers examine if they need to change cultivation conditions, etc. based on the predicted sugar content data of apples at the time of their shipping.

[Effect of Invention]

The present invention can provide support for cultivation based on the data to push the sugar content of those apples closer to a desired level by measuring

sugar content data of preharvest apples on trees and by predicting sugar content data of apples at the time of their shipping.

Conclusion (JPO)

The invention of claim 1 does not fall under "invention."

The invention of claim 2 does not fall under "invention."

The invention of claim 3 falls under "invention."

Explanation (JPO)

- Claim 1

Mere presentation of information (where the feature resides solely in the content of the information, and the main object is to present information), such as presentation of information (presentation per se, means for presentation or method of presentation) in which a technical feature does not reside, does not fall under "invention" ("creation of the technical idea utilizing a law of nature") mentioned in the main paragraph of Article 29(1).

Since Claim 1 does not specify any means for or a method of presenting sugar content data of apples, the sugar content data of apples of Claim 1 is considered to be characterized only in the content of information that "sugar content data of preharvest apples on trees measured by a portable sugar content sensor for apples which performs reflective near-infrared spectroscopic analyses". Therefore, the sugar content data of apples of Claim 1 does not have technical features in the presentation of information (presentation per se, means for presentation or method of presentation), its feature resides solely in the content of the information, and its main object is to present information.

Therefore, since the sugar content data of apples of Claim 1 is mere presentation of information, it is not a creation of the technical idea utilizing a law of nature and thus does not fall under "invention".

- Claim 2

Although Claim 2 identifies the sugar content data of apples of Claim 1 as "received by a receiving unit of a server and stored in a memory unit of the server", it does not specify any means for or method of presenting the sugar content data of apples. Therefore, it is still considered that its feature resides solely in the content of information. Therefore, the sugar content data of apples of Claim 2 does not have technical features in the presentation of information (presentation per se, means for presentation or method of presentation), its

feature resides solely in the content of the information, and its main object is to present information.

Therefore, since the sugar content data of apples of Claim 2 is mere presentation of information, it is not a creation of the technical idea utilizing a law of nature and thus does not fall under “invention”.

- Claim 3

The invention of Claim 3 is a method for predicting sugar content data of apples using the computer software. The method for predicting sugar content data of apples comprises “a step in which an analyzing unit of the server analyzes the relationship between sugar content data of preharvest apples for specified periods and data on meteorological conditions, and sugar content data of apples at the time of their shipping by means of machine learning, based on past performance; a step in which the receiving unit of the said server receives the sugar content data of apples for specified periods as described in Claim 1 (sugar content data of preharvest apples on trees measured by a portable sugar content sensor for apples which performs reflective near-infrared spectroscopic analyses); and a step in which a prediction unit of the said server predicts and outputs sugar content data of apples at the time of future shipping using the said received sugar content data of apples for specified periods and data on past and future meteorological conditions as inputs, based on the said analyzed relationships”. Therefore, the invention of Claim 3 is what concretely performs information processing based on the technical properties such as chemical or biological properties of apples.

Therefore, the invention of Claim 3 is a creation of the technical idea utilizing a law of nature as a whole and thus falls under “invention”.

(Supplementary explanation)

Since the determination whether or not the inventions of Claim 3 fall under “inventions” is judged in accordance with “Examination Guidelines Part III, Chapter 1: Eligibility of Invention and Industrial Applicability”, and thus is not examined from a viewpoint of the computer software.

[Measures of the applicant]

It is understood that regarding the sugar content data of apples its feature resides solely in the content of the information as far as the description etc. are referred to. Therefore, the sugar content data of apples of Claim 1 and 2 cannot overcome the reason for refusal.

CNIPA analysis

Conclusion (CNIPA)

Claims 1-3 constitute the subject matter for patent protection.

Claims 1-2 are not in conformity with the provisions of Article 26.4 Chinese Patent Law.

Explanation (CNIPA)

Although the title of the subject matter of claim 1 is "data", the limited content states that the data was measured by a portable sugar content sensor for apples which performs reflective near-infrared spectroscopic analyses.

The solution as a whole solves a technical problem of how to collect the sugar content data of preharvest apples on trees. What it utilizes is measuring sugar content data of preharvest apples by a portable sugar content sensor for apples which performs reflective near-infrared spectroscopic analyses, and thus is technical means. The solution enables to measure sugar content data of preharvest apples on trees. What is obtained is technical effect. Therefore, the solution is the technical solution as provided for in Article 2.2 Chinese Patent Law, and constitutes the subject matter of patent protection.

Under the premise that claim 1 constitutes the subject matter of patent protection, claim 2 also constitutes the subject matter of patent protection.

The solution of claim 3 refers to a method for predicting sugar content data of apples, wherein the data processed in each step of the prediction method includes physical measurements and meteorological condition data related to sugar content data of apples, all of which have exact technical implications, and each step is closely related to accurately predicting sugar content data of apples at the time of future shipping. What this solution solves is a technical problem on how to overcome the problem that the sugar content of apples can only be measured at the time of shipping. What It utilizes is analysing the correlation between sugar content data of apples and meteorological conditions with machine learning, and predicting the sugar content data of apples at the time of future shipping based on the sugar content data of apples on the tree and the meteorological conditions, and thus is technical means in conformity with the laws of natural. The method can predict sugar content data of apples on the tree in advance. What is obtained is technical effect. Therefore, the solution is the technical solution as provided for in Article 2.2 Chinese Patent Law, and constitutes the subject matter of patent protection.

The title of the subject matter of claims 1-2 "Sugar content data" does not indicate clearly whether the claims are product claims or process claims. Therefore claims 1-2 do not define the extent of the patent protection sought for in a clear manner, and do not comply with the provisions of Article 26.4 Chinese Patent Law about clarity. Applicants can modify the title of the subject matter to " A collection method of sugar content data ".

3. Case A-3

(from Example 1, Section 6.2, Chapter 9, Part II, CNIPA Guidelines)

Title of invention

A method for establishing a mathematical model

What is claimed is:

Claim 1

A method processed by a computer for establishing a mathematical model, which is characterized by comprising the following steps:

training the initial feature extraction model according to the feature values in the training samples of the first classification task and the feature values in the training samples of at least one second classification task to obtain the target feature extraction model; wherein the second classification task is other classification task related to the first classification task;

according to the target feature extraction model, processing the feature values in each training sample of the first classification task to obtain the extracted feature values corresponding to each training sample;

combining the extracted feature values and label values corresponding to each training sample to extracted training samples, and training the initial classification model to obtain the target classification model;

combining the target classification model and the target feature extraction model to form a mathematical model of the first classification task.

Overview of the description

[Background Art]

Omitted

[Problems to be solved by the invention]

A small number of training samples during establishing a mathematical model causes a problem of overfitting and low accuracy of building model.

[Solution for the Problem to be solved]

The solution of the invention application is a method to for establishing a mathematical model to improve the accuracy of building model by increasing the quantity of training samples. The model building method uses the training samples of other classification tasks related to the first classification task as the training samples of the first classification task as well, thereby the quantity of training samples is increased. Finally, a mathematical model of the first classification task is established by training a relevant mathematical

model with the feature values of training samples, extracted feature values, label values, etc.

[Effect of Invention]

This solution overcomes the disadvantage of overfitting and low accuracy of building model due to a small number of training samples.

JPO analysis

Conclusion (JPO)

The inventions of claim 1 falls under the term "invention".

Explanation (JPO)

It can be determined, from the statement of Claim 1, that the specific computing or processing of information depending on the intended use of "establishing a mathematical model to overcome the disadvantage of overfitting and low accuracy of building model due to a small number of training samples" is implemented by the concrete means or procedures on which software and hardware resources cooperate including the following steps using a computer:

training the initial feature extraction model on the basis of the feature values in the training samples of multiple classification tasks (the first classification task and the second classification task);

according to the target feature extraction model, processing the feature values in each training sample of the first classification task to obtain the extracted feature values corresponding to each training sample;

combining the extracted feature values and label values corresponding to each training sample to extracted training samples, and training the initial classification model to obtain the target classification model: and

combining the target classification model and the target feature extraction model of the first classification task.

Hence, a method for establishing a mathematical model of Claim 1 is to establish an specific operating method of an information processing device according to the intended use through cooperation of software and hardware resources.

Therefore, as information processing by software has been specifically implemented by using hardware resources, a method of constructing a mathematical model of Claim 1 is a creation of a technical idea utilizing a law of nature and thus falls under the term "invention".

If the specification "processed by a computer" is not found in claim 1, the examiner assesses whether "a method for establishing a mathematical model" described in the invention claimed in claim 1 is "processed by a computer" or not by referring to the description and common general technical knowledge. If the method is assessed to be "processed by a computer," the same conclusion is reached as above according to the "idea based on the standpoint of software" in JPHB, Annex B, Chapter 1, 2.1. (Step 2 shown in Figure 1 of (1) Eligibility above; for details, see Section 3 "Approach for assessing whether an AI-related invention is a statutory "invention" or excluded/ineligible subject-matter" in Part II, Chapter A of this report).

On the other hand, if the method is assessed not to be "processed by a computer," it may not be recognized as an invention on the grounds that it is merely an "arbitrary arrangements," "mental activities of humans," etc., based only on the assessment under JP Guideline, Part III, Chapter 1 (Step 1 shown in Figure 1 of (1) Eligibility above; for details, see Section 3 "Approach for assessing whether an AI-related invention is a statutory "invention" or excluded/ineligible subject-matter" in Part II, Chapter A of this report).

Note: If the invention claimed in claim 1 is assessed that the invention is not "processed by a computer," it is not considered to be a computer software-related invention. Therefore, the invention is not examined according to the "idea based on the standpoint of software" in JPHB, Annex B, Chapter 1, 2.1.1.

CNIPA analysis

Conclusion (CNIPA)

Claim 1 does not constitute the subject matter for patent protection.

Explanation (CNIPA)

The solution is a method processed by a computer for establishing a mathematical model, which uses the training samples of other classification tasks related to the first classification task as the training samples of the first classification task as well, trains the mathematical model with the relevant data of the training samples, and establishes a mathematical model of the first classification task. Although the establishment of a mathematical model is processed by a computer, the computer is just a device to carry out the solution, and the establishing process of the model neither improves the internal performance of the computer nor causes any technical change to the composition or function of the computer. The problem to be solved by the solution is a problem of overfitting and low accuracy of building model caused by a small number of training samples, which is a problem of the abstract mathematical method, and thus does not

constitute a technical problem. The measure it takes is not a technical measure in conformity with the laws of nature, which can be listed as the following: adding the number of training samples and training the mathematical model with the feature values, extracting feature values, tagging values for the training samples, and obtaining a mathematical model of the first classification task. The obtained effect cannot be a technical effect, but merely an effect of optimizing an abstract mathematical method. Therefore, the invention solution is not the technical solution as provided for in Article 2.2 Chinese Patent Law, and does not constitute the subject matter for patent protection.

If the solution of claim1 does not include “processed by a computer”, it still does not constitute the subject matter for patent protection. The solution does not involve any specific application field. The feature values, extracted feature values, tag values, target classification model and target feature extraction model of the training samples to be processed are general abstract data. The process for training the mathematical model with the relevant data of the training samples is a series of abstract mathematical method steps, and the final result is also an abstract general classification mathematical model. The solution is an abstract model building method, and its processing objects, processes and results do not involve the combination with a specific application field. The whole solution just optimizes an abstract mathematical method, and does not include any technical feature. The solution of the invention application is rules and methods for mental activities as provided for in Article 25.1(2) Chinese Patent Law, and does not constitute the subject matter for which patent protection may be sought.

4. Case A-4

(from Example 2, Section 6.2, Chapter 9, Part II, CNIPA Guidelines)

Title of invention

A method for training a Convolutional Neural Network (CNN) model

What is claimed is:

Claim 1

A method processed by a computer for training a Convolutional Neural Network (CNN) model, comprising:

- acquiring initial model parameters of a CNN model to be trained, the initial model parameters comprising initial convolution kernels and initial bias matrixes of convolution layers of respective levels, and an initial weight matrix and an initial bias vector of a fully connected layer;

- acquiring a plurality of training images;

- on the convolution layer of each level, performing convolution operation and maximal pooling operation on each of the training images to obtain a first feature image of each of

the training images on the convolution layer of each level by using the initial convolution kernel and initial bias matrix of the convolution layer of each level;

performing horizontal pooling operation on the first feature image of each of the training images on the convolution layer of at least one of the levels to obtain a second feature image of each of the training images on the convolution layer of each level; determining a feature vector of each of the training images according to the second feature image of each of the training images on the convolution layer of each level;

processing each feature vector to obtain a classification probability vector of each of the training images according to the initial weight matrixes and the initial bias vectors;

calculating a classification error according to the classification probability vector and initial classification of each of the training images; regulating the model parameters of the CNN model to be trained on the basis of the classification errors;

on the basis of the regulated model parameters and the plurality of training images, continuing the process of regulating the model parameters, until the number of iterations reaches a preset number;

and determining model parameters obtained when the number of iterations reaches the preset number as the model parameters of the trained CNN model.

Overview of the description

[Background Art]

Omitted

[Problems to be solved by the invention]

CNN model can only recognize images with fixed size.

[Solution for the Problem to be solved]

The solution of the invention application is to perform convolution operation and maximal pooling operation on the training images on the convolution layer of each level, and further to perform horizontal pooling operation on the feature images obtained by the maximal pooling operation.

[Effect of Invention]

The trained CNN model can recognize images of any size to be recognized.

JPO analysis

Conclusion (JPO)

The invention of Claim 1 falls under the term "invention".

Explanation (JPO)

It can be determined, from the statement of Claim 1, that specific computing or processing of information depending on the intended use of "enabling a CNN model to recognize images any size to be recognized", has been implemented by concrete means or procedures including the following steps using a computer:

performing horizontal pooling operation on the first feature image of each of the training images on the convolution layer of at least one of the levels to obtain a second feature image of each of the training images on the convolution layer of each level;

determining a feature vector of each of the training images according to the second feature image of each of the training images on the convolution layer of each level;

processing each feature vector to obtain a classification probability vector of each of the training images according to the initial weight matrixes and the initial bias vectors;

calculating a classification error according to the classification probability vector and initial classification of each of the training images; and

regulating the model parameters of the CNN model to be trained on the basis of the classification errors.

Hence, a method for training a Convolutional Neural Network CNN model of Claim 1 is a method for establishing an specific operating method of a information processing device according to the intended use through cooperation of software and hardware resources.

Therefore, as the information processing by software has been concretely implemented by using hardware resources, a method for training a Convolutional Neural Network CNN model of Claim 1 is a creation of a technical idea utilizing a law of nature and thus falls under the term "invention".

CNIPA analysis

Conclusion (CNIPA)

Claim 1 constitutes the subject matter for patent protection.

Explanation (CNIPA)

The solution is a training method of Convolutional Neural Network (CNN) model processed by a computer, which clarifies that the data processed in each step of the model training method is image data and how to process image data in each step, which reflects that the neural network training algorithm is closely related to image information processing. The solution overcomes a technical problem that CNN model can only recognize images with fixed size. It adopts the means of different processing and training of images on different convolution layers, and what it utilizes is the technical means in

conformity with the laws of nature. What is obtained is the technical effect that the trained CNN model can recognize images of any size to be recognized. Therefore, the solution of the invention patent application is the technical solution as provided for in Article 2.2 Chinese Patent Law, and constitutes the subject matter for which patent protection may be sought.

5. Case A-5

(from Example 3, Section 6.2, Chapter 9, Part II, CNIPA Guidelines)

Title of invention

A method for using shared bicycles

What is claimed is:

Claim 1

A method for using shared bicycles, characterized in that it includes the following steps:
step1, a user sends a request to use the shared bicycle to the server through a terminal device;

step2, the server obtains the user's first location information, searches for the second location information of shared bicycles within a certain distance corresponding to the first location information, and the status information of these shared bicycles, and sends the second location information of the shared bicycle and the status information to the terminal device, wherein the first location information and the second location information are obtained through GPS signals;

step3, the user finds a target shared bicycle that can be ridden based on the location information of the shared bicycle displayed on the terminal device;

step4, the user scans the QR code on the body of the target shared bicycle through the terminal device, and obtains the permission to use the target shared bicycle after passing the server authentication;

step 5: the server pushes the parking reminder to the user according to the riding situation, if the user parks the bicycle in the designated area, the preferential tariff will be used for charging, and otherwise the standard tariff will be used for charging;

step 6: the user makes a selection according to the prompt, and after the ride is completed the user locks the shared bicycle, and the shared bicycle detects the locked state and sends the ride completion signal to the server.

Overview of the description

[Background Art]

Omitted

[Problems to be solved by the invention]

How to accurately find the location of shared bicycles that can be ridden and unlock the shared bicycles.

[Solution for the Problem to be solved]

The solution of the invention application is to provide a method of using shared bicycles. By obtaining the location information of the user's terminal equipment and the status information of the shared bicycles within a certain distance, the user could accurately find the shared bicycle that can be ridden according to the status information of the shared bicycles to ride, and could be guided to park the bicycle by prompts.

[Effect of Invention]

The solution facilitates the use and management of shared bicycles, saves users' time and improves user experience.

JPO analysis

Conclusion (JPO)

The invention of Claim 1 falls under the term "invention".

Explanation (JPO)

A method for using shared bicycles of the Claim is to find accurately the location of shared bicycles that can be ridden and unlock the shared bicycles by using the technical means of a server and a terminal device. Here, as Claim 1 has statements:

the terminal device sending a request to the server to use the shared bicycle;

the server obtaining the user's first location information, searching for the second location information of shared bicycles within a certain distance corresponding to the first location information, and the status information of these shared bicycles, and sending the second location information of the shared bicycle and the status information to the terminal device, wherein the first location information and the second location information are obtained through GPS signals;

the terminal device displaying the location information of a target shared bicycle that can be ridden;

the server pushing the parking reminder to the user according to the riding situation, if the user parks the bicycle in the designated area, the preferential tariff will be used for charging, and otherwise the standard tariff will be used for charging;

the shared bicycle detecting the locked state and sending the ride completion signal to the server.

Accordingly, it can be determined that specific computing or processing of the information depending on the intended use of finding accurately the location of shared bicycles that can be ridden and unlocking the shared bicycles has been implemented by concrete means or procedures through cooperation of software and hardware resources.

Hence, a method for using shared bicycles of Claim 1 is a method for establishing an specific operating method of a information processing device depending on the intended use through cooperation of software and hardware resources.

Therefore, as it can be determined that information processing by software is concretely implemented using hardware resources, "a method of using shared bicycles" of Claim 1 is a creation of a technical idea utilizing a law of nature and thus falls under the term "invention".

CNIPA analysis

Conclusion (CNIPA)

Claim 1 constitutes the subject matter for patent protection.

Explanation (CNIPA)

The solution involves a method of using shared bicycles. What this solution solves is a technical problem on how to accurately find the location of shared bicycles that can be ridden and unlock the shared bicycles. The solution realizes the control and guidance of users' behaviour of using shared bicycles by executing computer programs on terminal devices and servers, and what it reflects is the control of collection and calculation of location information, authentication and other data. What it utilizes is the technical means in conformity with the laws of natural and what is obtained is the technical effect of accurately finding the location of the shared bicycles and unlocking shared bicycles. Therefore, the solution of the invention patent application is the technical solution as provided for in Article 2.2 Chinese Patent Law, and constitutes the subject matter for which patent protection may be sought.

6. Case A-6

(from Example 5, Section 6.2, Chapter 9, Part II, CNIPA Guidelines)

Title of invention

A training method of deep neural network model

What is claimed is:

Claim 1

A training method processed by a computer for deep neural network model, comprising:
when the size of the training data changes, for the changed training data, calculating the training time of the changed training data respectively by preset candidate training schemes;

selecting the training scheme with the least training time from the preset candidate training schemes as an optimal training scheme for the changed training data, and the candidate training schemes include single processor training scheme and parallel multiple-processor training scheme based on data;

performing model training on the changed training data by the optimal training scheme.

Overview of the description

[Background Art]

Omitted

[Problems to be solved by the invention]

Consistently using single processor training scheme or multiple-processor training scheme cannot work with all sizes of training data, which resulted in slow training speed.

[Solution for the Problem to be solved]

The solution of the invention application is to provide a training method of deep neural network model, which selects the scheme with the least training time from multiple candidate training schemes for model training for a certain size of training data.

[Effect of Invention]

The solution improves the execution effect of hardware in the training process of deep neural network mode.

JPO analysis

Conclusion (JPO)

The invention of Claim 1 falls under the term "invention".

Explanation (JPO)

It can be determined, from the statement of Claim 1, that specific computing or processing of information depending on the intended use of "providing a training method

of deep neural network model, which selects the scheme with the least training time from multiple candidate training schemes for model training for a certain size of training data" has been implemented by concrete means or procedures, through cooperation of software and hardware resources, including the following steps using a computer:

when the size of the training data changes, for the changed training data, calculating the training time of the changed training data respectively by preset candidate training schemes; and

selecting the training scheme with the least training time from the preset candidate training schemes as an optimal training scheme for the changed training data, and the candidate training schemes include single processor training scheme and parallel multiple-processor training scheme based on data.

Hence, a training method of deep neural network model of Claim 1 is a method for establishing an specific operating method of a information processing device depending on the intended use through cooperation of software and hardware resources.

Therefore, as the information processing by software has been concretely implemented by using hardware resources, a training method of deep neural network model of Claim 1 is a creation of a technical idea utilizing a law of nature and thus falls under the term "invention".

CNIPA analysis

Conclusion (CNIPA)

Claim 1 constitutes the subject matter for patent protection.

Explanation (CNIPA)

The solution involves a training method processed by a computer for deep neural network model. What it solves is a problem of slow training speed, and the solution selects a single processor training scheme or multiple-processor training scheme with different processing efficiency for different sizes of training data. The model training method has specific technical associations with the internal structure of the computer system, and improves the execution effect of hardware in the training process, and what is obtained is the technical effect that improves the internal performance of the computer system in conformity with the laws of nature. Therefore, the solution of the invention patent application is the technical solution as provided for in Article 2.2 Chinese Patent Law, and constitutes the subject matter for which patent protection may be sought.

7. Case A-7

(from Example 7, Section 6.2, Chapter 9, Part II, CNIPA Guidelines)

Title of invention

A knowledge graph inference method

What is claimed is:

Claim 1

A relationship attention-based knowledge graph inference method processed by a computer, comprising:

acquiring initial embedded representation of nodes in a knowledge graph, and converting the initial embedded representation into a high-dimensional space to obtain high-dimensional embedded representation; the node is the entity in the knowledge graph, the knowledge graph is constructed by entity recognition and relationship extraction of knowledge, the knowledge is the knowledge associated within the question answering system and semantic searching, the entity is the text data obtained from the natural language text by a named entity recognition tool, and the initial embedded representation is a vector obtained from the text data by a word embedded model;

acquiring a neighbor node set of a target node in the knowledge graph, and constructing a neighbor sub-graph according to the relationship type of the target node and the neighbor node in the neighbor node set;

obtaining neighbor embedded representation of the information embedded into the neighbor sub-graph by the target node according to the high-dimensional embedded representation of the target node and the high-dimensional embedded representation of the neighbor node in the neighbor subgraph;

aggregating the high-dimensional embedded representation of the target node and the neighbor embedded representation to obtain an aggregated embedded representation of the target node;

according to the first attention value of each neighbor subgraph, fusing the aggregation embedded representation to obtain a fused embedded representation of the target node;

and calculating the score of the triple corresponding to the target node according to the fusion embedding representation, and performing triple inference according to the score.

Overview of the description

[Background Art]

Knowledge graph plays a very important role in many natural language processing applications, such as question answering systems, semantic searching, etc. However, due to uncertainty of knowledge acquisition, the knowledge graph constructed by entity recognition and relationship extraction technology could result in incomplete knowledge graph. If there is an error in the knowledge graph, it could cause the application to return incorrect results.

[Problems to be solved by the invention]

How to enrich semantic information and improve inference accuracy in the process of text embedded and semantic searching.

[Solution for the Problem to be solved]

The solution of the invention application is to provide a relationship attention-based knowledge graph inference method, which constructs knowledge graph by entity recognition and relationship extraction from knowledge related with the question answering systems and semantic searching, so as to carry out knowledge graph inference.

[Effect of Invention]

The solution enriches semantic information and improves inference accuracy in the process of text embedded and semantic searching.

JPO analysis

Conclusion (JPO)

The invention of Claim 1 falls under the term "invention".

Explanation (JPO)

It can be determined, from the statement of Claim 1, that specific computing or processing of information depending on the intended use of "enriching semantic information and improving inference accuracy in the process of text embedded and semantic searching", has been implemented by concrete means or procedures through cooperation of software and hardware resources, including the following steps using a computer:

acquiring a neighbor node set of a target node in the knowledge graph, and constructing a neighbor sub-graph according to the relationship type of the target node and the neighbor node in the neighbor node set;

obtaining neighbor embedded representation of the information embedded into the neighbor sub-graph by the target node according to the high-dimensional embedded representation of the target node and the high-dimensional embedded representation of the neighbor node in the neighbor subgraph;

aggregating the high-dimensional embedded representation of the target node and the neighbor embedded representation to obtain an aggregated embedded representation of the target node;

according to the first attention value of each neighbor subgraph, fusing the aggregation embedded representation to obtain a fused embedded representation of the target node; and

calculating the score of the triple corresponding to the target node according to the fusion embedding representation, and performing triple inference according to the score.

Hence, a method for establishing a mathematical model of Claim 1 is to establish an specific operating method of a information processing device depending on the intended use through cooperation of software and hardware resources.

Therefore, as information processing by software has been concretely implemented by using hardware resources, a relationship attention-based knowledge graph inference method of Claim 1 is a creation of a technical idea utilizing a law of nature and thus falls under the term "invention".

CNIPA analysis

Conclusion (CNIPA)

Claim 1 constitutes the subject matter for patent protection.

Explanation (CNIPA)

The solution is a relationship attention-based knowledge graph inference method processed by a computer. The data processed in each step of this method is technical data such as text data or semantic information in natural language. The knowledge graph is constructed by entity recognition and relationship extraction of the knowledge associated with question answering systems and semantic searching, so as to carry out knowledge graph inference. What the solution solves is a technical problem on how to enrich semantic information and improve inference accuracy in the process of text embedded and semantic searching, and what it utilizes is the technical means in conformity with the laws of nature and it obtains corresponding technical effects. Therefore, the solution of the invention patent application is the technical solution as provided for in Article 2.2 Chinese Patent Law, and constitutes the subject matter for which patent protection may be sought.

B. Inventive step

1. Case B-1

(from JPHB, Annex A, Chap. 5, Case 34)

Title of invention

Estimation system of hydroelectric generating capacity

What is claimed is:

Claim 1

An estimation system of a hydroelectric power generating capacity of a dam comprising:
a neural network that is built by means of an information processor, the neural network having an input layer and an output layer, in which an input data to the input layer containing a precipitation amount of the upper stream of a river, a water flow rate of the upper stream of the river, and a water inflow rate into a dam during a predetermined period between a reference time and a predetermined time before the reference time, and an output data from the output layer containing a hydroelectric power generating capacity in the future after the reference time;

a machine learning unit that trains the neural network using a training data corresponding to actual values of the input data and the output data; and

an estimation unit that inputs the input data to the neural network that has been trained by the machine learning unit with setting a current time as the reference time, and then calculates an estimated value of a future hydroelectric power generating capacity based on the output data of which reference time is the current time.

Claim 2

The estimation system of a hydroelectric power generating capacity as in Claim 1, wherein the input data to the input layer further contains a temperature of the upper stream of the river during the predetermined period between the reference time and the predetermined time before the reference time.

Overview of the description

Background art

Hydroelectric power-generating capacity in the future is estimated by a dam operator by estimating a water inflow rate into a dam in the future based on a previous precipitation amount of the upper stream of the river, a water flow rate of the upper stream of the river and the like, and then converting the estimated water inflow rate into hydroelectric power-generating capacity.

Problem to be solved by the invention

Generally, hydroelectric power-generating capacity in the future is estimated based on a precipitation amount of the upper stream of the river, a water flow rate of the upper stream of the river and an actual water inflow rate into a dam within the past few weeks. In many cases, dam operators make a function to calculate a water inflow rate in the future based on such data; input data that was obtained at certain times within the past few weeks to the function; and then convert the estimated water inflow rate into hydroelectric power-generating capacity.

In this method, however, operators have to make a function for each dam. Then, a water inflow rate in the future should be calculated using this function and converted into hydroelectric power-generating capacity in an approximate way. As a result, hydroelectric power-generating capacity cannot be estimated with high accuracy even if operators precisely modify a function itself.

In view of such a problem, it is an object of the present invention to provide an estimation system for hydroelectric power-generating capacity that can directly estimate hydroelectric power-generating capacity with high accuracy.

Means for solving the problem

According to the invention of claim 1, a neural network is trained through supervised machine learning using training data. The training data includes input data containing a precipitation amount of the upper stream of a river, a water flow rate of the upper stream of the river and a water inflow rate into a dam during a predetermined period between a reference time and a predetermined time before the reference time, and output data containing hydroelectric power-generating capacity in the future after the reference time. In response to an input to the trained neural network of a precipitation amount of the upper stream of a river, a water flow rate of the upper stream of the river and a water inflow rate into a dam before the current time, hydroelectric power-generating capacity in the future is estimated.

According to the invention of claim 2, the input data further includes a temperature of the upper stream of the river during a predetermined period between a reference time and a predetermined time before the reference time.

Effects of the invention

According to the invention of claim 1, hydroelectric power-generating capacity in the future can be directly estimated with high accuracy using a trained neural network.

According to the invention of claim 2, a temperature of the upper stream of the river is added to the input data. It allows a highly accurate estimation of actual hydroelectric power-generating capacity all year round, including in the spring with low precipitation. It has so far not been considered that there is a correlation between hydroelectric power-generating capacity and a temperature of the upper stream of the river. However, it is possible to achieve a more accurate estimation taking an increase of inflow rate due to meltwater into consideration, by using input data containing a temperature too.

State of the art (prior art, well-known art, etc.)

Cited invention 1 (invention disclosed in cited document 1 (D1)):

An estimation system of a hydroelectric power generating capacity that carries out a multiple regression analysis by an information processor, comprising:

a regression equation model, in which explanatory variables are a precipitation amount of the upper stream of a river, a water flow rate of the upper stream of the river, and a water inflow rate into a dam during a predetermined period between a reference time and a predetermined time before the reference time, and an objective variable is a hydroelectric power generating capacity in the future after the reference time;

an analysis unit that calculates a partial regression coefficient of the regression equation model based on actual values corresponding to the explanatory variables and the objective variable; and

an estimation unit that, into the regression equation model to which the partial regression coefficient that has been calculated by the analysis unit is set, inputs data of the explanatory variables with setting a current time as the reference time, and then, calculates an estimated value of a future hydroelectric power generating capacity based on an output data from the objective variable setting a current time as the reference time.

Well-known art

In the technical field of machine learning, it is well known that an estimation process of an output in the future is carried out based on an input of time series data in the past, by using a neural network which has been trained with data containing an input of time series data in the past and a certain output in the future.

JPO analysis

Conclusion (JPO)

The invention of claim 1 does not involve an inventive step.

The invention of claim 2 involves/does not involve an inventive step¹³.

Explanation (JPO)

Claim 1

The inventions of claim 1 and cited invention 1 are different from each other in the following respect.

Difference

The invention of claim 1 realises an estimation of hydroelectric power-generating capacity by means of a neural network having an input layer and output layer. Meanwhile, cited invention 1 realises an estimation of hydroelectric power-generating capacity by means of a regression equation model.

The difference is assessed as follows.

It is well known that an estimation process of an output in the future is carried out based on an input of time series data in the past, using a trained neural network. The neural network has been trained with training data containing an input of time series data in the past and a certain output in the future. Cited invention 1 and the well-known art both estimate a certain output in the future based on an input of time series data in the past, with reference to a correlation among data.

Therefore, a person skilled in the art could easily derive a configuration that enables estimation of hydroelectric power-generating capacity by applying the well-known art to cited invention 1 and adopting a trained neural network as a substitution for a regression equation model.

Further, a person skilled in the art would expect the effect of the invention of claim 1, and there is no obstructive factor found in applying the well-known art to cited invention 1.

Both cited invention 1 and the well-known art estimate an output in the future through an input of time series data in the past based on a correlation between data and have the same function.

Claim 2

¹³ Two different explanations are provided: when "the temperature change in the upper stream of the river will lead to the change of precipitation amount and changes in inflow rates through effects of meltwater, and then lead to the change of a hydroelectric power generating capacity of a dam" is not common general technical knowledge and when it is.

The invention of claim 2 and cited invention 1 are different from each other in the following respect.

Difference

The invention of claim 2 contains, in input data into an input layer, a temperature of the upper stream of the river during a predetermined period between a reference time and a predetermined time before the reference time. Meanwhile, cited invention 1 does not have such a configuration.

* Two different ways of making determination on inventive step according to "common general technical knowledge at the time of filing" are provided as follows:

Pattern 1

When "the temperature change in the upper stream of the river will lead to the change of precipitation amount and changes in inflow rates through effects of meltwater, and then lead to the change of a hydroelectric power generating capacity of a dam" is not common general technical knowledge.

[Description of the absence of reasons for refusal in claim 2]

The difference is assessed as follows.

The invention of claim 2 uses a temperature of the upper stream of the river for estimation of hydroelectric power-generating capacity. There is no prior art found disclosing such use of a temperature of the upper stream of the river. Accordingly, it is not common general technical knowledge that there is a correlation between temperature and hydroelectric power-generating capacity.

Generally, input of data whose correlation is unknown may cause noise in machine learning. However, the invention of claim 2 uses input data containing a temperature of the upper stream of the river during a predetermined period between a reference time and a predetermined time before the reference time. This enables a highly accurate estimation of hydroelectric power-generating capacity, taking an increase of inflow rate due to meltwater in the spring into consideration. It is a significant effect that a person skilled in the art cannot expect.

Accordingly, it is not considered to be a mere workshop modification that can be carried out in application of the well-known art to cited invention 1 by a person skilled in the art to include in input data in an estimation of hydroelectric power-generating capacity a temperature of the upper stream of the river during a predetermined period between a reference time and a predetermined time before the reference time.

Therefore, the invention of claim 2 involves an inventive step.

Pattern 2

When "the temperature change in the upper stream of the river will lead to the change of precipitation amount and changes in inflow rates through effects of meltwater, and then lead to the change of a hydroelectric power generating capacity of a dam" is common general technical knowledge.

[Description of the presence of reasons for refusal in claim 2]

The difference is assessed as follows.

In the technical field related to hydroelectric power generation, it is common general technical knowledge at the time of filing that "the temperature change in the upper stream of the river will lead to the change of precipitation amount and changes in inflow rates through effects of meltwater, and then lead to the change of a hydroelectric power generating capacity of a dam."

In the technical field of machine learning devices, it is common general technical knowledge in the technical field of machine learning to adopt, as an input to a machine learning device, variables that may have a correlation with an output with high possibility, in order to enhance the reliability and accuracy of an output from the machine learning device. Based on the correlation between temperature in the upper stream of the river and the hydroelectric power generating capacity, which is supported by the common general technical knowledge described above, it would have been easy for a person skilled in the art to add the temperature in the upper stream of the river to the input data of the input layer for the purpose of more precisely predicting the hydroelectric power generating capacity of a dam in the cited invention 1.

And the effect of the invention of claim 2 is to the extent that a person skilled in the art could predict it, and no particular disincentive exists for adding the temperature in the upper stream of the river to the input data of the input layer of the cited invention 1.

CNIPA analysis

Conclusion (CNIPA)

The invention of claim 1 does not involve an inventive step.

The invention of claim 2 involves/does not involve an inventive step.

Explanation (CNIPA)

Claim 1:

Reference document 1 discloses an estimation system of a hydroelectric power generating capacity of a dam using a regression equation model, in which the input data contains a precipitation amount of the upper stream of a river, a water flow rate of the upper stream of the river and a water inflow rate into a dam. The difference between the solution of the invention patent application and reference document 1 is that the neural network with input layer and output layer is adopted to realize the estimation of a hydroelectric power generating capacity of a dam.

In this solution, a trained neural network is used to estimate hydroelectric power generating capacity. The above algorithmic features and technical features of this solution functionally support each other and have an interaction relationship, realizing the directly estimation of a hydroelectric power generating capacity of a dam with high accuracy. Since the reference document 1 is in the same technical field as the solution, and has given the technical motivation of using a regression equation model in machine learning technology to directly estimate the future hydroelectric power generating capacity of a dam with high accuracy based on the past time series data, meanwhile, it is a common knowledge in the field to use a trained neural network model in machine learning technology to perform an estimation process of an output in the future based on an input of time series data in the past. Therefore, a person skilled in the art has the motivation to replace the regression equation model in reference document 1 with the neural network with input layer and output layer. It also achieves the directly estimation of the future hydroelectric power generating capacity of a dam with high accuracy, thus obtaining the invention of claim 1. Therefore, the invention of claim 1 is obvious as compared with the combination of reference document 1 and common knowledge and does not involve an inventive step.

Claim 2:

Pattern 1

When "the temperature change in the upper stream of the river will lead to the change of precipitation amount and changes in inflow rates through effects of meltwater, and then lead to the change of a hydroelectric power generating capacity of a dam" is not common general technical knowledge.

The estimation of hydroelectric power generating capacity based on a temperature of the upper stream of the river has not been disclosed in other reference documents, nor is it common knowledge in the field. On the whole, the prior art does not exist a technical motivation to enable a person skilled in the art to improve reference document 1 and reach the claimed invention. The invention of claim 2 is non-obvious as compared with reference document 1 and involves an inventive step.

Pattern 2

When "the temperature change in the upper stream of the river will lead to the change of precipitation amount and changes in inflow rates through effects of meltwater, and then lead to the change of a hydroelectric power generating capacity of a dam" is common general technical knowledge.

It is a common knowledge in the field that the temperature change of the upper stream of the river will lead to the change of precipitation amount and the change of water flow rate affected by meltwater, and then lead to the change of a hydroelectric power generating capacity of a dam. It is a common knowledge in the field to adopt, as an input to a machine learning device, variables that may have a correlation with an output with high possibility, in order to enhance a reliability and accuracy of an output from the machine learning device. Based on the above common knowledge, in order to more accurately estimate the hydroelectric power generating capacity of the dam, a person skilled in the art has the motivation to improve reference document 1, and further use the temperature in the upper stream of the river with a high possibility of correlation with the hydroelectric power generating capacity of the dam as the input of the neural network, thus obtaining the invention of claim 2. Therefore, the invention of claim 2 is obvious as compared with the combination of document 1 and common knowledge and does not involve an inventive step.

2. Case B-2

(from JPHB, Annex A, Chap. 5, Case 35)

Title of invention

Screw clamping quality estimation apparatus

What is claimed is:

[Claim 1]

A screw clamping quality estimation apparatus that assesses a screw clamping quality at the time of automatic screw clamping operation by means of a screwdriver comprising:

- a condition measurement unit that measures a set of condition variables containing a rotation speed, angular acceleration, position, and inclination of the screwdriver;

- a machine learning unit that trains a neural network through machine learning by associating, with each other, the set of condition variables measured by the condition measurement unit and the screw clamping quality at the time of automatic screw clamping operation with the use of the set of condition variables; and

a screw clamping quality estimation unit that estimates a screw clamping quality in response to an input, to the neural network that has been trained by the machine learning unit, of the set of condition variables that have been measured at the time of automatic screw clamping operation by means of a screwdriver.

Overview of the description

Background art

An automatic screw clamping operation is carried out by means of a screwdriver.

Problem to be solved by the invention

A product that has been assembled through automatic screw clamping operation is inspected by an operator to check whether a screw clamping quality meets a predetermined standard. This inspection burden the operator with a load and is a bottleneck for the whole process.

Inventors of the present invention found that a behavior of a screwdriver used in automatic screw clamping operation affects a screw clamping quality. In view of this, it is an object of the present invention to provide an apparatus that estimates a screw clamping quality based on a behavior of a screwdriver, in order to achieve a time-saving quality inspection.

Means for solving the problem

A set of state variables is obtained by measuring a combination of rotation speed, angular acceleration, position, and inclination of a screwdriver used in an automatic screw clamping operation. Assessment results by an operator is obtained as a screw clamping quality on a product that has been assembled through the automatic screw clamping operation. Then, a neural network is trained by using a training data containing (i) an input data of the set of state variables and (ii) an output data of a screw clamping quality at the time of the automatic screw clamping using the set of state variables. The screw clamping quality of a product is estimated through an input of rotation speed, angular acceleration, position, and inclination of the screwdriver at the time of automatic screw clamping operation. A product of which screw clamping quality does not meet a predetermined standard, if any, is sorted to go on to a reinspection process of a screw clamping quality by an operator or disposal.

Effects of the invention

An apparatus of the present invention assesses a screw clamping quality of a product that has been assembled through an automatic screw clamping operation. Conventionally, an inspection by an operator is needed after an automatic screw

clamping process, and it burdened an operator with a load. However, the present invention enables a time-saving inspection by using an estimated screw clamping quality.

State of the art (prior art, well-known art, etc.)

Cited invention 1 (invention disclosed in the cited document 1 (D1)):

A screw clamping quality estimation apparatus that assesses a screw clamping quality at the time of automatic screw clamping operation by means of a screwdriver comprising:

a condition measurement unit that measures a set of condition variables containing a rotation speed and angular acceleration of the screwdriver;

a machine learning unit that trains a neural network through machine learning by associating, with each other, the set of condition variables measured by the condition measurement unit and the screw clamping quality at the time of automatic screw clamping operation with the use of the set of condition variables; and

a screw clamping quality estimation unit that estimates a screw clamping quality in response to an input, to the neural network that has been trained by the machine learning unit, of the set of condition variables that have been measured at the time of automatic screw clamping operation by means of a screwdriver.

Cited invention 2 (Invention disclosed in the cited document 2 (D2)):

A screw clamping quality assessment method comprising:

measuring a position and inclination of a screwdriver; and

assessing a screw-clamping quality based on the measured position and inclination of the screwdriver.

Well-known art

It is a common general technical knowledge in the technical field of machine learning to adopt, as an input to a machine learning device, variables that may have a correlation with an output with high possibility, in order to enhance a reliability and accuracy of an output from the machine learning device.

JPO analysis

Conclusion (JPO)

The invention of claim 1 does not involve an inventive step.

Explanation (JPO)

Claim 1

The invention of Claim 1 and Cited Invention 1 are different with each other at the point below.

(Difference)

According to the invention of Claim 1, a condition measurement unit measures a set of condition variables containing a rotation speed, angular acceleration, position, and inclination of a screwdriver. Using the set of condition variables containing these four types of variable, a machine learning of a neural network is carried out and a screw clamping quality is estimated. Meanwhile, according to Cited Invention 1, a condition measurement unit measures a set of condition variables containing a rotation speed and angular acceleration of a screwdriver. Using the set of condition variables containing these two types of variables, a machine learning of a neural network is carried out and a screw clamping quality is estimated.

The difference is assessed as follows.

Cited Invention 2, in which a screw clamping quality is assessed based on a position and inclination of a screwdriver, discloses that there is a correlation between a position and inclination of a screwdriver and it affects the assessment. Both Cited Invention 1 and Cited Invention 2 assess a screw clamping quality based on several conditions of a screwdriver, and have a common object. Further, it is a common general technical knowledge in the technical field of machine learning to adopt, as an input to a machine learning device, variables that may have a correlation with an output with high possibility, in order to enhance a reliability and accuracy of an output from the machine learning device.

In view of the above, a person skilled in the art can easily derive a configuration that enables a machine learning of a neural network and an estimation of screw clamping quality using a set of condition variables containing four types of variable (in addition to a rotation speed and angular acceleration of a screwdriver in Cited Invention 1, a position and inclination of a screwdriver having a correlation with a screw clamping quality in Cited Invention 2 are adopted), in order to enhance a reliability and accuracy of an output from a machine learning device.

Further, a person skilled in the art can expect the effect of the invention of Claim 1, and thus, there is no obstructive factor found to apply Cited Invention 2 to Cited Invention 1.

[Explanation]

(Considered Motivation)

(1) Relation of technical fields

Both Cited Invention 1 and Cited Invention 2 aim at estimating a screw clamping quality, and are common with each other in the technical field.

(2) Similarity of the problem to be solved

Both Cited Invention 1 and Cited Invention 2 aim at assessing a screw clamping quality based on several conditions of a screwdriver, and are common with each other in the problem to be solved.

CNIPA analysis

Conclusion (CNIPA)

The invention of claim 1 does not involve an inventive step.

Explanation (CNIPA)

Reference document 1 discloses a screw clamping quality estimation apparatus that trains a neural network using a set of condition variables containing a rotation speed and angular acceleration of the screwdriver and assesses the screw clamping quality. The difference between the solution of the invention patent application and reference document 1 is that the set of condition variables used to train the neural network and assess the screw clamping quality contain not only the rotation speed and angular acceleration of the screwdriver, but also position, and inclination of the screwdriver.

In this solution, a neural network is trained through machine learning by associating, with each other, the set of condition variables containing the rotation speed, angular acceleration, position, inclination of the screwdriver and the screw clamping quality at the time of automatic screw clamping operation with the use of the set of condition variables. The trained neural network is used to assess the screw clamping quality. The above algorithmic features and technical features of this solution functionally support each other and have an interaction relationship, saving the time of screw clamping quality inspection. Compared with reference document 1, the technical problem actually solved by the invention can be determined as how to further improve the screw clamping quality assessment effect.

Reference document 2 is in the same technical field as the solution and reference document 1, and discloses a screw clamping quality assessment method to assess a screw clamping quality based on the measured position and inclination of the screwdriver.

That is, reference document 2 discloses that the set of condition variables used to assess the screw clamping quality contain position and inclination of the screwdriver in

the distinguishing features, and the function of the disclosed feature in reference document 2 is the same as the function of the disclosed feature in the claimed invention, both of which are that the position and inclination of the screwdriver have a high correlation with the screw clamping quality. It can effectively evaluate the screw clamping quality. In addition, it is a common knowledge in the field to adopt, as an input to a machine learning device, variables that may have a correlation with an output with high possibility, in order to enhance a reliability and accuracy of an output from the machine learning device. Therefore, in order to further improve the screw clamping quality assessment effect, a person skilled in the art has the motivation to improve reference document 1, and use the position and inclination of the screwdriver as the condition variables for training the neural network and assessing the screw clamping quality, thus obtaining the invention of claim 1. Therefore, the invention of claim 1 is obvious as compared with the combination of reference document 1, reference document 2 and common knowledge and does not involve an inventive step.

3. Case B-3

(from Example 11, Section 6.2, Chapter 9, Part II, CNIPA Guidelines)

Title of invention

A falling state detection method of humanoid robot based on multi-sensor information

What is claimed is:

Claim 1

A method for detecting a fall state of a humanoid robot based on multi-sensor information, characterized by comprising the following steps:

(1) establish a hierarchical sensor information fusion model by fusing the posture sensor information, zero-moment point ZMP sensor information and robot walking stage information;

(2) use the front and rear fuzzy decision-making system and the left-right fuzzy decision-making system to determine the stability of the robot in the front and rear directions and the left and right directions, and the specific steps are as follows:

① determine the walking stage of the robot according to the contact situation between the supporting feet of the robot and the ground and offline gait planning;

② using fuzzy inference algorithm to fuzzify the position information of ZMP points;

③ using fuzzy inference algorithm to fuzzify the pitch angle or roll angle of the robot;

④ determine the output membership function;

⑤ determine fuzzy inference rules according to step①~step④;

⑥ defuzzy.

Overview of the description

Background art/Problem to be solved by the invention

Existing judgments of the falling state of humanoid robots while walking mainly use posture information or ZMP points position information, but such judgments are not comprehensive.

Means for solving the problem

The invention patent application proposes a method for detecting the falling state of a humanoid robot based on multi-sensor, by real-time fusion of robot gait stage information, posture information and ZMP points position information, and using a fuzzy decision system to determine the current stability and controllability of the robot to provide a reference for the next action of the robot.

Effects of the invention

The solution had effectively improved the reliability and accuracy of the judgment of the stability of the robot and its possible falling direction.

State of the art (prior art, well-known art, etc.)

Cited invention 1 (invention disclosed in cited document 1 (D1)):

Reference document 1 discloses a gait planning and sensor information-based feedback control of a humanoid robot, and judges the stability of the robot based on relevant fusion information, including the evaluation of the stable state of the humanoid robot based on the information of multiple sensors. Reference document 1 specifically discloses the establishment of a hierarchical sensor information fusion model by fusing the posture sensor information, zero-moment point ZMP sensor information and robot walking stage information.

JPO analysis

Conclusion (JPO)

The invention of Claim 1 involves an inventive step.

Explanation (JPO)

The invention of Claim 1 and the cited invention 1 are different from each other at the point below.

(Difference)

The invention of Claim 1 includes, upon judging the stability of the humanoid robot, a step to use the front and rear fuzzy decision-making system and the left-right fuzzy decision-making system to determine the stability of the robot in the front and rear directions and the left and right directions, and in the step, the steps identified in (1) to (6) of the Claim 1 are performed, whereas no such point is specified in the invention described in the cited document 1.

The difference is assessed as follows.

In the cited document 1, there is no prior art that suggests technical matters pertaining to the differences, including the point of using a front and rear fuzzy decision-making system and a left and right fuzzy decision-making system for detecting a fall state of the robot. There is also no basis for assuming that the technical matter in question is "design variation, etc." from the cited document 1 (design variation or design choice associated with an application of specific techniques to solve certain problems).

Further, by having matters pertaining to the differences, the invention of Claim 1 has an advantageous effect compared to the cited invention 1 because it improves the reliability and accuracy of the judgment of the stability of the robot and its possible falling direction.

In view of the above, it is not possible for a person skilled in the art to have easily conceived of the invention of Claim 1 based on the cited invention 1.

CNIPA analysis

Conclusion (CNIPA)

The invention of claim 1 involves an inventive step.

Explanation (CNIPA)

Reference document 1 discloses a gait planning and sensor information-based feedback control of a humanoid robot, and judges the stability of the robot based on relevant fusion information, including the evaluation of the stable state of the humanoid robot based on the information of multiple sensors. Reference document 1 discloses step (1) in the solution of the invention application. The difference between this solution and reference document 1 lies in the fuzzy decision method using the specific algorithm of step (2).

Based on the application document, it could be known that this solution had effectively improved the reliability and accuracy of the judgment of the stability of the robot and its possible falling direction. The posture information, the position information of the ZMP points and the information of the walking stage were input into the system. The information of the stable state of the humanoid robot was determined through the fuzzy algorithm, which provided the basis for further accurate posture adjustment instructions. Therefore, the algorithmic features functionally support each other and have an interaction relationship with the technical features. Compared with reference document 1, the technical problem actually solved by the invention can be determined as how to judge the stable state of the robot and accurately predict its possible falling direction. The implementation algorithm of the above-mentioned fuzzy decision and its application to the judgment of the stable state of the robot have not been disclosed in other reference documents, nor are they common knowledge in the field. On the whole, the prior art does not exist a technical motivation to enable a person skilled in the art to improve reference document 1 and reach the claimed invention. The solution claimed in the application is non-obvious as compared with the closest prior art and involves an inventive step.

4. Case B-4

(from Example 12, Section 6.2, Chapter 9, Part II, CNIPA Guidelines)

Title of invention

Multi-robots path planning system based on cooperative co-evolution and multi-group genetic algorithm

What is claimed is:

Claim 1

A multi-robots path planning system based on cooperative co-evolution and multi-group genetic algorithm, characterized by:

(1) a path of a robot is represented by a chromosome, and the chromosome is represented as a linked list of nodes, namely $[(x,y),time]$, $(x,y,time \in R)$, (x,y) represents the robot's position coordinates, time represents the time required to move this node from the previous node, the time of the start node is equal to 0, the number of intermediate nodes and nodes of the chromosome of each individual robot is variable except that the initial position of the initial node and the target position of the end node are fixed;

(2) the fitness function of each robot Robot(i) path(j) is expressed as $\varphi(pi,j)$:

$$\|pi, j\| = \text{Distance}(pi,j) + ws \times \text{smooth}(pi,j) + wt \times \text{Time}(pi,j)$$

wherein $\|pi, j\|$ is a linear combination of distance, smoothness and time consumption, ws is a smoothing weighting factor, wt is a time weighting factor; $\text{Distance}(pi,j)$ represents the path length, and $\text{smooth}(pi,j)$ represents the smoothness of the path, $\text{Time}(pi,j)$ is the

time consumption of path $p_{i,j}$; each robot uses the fitness function to obtain the optimal path through Messy genetic algorithm optimization.

Overview of the description

Background art/Problem to be solved by the invention

The existing multi-mobile robots motion planning control structure usually adopts a centralized planning method, which treats the multi-robots system as a complex robot with multiple degrees of freedom, and a planner in the system completes the motion planning of all robots uniformly. The disadvantage is that the calculation time is long and the practicality is not good.

Means for solving the problem

The invention patent application provides a multi-robots path planning system based on collaborative co-evolution and multi-group genetic algorithm. Each path of the robot is represented by a chromosome, and the shortest distance, smoothness, and safety distance are taken as the three goals of the design path fitness function. The optimal path is obtained by optimizing the path of each robot through the Messy genetic algorithm.

Effects of the invention

The solution uses the Messy genetic algorithm to optimize the robot's forward path and realizes the optimization of the robot's forward path.

State of the art (prior art, well-known art, etc.)

Cited invention 1 (invention disclosed in cited document 1 (D1)):

Reference document 1 discloses a multi-robots path planning system based on cooperative co-evolution and multi-group genetic algorithm, characterized by:

(1) a path of a robot is represented by a chromosome, and the chromosome is represented as a linked list of nodes, namely $[(x,y),time]$, $(x,y,time \in R)$, (x,y) represents the robot's position coordinates, time represents the time required to move this node from the previous node, the time of the start node is equal to 0, the number of intermediate nodes and nodes of the chromosome of each individual robot is variable except that the initial position of the initial node and the target position of the end node are fixed;

(2) the fitness function of each robot Robot(i) path(j) is expressed as $\varphi(p_{i,j})$:

$$||p_{i,j}|| = \text{Distance}(p_{i,j}) + w_s \times \text{smooth}(p_{i,j}) + w_t \times \text{Time}(p_{i,j})$$

wherein $||p_i, j||$ is a linear combination of distance, smoothness and time consumption, w_s is a smoothing weighting factor, w_t is a time weighting factor; $\text{Distance}(p_i, j)$ represents the path length, and $\text{smooth}(p_i, j)$ represents the smoothness of the path, $\text{Time}(p_i, j)$ is the time consumption of path p_i, j ; each robot uses the fitness function to obtain the optimal path through chaotic genetic algorithm.

Cited invention 2 (invention disclosed in cited document 1 (D2)):

Reference document 2 discloses that a variety of genetic algorithms including the chaotic genetic algorithm can be used for path optimization. At the same time, the Messy genetic algorithm can solve the drawbacks of other algorithms and obtain more reasonable optimization results.

JPO analysis

Conclusion (JPO)

The invention of Claim 1 lacks an inventive step.

Explanation (JPO)

The invention of Claim 1 and the invention described in the cited document 1 are different from each other at the point below.

(Difference)

The invention of Claim 1 realizes path planning of multi-robots through the Messy genetic algorithm, whereas the invention described in the cited document 1 realizes path planning of multi-robots through a chaotic genetic algorithm.

The difference is assessed as follows.

The invention described in the cited document 2 has disclosed that a variety of genetic algorithms, including CGA, can all be used for path optimization, and that at the same time, the Messy genetic algorithm can solve the drawbacks of other algorithms and thus obtain more reasonable optimization results.

In addition, the invention described in the cited document 1 and the invention described in the cited document 2 share the same function in that they use a genetic algorithm to optimize the robot's path.

In this view, it was easily conceived for a person skilled in the art to apply the invention described in the cited document 2 to the invention described in the cited document 1, expecting the effect of obtaining more reasonable optimization results, and to configure the invention to use the Messy genetic algorithm instead of CGA.

In view of the above, the effect of the invention of Claim 1 is such that a person skilled in the art could have expected it, and there is no particular obstructive factor in applying the invention described in the cited document 2 to the invention described in the cited document 1.

CNIPA analysis

Conclusion (CNIPA)

The invention of claim 1 does not involve an inventive step.

Explanation (CNIPA)

Reference document 1 discloses a multi-robots path planning method based on cooperative co-evolution, in which a fitness function is adopted to obtain an optimal path through a chaotic genetic algorithm. The difference between the solution of the invention application and reference document 1 is that the path planning of multi-robots is realized through the Messy genetic algorithm.

In this solution, the Messy genetic algorithm is used to optimize the robot's forward path. The algorithmic features functionally support each other and have an interaction relationship with the technical features of the solution, which realizes the optimization of the robot's forward path. Compared with reference document 1, the technical problem actually solved by the invention can be determined as how to make the robot advance on the optimal path based on a specific algorithm. Reference document 2 has disclosed that a variety of genetic algorithms including the chaotic genetic algorithm can be used for path optimization. At the same time, the Messy genetic algorithm can solve the drawbacks of other algorithms and obtain more reasonable optimization results. Based on the technical motivation given by reference document 2, the person skilled in the art has the motivation to combine reference document 1 and 2 to obtain the technical solution of the invention application. Consequently, the solution claimed in the application is obvious as compared with the combination of reference document 1 and 2 and does not involve an inventive step.

5. Case B-5

(from Example 15, Section 6.2, Chapter 9, Part II, CNIPA Guidelines)

Title of invention

A method for adapting parameters of neural network

What is claimed is:

Claim 1

A method for adapting parameters of a neural network, comprising:
selecting multiple dimensions for a weight parameter of each of at least one layer of the neural network;
determining the size of the weight parameter in each of the multiple dimensions;
determining a set of candidate values for the target size of the weight parameter in each of the multiple dimensions based on the utilization rate of the hardware supporting neural network calculation;
selecting a subset of a set of candidate values in which each candidate value being greater than or equal to the size on the corresponding dimension, and determining that the minimum value in the subset is the target size on the corresponding dimension;
if the size of the weight parameter in at least one of the multiple dimensions is less than the target size in the corresponding dimension, padding the weight parameter in the dimension so that the size of the weight parameter obtained after the padding in each dimension is equal to the target size in the corresponding dimension.

Overview of the description

Background art/Problem to be solved by the invention

Different neural network architectures need to be designed for different application scenarios and implemented using a series of operations on a certain type of computing architecture. Therefore, it is expected that the operations in neural network can be implemented efficiently with lower hardware cost.

Means for solving the problem

The invention patent application proposes a method for adapting parameters of a neural network. By obtaining neural network parameters in canonical form, the operations in neural network can be mapped to the operations supported by computing architecture, and the design and implementation of neural network related hardware can be simplified.

Effects of the invention

The solution pads the size of the weight parameter equal to the target size. When the hardware supporting the neural network calculates the data of the neural network, the hardware can process the data efficiently. The algorithm in the solution improves the operational efficiency of the hardware.

State of the art (prior art, well-known art, etc.)

Cited invention 1 (invention disclosed in cited document 1 (D1)):

Reference document 1 discloses a design method for neural network processor. According to the neural network topology, the weight parameter and dimension parameter of each layer in the neural network layers, as well as the hardware resource constraint parameter, the method searches the unit library from the constructed neural network component library, and generates the hardware description language code of the neural network processor corresponding to the neural network model according to the unit library. Further, the hardware description language code is transformed into the hardware circuit of the neural network processor. The feature data and weight data of the neural network are divided into appropriate data blocks for centralized storage and access.

JPO analysis

Conclusion (JPO)

The invention of Claim 1 involves an inventive step.

Explanation (JPO)

The invention of Claim 1 and the invention described in the cited document 1 are different from each other at the point below.

(Difference)

The invention of Claim 1

selects multiple dimensions for a weight parameter of each of at least one layer of the neural network;

determines the size of the weight parameter in each of the multiple dimensions;

determines a set of candidate values for the target size of the weight parameter in each of the multiple dimensions based on the utilization rate of the hardware supporting neural network calculation;

selects a subset of a set of candidate values in which each candidate value being greater than or equal to the size on the corresponding dimension, and determines that the minimum value in the subset is the target size on the corresponding dimension;

if the size of the weight parameter in at least one of the multiple dimensions is less than the target size in the corresponding dimension, pads the weight parameter in the dimension so that the size of the weight parameter obtained after the padding in each dimension is equal to the target size in the corresponding dimension,

whereas the cited document 1 searches the unit library from the constructed neural network component library according to the neural network topology, the weight parameter and dimension parameter of each layer in the neural network layers, as well as the hardware resource constraint parameter,

generates the hardware description language code of the neural network processor corresponding to the neural network model according to the unit library,

transforms the hardware description language code into the hardware circuit of the neural network processor, divides feature data and weight data of the neural network into appropriate data blocks for centralized storage and access.

The difference is assessed as follows.

In adjusting the parameters of the neural network, there is no prior art that considers the target size of the weight parameter in each dimension and padding the weight parameter in a dimension.

In addition, in order to solve the problem of making the hardware perform the operations in the neural network efficiently, the invention of Claim 1 adopts a completely different technical matters than the invention described in the cited document 1. Hence, there is no grounds sufficient to support the discussion that the technical matter in question is "design variation, etc." (design variation or design choice associated with an application of specific techniques to solve certain problems) from the cited document 1.

In view of the above, it cannot be determined that a person skilled in the art could have easily conceived of the invention of Claim 1 based on the cited invention 1.

CNIPA analysis

Conclusion (CNIPA)

The invention of claim 1 involves an inventive step.

Explanation (CNIPA)

Reference document 1 discloses a design method for neural network processor. According to the neural network topology, the weight parameter and dimension parameter of each layer in the neural network layers, as well as the hardware resource constraint parameter, the method searches the unit library from the constructed neural network component library, and generates the hardware description language code of the neural network processor corresponding to the neural network model according to the unit library. Further, the hardware description language code is transformed into the hardware circuit of the neural network processor. The feature data and weight data of the neural network are divided into appropriate data blocks for centralized storage and access. The difference between the solution of the invention application and reference document 1 is to determine the size of the weight parameter of each layer of the neural network in each dimension, determine a set of candidate values for the target size of the weight parameter in each dimension based on the hardware utilization, selecting a subset of a set of candidate values in the corresponding dimension, and determine the minimum value as the target size, padding the weight parameter in a dimension if the size of the weight parameter in the dimension is less than the target size.

Based on the application file, the solution pads the size of the weight parameter equal to the target size. When the hardware supporting the neural network calculates the data of the neural network, the hardware can process the data efficiently. The algorithm in the solution improves the operational efficiency of the hardware. Therefore, the above algorithmic features and technical features for adapting parameters of the neural network functionally support each other and have an interaction relationship. Compared with reference document 1, the technical problem actually solved by the invention can be determined as how to make the hardware perform the operations in the neural network efficiently. The above content of adapting the parameters of the neural network to improve the operational efficiency of hardware has not been disclosed in other reference documents, nor is it a common knowledge in the field. On the whole, the prior art does not exist a technical motivation to enable a person skilled in the art to improve reference document 1 and reach the claimed invention. The solution claimed in the application is non-obvious as compared with the closest prior art and involves an inventive step.

1. Case C-1

(from JPHB, Annex A, Chap.1, Case 47)

Title of the Invention

Business plan design apparatus

What is claimed is:

Claim 1

A business plan design apparatus comprising:

a storage means for storing a stock amount of a specific product;

a reception means for receiving a web advertisement data and mention data of the specific product;

a simulation and output means for, using an estimation model that has been trained through machine learning with a training data containing a web advertisement data and mention data of a similar product that has been sold in the past and a sales quantity of the similar product, simulating and outputting a future sales quantity of the specific product estimated based on the web advertisement data and mention data of the specific product;

a production plan making means for planning a future production quantity of the specific product, based on the stored stock amount and the output sales quantity; and

an output means for outputting the output sales quantity and the production plan.

Overview of the description

As the internet is widely spreading, a web advertisement has become an effective way for sales promotion of a product. However, it cannot readily be determined in real-time whether a web advertisement is actually effective and, through trial and error, not a few business opportunities have been wasted due to stock shortage or the like. In view of this, it is an object of the present invention to provide a business plan design apparatus that estimates the sales quantity of a specific product in the future based on web advertisement data and mention data of the product and presents a production plan of the product including a future production quantity based on a stored stock amount and an estimated sales quantity. With this apparatus, a seller of a specific product can revise a production plan of the product at an early stage.

The business plan design apparatus firstly stores a stock amount of a specific product. The apparatus then obtains an estimated sales quantity of the product based on an input of web advertisement data and mention data of the product, using an estimation model that outputs an estimated product sales quantity. In this case, the web advertisement data is the number of times the specific product publicly appeared on the web. The term "advertisement" includes banner ads, product listing ads and direct emails. The mention data includes reviews of the product or advertisement in web articles, on social media, in blogs, etc. In the reviews of the product or advertisement, an evaluation value is set so that it becomes greater if there are a lot of positive reviews, and otherwise it becomes lower. The evaluation value can be obtained through known computer processing of the text in web articles, on social media, in blogs, etc. The estimation model is generated through supervised machine learning with training data using a known machine learning algorithm, such as a neural network. The training data contains a relation between web advertisement data and mention data of a similar product that has been sold in the past and an actual sales quantity of the similar product.

The model compares the stored stock amount and the estimated sales quantity of the product. Then, the model makes a plan for increased production if the sales quantity exceeds the stored stock amount, and otherwise makes a plan for decreased production.

The apparatus, using the estimation model that has been trained in this way, simulates a sales quantity of a product; compares the sales quantity and a stock amount of the product; and presents the comparison in a manner that a user can readily determine whether production of the product should be increased or decreased.

Note: In this case, it is assumed that, in view of common general technical knowledge at the time of filing, a person skilled in the art can presume a certain relation such as a correlation (hereinafter referred to as "correlation or the like") between advertisement data and reference data on the web and sales quantity.

JPO analysis

No reason for refusal is found.

Article 29(1) JPA (eligibility)

It can be determined, from the statement of Claim 1, that specific calculation or processing of information depending on the intended use, that is, simulating and outputting a future sales quantity of the specific product based on various data, is implemented by specific means or specific procedures on which software and hardware co-operate, that is, a storage means, a reception means, a simulation and output means, a production plan making means, and output means for outputting the output sales quantity and the production plan.

It is thus determined that the business plan design apparatus of Claim 1 constructs a computer (business plan design apparatus) depending on the intended use through co-operation of software and hardware resources.

Therefore, since the information processing by the software is specifically implemented by using hardware resources, the business plan design apparatus of Claim 1 is a creation of a technical idea utilizing a law of nature and thus falls under “invention”

Article 36(4)(i) JPA (enablement requirement) / Article 36(6)(i) (Support Requirement)

The description discloses that web advertisement data and mention data are used. The web advertisement data is based on the number of times a specific product publicly appeared on the web, and the mention data is based on an evaluation value of reviews of the product or advertisement in web articles, on social media, in blogs, etc.

Although the description does not disclose a correlation or the like between the web advertisement data and the mention data and the sales quantity, it can be presumed that there is a correlation or the like between them in view of common general technical knowledge at the time of filing.

Furthermore, it is known at the time of filing that an estimation model can be generated that estimates an output in response to an input through machine learning with training data containing input data and output data having a correlation or the like, using a generally used machine learning algorithm.

In view of the above, an estimation model can be generated using a universal machine learning algorithm with training data containing the number of times a similar product publicly appeared in a web advertisement; an evaluation value of reviews of the product or advertisement in web articles, on social media, in blogs, etc.; and a sales quantity of the similar product. Accordingly, it is obvious for a person skilled in the art that a business plan design apparatus can be derived that simulates and outputs a sales quantity of a specific product and makes a production plan of the specific product based on the output sales quantity, using the above estimation model.

Therefore, the "business plan design apparatus" in claim 1 is disclosed in the description in such a manner that a person skilled in the art can make and use the apparatus. In other words, the description provides a clear and sufficient disclosure for a person skilled in the art to carry out the invention.

In addition, in light of the statement of the detailed explanation of the invention, the detailed explanation of the invention can be regarded as disclosing the invention in such a way that a person skilled in the art could recognize that the problem to be solved by the invention of claim 1, which is providing a business plan design apparatus that estimates a sales quantity of a specific product in the future based on a web advertisement data and mention data of the product, and presents a production plan of the product including a future production quantity based on a stored stock amount and an estimated sales quantity, would be actually solved. Thus, the invention of claim 1 is stated in the detailed explanation of the invention, and claim 1 satisfies the requirement of Article 36(6)(i).

CNIPA analysis

Conclusion (CNIPA)

Claim 1 constitutes the subject matter for patent protection.

Description discloses the invention sufficiently, and the invention complies with the provisions of Article 26.3 Chinese Patent Law.

Claim 1 is supported by the description, and complies with the provisions of Article 26.4 Chinese Patent Law.

Explanation (CNIPA)

About the subject matter for patent protection:

Claim 1 refers to a business plan design apparatus, which belongs to a computer device. The solution solves a technical problem that the advertising actual effect cannot be determined, which prevents the production plan from being modified at an early stage. What it utilizes is predicting future sales of products based on a web advertisement data and mention data by machine learning, and then making a production plan based on the stored stock amount and the predicted future sales quantity, and thus is technical means in conformity with the laws of nature. The solution enables to modify the production plan at an early stage based on the advertising effect. What is obtained is technical effect. Therefore, the solution is the technical solution as provided for in Article 2.2 Chinese Patent Law, and constitutes the subject matter for which patent protection may be sought.

About description:

The application solves a problem that the actual effect of advertising cannot be determined, which prevents the production plan from being modified at an early stage. Description sets forth that the future sales of the product is predicted based on a web advertisement data and mention data by machine learning, and a production plan is made based on the stored stock amount and the predicted future sales quantity. Although the description does not record the specific correlation between the web advertisement data and the mention data and the future sales quantity of products, it is a common knowledge in this field that there is a correlation between the web advertisement data and the mention data and the future sales quantity. Furthermore, it is known at the time of filing that a general-purpose machine learning model after being trained with data with correlation can output data according to new input data. Therefore, a person skilled in the art can realize the technical solution of the invention by the specific embodiments described in the description, solve the technical problem, and achieve the expected technical effects of modifying the production plan at an early stage based on the effect of advertising. In summary, the description sets forth the invention in a manner sufficiently clear and complete to such an extent that a person skilled in the art can carry it out. Description discloses the invention sufficiently.

About supported by the description:

Description sets forth that the future sales of the product is predicted based on a web advertisement data and mention data by machine learning, and a production plan is made based on the stored stock amount and the predicted future sales quantity. Therefore, the technical solution claimed in claim 1 is a technical solution that a person skilled in the art can obtain from the contents sufficiently disclosed in the description, and does not go beyond the scope of the contents disclosed in the description. Claim 1 is supported by the description, and complies with the provisions of Article 26.4 of Chinese Patent Law.

2. Case C-2

(from JPHB, Annex A, Chap.1, Case 49)

Title of the Invention

BODY WEIGHT ESTIMATION SYSTEM

What is claimed is:

Claim 1

A body weight estimation system comprising:

a model generation means for generating an estimation model that estimates a body weight of a person based on a feature value representing a face shape and a body height of the person, through machine learning using training data containing feature values representing face images as well as actual measured values of body heights and body weights of people;

a reception means for receiving an input of a face image and body height of a person;

a feature value obtainment means for obtaining a feature value representing a face shape of the person through analysis of the face image of the person that has been received by the reception means; and

a processing means for outputting an estimated value of a body weight of the person based on the feature value representing the face shape of the person that has been received by the feature value obtainment means and the body height of the person that has been received by the reception means, using the generated estimation model by the model generation means.

Claim 2

The body weight estimation system as in Claim 1, wherein the feature value representing a face shape is a face-outline angle.

Overview of the description

It is an object of the present invention to provide a body weight estimation system that can conveniently be used outside without a body weight scale.

There is a certain degree of correlation between a face feature and physical size of a person. As seen in Fig. 1, the inventor found a statistically significant correlation between a cosine of a face-outline angle and BMI (defined as a body weight divided by the square of a body height) of a person. The face-outline angle here means an angle defined between a tangent line to a jaw and a tangent line to a cheek. As seen in Fig. 2, data plots can be approximated by a linear function in the coordinate system in which the horizontal axis represents BMI and the vertical axis represents a cosine of a face-outline angle.

This suggests a certain degree of correlation between a body height and weight used for BMI calculation and a face-outline angle. Accordingly, an estimation model with a highly accurate output can be generated through machine learning, using a known machine learning algorithm such as a neural network with a training data. The training data contains actual measured values of face-outline angles, body heights, and body weights. The face-outline angles are obtained through analysis on face images of people.

A feature value representing a face shape of a person is a face-outline angle in this embodiment, but it is not limited to this. Any feature value representing a face shape may be obtained from a face image and used.

Note:

In this case, it is assumed that, even in view of a common general technical knowledge at the time of filing, a person skilled in the art cannot presume a certain relation such as a correlation (referred to as “correlation or the like” in this Case Example) between (i) a body height, weight, and the like of a person and BMI based on these and (ii) a feature representing a face shape such as a face-outline angle is not a common general technical knowledge at the time of filing here.

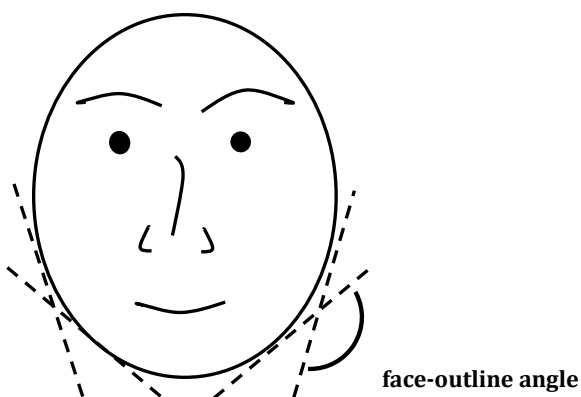


Fig. 1

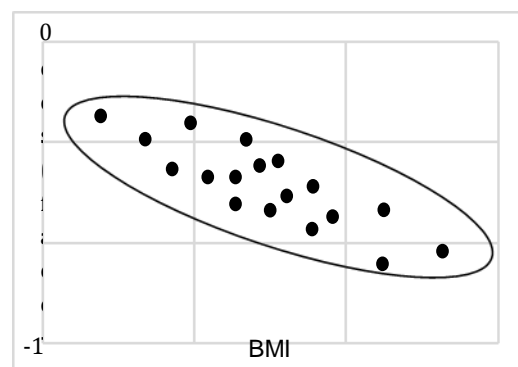


Fig. 2

JPO analysis

Claim 1: Article 36(6)(i) (Support Requirement)/Article 36(4)(i) (Enablement Requirement)

Claim 2: There is no reason for refusal found.

Article 36(6)(i) (Support Requirement)/Article 36(4)(i) (Enablement Requirement):
Claim 1

The description discloses that (i) a feature value representing a face shape of a person is a face-outline angle, which is defined between a tangent line to a jaw and a tangent line to a cheek, and (ii) there is a statistically significant correlation between a cosine of a face-outline angle and BMI (defined as a body weight divided by the square of a body height) of a person.

However, the description only discloses that any feature value other than a face-outline angle representing a face shape may be obtained from a face image and used. It does not disclose a correlation or the like between (i) a feature value other than a face-outline angle representing a face shape and (ii) a body height, weight, and the like of a person and BMI based on these. Further, it cannot be presumed that there is such a correlation or the like even if a common general technical knowledge at the time of filing is taken into consideration. There is no performance evaluation result disclosed on an estimation model that has actually been generated using a feature value other than a face-outline angle representing a face shape.

Accordingly, the description does not provide a sufficient disclosure for a person skilled in the art to recognize that a body weight estimation can be attained based on a body height and any feature value representing a face shape. In other words, the scope of the description cannot be expanded or generalized to that of the invention of Claim 1, in which an input to an estimation model that outputs an estimation value of a body weight is specified only by a body height and a feature value representing a face shape in a face image of a person.

Thus, the scope of the invention of Claim 1 exceeds that of the description.

In view of the disclosure in the description and a common general technical knowledge at the time of filing as explained above, it does not seem that a person skilled in the art can make a body weight estimation system that estimates a body weight of a person in response to an input of a body height and a feature value representing a face shape of a person, by generating an estimation model using a universal machine learning algorithm with a training data containing actual measured values of body weights, body heights, and feature values representing face shapes of people.

Therefore, a “body weight estimation system” in Claim 1 is not disclosed in the description in a manner that a person skilled in the art can make and use the system. In other words, the description does not provide a clear and sufficient disclosure for a person skilled in the art to carry out the invention.

Notes

Claim 2

The description discloses that there is a statistically significant correlation between a cosine of a face-outline angle and BMI of a person.

Based on the disclosure in the description, a person skilled in the art can recognize that there is a certain degree of correlation between a body height and weight and a face-outline angle, and can generate an estimation model using a universal machine learning algorithm with a training data containing actual measured values of body heights, body weights, and face-outline angles. Accordingly, a body weight estimation system can be made that estimates a body weight of a person in response to an input of a face-outline angle and a body height of a person, using the above estimation model.

Therefore, the description discloses a “body weight estimation system” in Claim 2 in a manner that a person skilled in the art can make and use the system. In other words, the description provides a clear and sufficient disclosure for a person skilled in the art to carry out the invention.

Further, the invention of Claim 2 is disclosed in the description and Claim 2 satisfies the support requirement.

Measures to be Taken by the Applicant

The applicant can overcome the reason for refusal by an amendment deleting Claim 1 and leaving only Claim 2.

CNIPA analysis

Conclusion (CNIPA)

Description discloses the invention sufficiently, and the invention complies with the provisions of Article 26.3 Chinese Patent Law.

Claim 1 is not supported by the description, and does not comply with the provisions of Article 26.4 Chinese Patent Law.

Claim 2 is supported by the description, and complies with the provisions of Article 26.4 Chinese Patent Law.

Explanation (CNIPA)

About description:

The invention is to solve the problem for conveniently estimating a body weight without a body weight scale. Description discloses that there is a statistically significant correlation between a cosine of a face-outline angle and BMI (defined as a body weight

divided by the square of a body height) of a person, and an estimation mode based on a machine learning algorithm is provided, wherein the training data contains a face-outline angle, body heights and body weights of people, and the estimation model can output an estimated value of a body weight of the person based on the received face-outline angle and body heights. In addition, it is known at the time of filing that a trained model can output data in response to a new input through machine learning with training data having a correlation. Therefore, on the premise that a cosine of a face-outline angle is presumptively statistically correlated with BMI of a person, a person skilled in the art can realize the technical solution of the invention in accordance with the specific mode for carrying out the invention described in the description, solve said technical problem, and conveniently estimate a body weight without a body weight scale, thus achieve the expected technical effects. In summary, the description sets forth the invention in a manner sufficiently clear and complete to such an extent that a person skilled in the art can carry it out. Description discloses the invention sufficiently.

About Claim 1

Claim 1 defines " through machine learning using training data containing feature values representing face images as well as actual measured values of body heights and body weights of people ", and "outputting an estimated value of a body weight of the person based on the feature value representing the face shape of the person that has been received by the feature value obtainment means and the body height of the person that has been received by the reception means". However, the description only discloses that there is a statistically significant correlation between a cosine of a face-outline angle and BMI of a person, and does not disclose a correlation between any other feature values of the face shape and body weights of people. Even in view of a common general technical knowledge at the time of filing, the existence of such a correlation cannot be presumed, so this correlation cannot be reached directly or by generalization from the contents disclosed in the description, that is, the generalizations of claim 1 contains the content speculated by the applicant, and the effects cannot be expected and evaluated. Therefore, the generalizations of claim 1 go beyond the scope of the contents disclosed in the description. Claim 1 is not supported by the description, and does not comply with the provisions of Article 26.4 Chinese Patent Law.

About Claim 2

Claim 2 defines the generalizations of claim 1 to the specific mode for carrying out the invention described in the description, so that *the technical solution claimed in claim 2 is a technical solution that a person skilled in the art can obtain from the contents sufficiently disclosed in the description, and does not go beyond the scope of the contents disclosed in the description. Claim 2 is supported by the description, and complies with the provisions of Article 26.4 of Chinese Patent Law.*

3. Case C-3

(from JPHB, Annex A, Chap.1, Case 50)

Title of the Invention

METHOD FOR ESTIMATING ALLERGY INCIDENCE RATE OF TEST SUBSTANCE

What is claimed is:

Claim 1

A method for estimating an allergy incidence rate of a test substance in a human being comprising:

inputting a training data to an artificial intelligence model to train the model, the training data including a group of data representing a shape change of a human X cell in culture solution and a scoring data on incidence rates of human allergic reaction caused by each substance, in which each of the substances is separately added to the culture solution and the incidence rates of human allergic reaction caused by each of the substances are already known;

obtaining a group of data representing a shape change of a human X cell that has been measured in culture solution to which a test substance is added;

inputting, to the trained artificial intelligence model, the group of data representing a shape change of a human X cell that has been measured in the culture solution to which the test substance is added; and

causing the trained artificial intelligence model to calculate a scoring data of an incidence rate of human allergic reaction.

Claim 2

The method for estimating an allergy incidence rate as in Claim 1, wherein the group of data representing a shape change of a human X cell is a combination of a shape change in an ellipticity, rugosity, and oblateness of the human X cell; and the allergic reaction is contact dermatitis.

Overview of the description

The present invention relates to a method for estimating an allergy incidence rate of a test substance in a human being, using a trained artificial intelligence model. It is an object of the invention to prevent loss in selecting a candidate substance, through an estimation of an incidence rate of human allergic reaction of a test substance at an early stage in selecting a candidate substance.

An embodiment discloses an experimental result verified by (i) adding each of candidate substances, of which contact dermatitis incidence rate is known, is separately added to culture solution for a human X cell, (ii) obtaining a group of data representing a shape change of a human X cell in the culture solution in an ellipticity, rugosity, and oblateness between before and after the addition; inputting, to a universal artificial intelligence model, a training data to train the model including the above-mentioned 3 types of data in the shape change and a scoring data on incidence rates of contact dermatitis caused by each of the substances so as to train the model; each of substances that has not been used for the training of the artificial intelligence model, of which contact dermatitis incidence rate is known, is separately added to culture solution for a human X cell; obtaining a group of data representing a shape change of a human X cell in the culture solution in an ellipticity, rugosity, and oblateness between before and after the addition; inputting the obtained group of data to the trained artificial intelligence model; and calculating a scoring data on contact dermatitis incidence rates that is estimated by the artificial intelligence. The experimental result shows that, for 0% or more of the candidate substances, the difference between the estimated score and the actual score was equal to or less than 0%.

Note:

In this case, it is assumed that, even in view of a common general technical knowledge at the time of filing, a person skilled in the art cannot presume a certain relation such as a correlation (hereinafter, referred to as a “correlation or the like”) between an allergy incidence rate and a shape change of a cell.

JPO analysis

Claim 1: Article 36(6)(i)(support requirement) / Article 36(4)(i)(enablement requirement)

Claim 2: None

Claim 1: Article 36(6)(i) (support requirement) / Article 36(4)(i) (enablement requirement)

Claim 1 discloses a method for estimating an allergy incidence rate that is specified only by a training data including a group of data representing a shape change of a human X cell and a scoring data on incidence rates of human allergic reaction. The description only discloses some specific examples of training data that could be used for an incidence rate estimation of allergic reaction, namely, a combination of an ellipticity, rugosity, and oblateness of a human X cell, and a scoring data on incidence rates of contact dermatitis.

A shape change of a human X cell can be represented by various parameters in addition to the ellipticity, rugosity, and oblateness. However, it is difficult to know the

parameters that lead to an incidence rate estimation of allergic reaction other than the combination of these three factors, because it is difficult to presume a correlation or the like between an allergic reaction incidence rate and a cell shape change even if a common general technical knowledge at the time of filing of the present invention is taken into consideration. Meanwhile, it is a common general technical knowledge that an antibody or cell associated with allergic reaction and a development mechanism varies among many types of allergic reaction including contact dermatitis. Accordingly, there is no reasonable ground to consider that an incidence rate of a different type of allergic reaction can also be estimated.

It is not possible to find a ground to expand or generalize the disclosed matters in the description to the scope of the invention as in Claim 1, in which an input to an artificial intelligence model that calculates a scoring data of incidence rates of allergic reaction is specified only by a group of data representing a shape change of a human X cell and a scoring data on incidence rates of allergic reaction.

Thus, the scope of the invention as in Claim 1 exceeds the scope disclosed in the description.

In view of the disclosure in the description and the common general technical knowledge at the time of filing, it does not seem that the invention is sufficiently disclosed for a person skilled in the art to recognize that an allergic reaction incidence rate can be estimated through a method for estimating an allergy incidence rate, which uses a training data including a group of data representing a shape change of a human X cell other than the combination of a shape change in an ellipticity, rugosity, and oblateness, and a scoring data on known incidence rates of human allergic reaction other than contact dermatitis.

Therefore, the description does not provide a clear and sufficient disclosure of the invention of a “method for estimating an allergy incidence rate of a test substance in a human being” as in Claim 1 in a manner that a person skilled in the art can carry out the invention.

Notes

Claim 2

The description discloses that inputting, to an artificial intelligence model to train the model, a training data including: a group of data representing a known shape change of a human X cell in each known substance, with which known incidence rates of contact dermatitis is associated, respectively, containing a combination of the ellipticity, rugosity, and oblateness; and a scoring data on the known incidence rates of human contact dermatitis for each of the known substances. Further, the description discloses the fact that the trained artificial intelligence model could actually estimate an incidence rate of contact dermatitis with a certain accuracy, using data that had not been used to train the artificial intelligence model.

Thus, the description provides a clear and sufficient disclosure of the invention as in Claim 2, which is a method for estimating a contact dermatitis incidence rate of a test

substance in a human being using an artificial intelligence model, in a manner that a person skilled in the art can carry out the invention. In other words, the description satisfies the enablement requirement for Claim 2.

Therefore, the invention as in Claim 2 is sufficiently disclosed in the description and thus satisfies the support requirement.

Measures to be taken by the Applicant

The applicant can overcome the reason for refusal by an amendment deleting Claim 1 and leaving only Claim 2.

CNIPA analysis

Conclusion (CNIPA)

Description discloses the invention sufficiently, and the invention complies with the provisions of Article 26.3 Chinese Patent Law.

Claim 1 is not supported by the description and does not comply with the provisions of Article 26.4 Chinese Patent Law.

Claim 2 is supported by the description and complies with the provisions of Article 26.4 Chinese Patent Law.

Explanation (CNIPA)

About description:

The technical problem to be solved by the invention is how to prevent loss in selecting a candidate substance. In the description, it is recorded that the artificial intelligence model is trained by using a group of data representing a shape change of a human X cell in culture solution in an ellipticity, rugosity and oblateness and a scoring data on contact dermatitis incidence rates. The trained artificial intelligence model is then used to estimate the scoring data on contact dermatitis incidence rates. The description also recorded experimental data that proves the reliability of the estimation results obtained by the trained artificial intelligence model. Furthermore, the correlation between the shape change of human X cells in the culture solution in an ellipticity, rugosity and oblateness between before and after the addition and the scoring data on contact dermatitis incidence rates was proved. Therefore, a person skilled in the art, in accordance with the specific mode recorded in the description, can carry out the invention, solve the technical problem mentioned above and can estimate at the early stage in selecting a candidate substance to prevent the loss in selecting a candidate substance, that is, achieve the expected technical effect. In summary, the description set forth the invention in a manner sufficiently clear and complete to such an extent that a person skilled in the art can carry it out. The description discloses the invention sufficiently.

About Claim 1:

Claim 1 defines "the training data including a group of data representing a shape change of a human X cell in culture solution and a scoring data on incidence rates of human allergic reaction caused by each substance", and "obtaining a group of data representing a shape change of a human X cell that has been measured in culture solution to which a test substance is added; inputting, to the trained artificial intelligence model, the group of data representing a shape change of a human X cell that has been measured in the culture solution to which the test substance is added; and causing the trained artificial intelligence model to calculate a scoring data of an incidence rate of human allergic reaction". However, the experimental data in the description only proves the correlation between the shape change of human X cells in the culture solution in an ellipticity, rugosity and oblateness and the scoring data on contact dermatitis incidence rates. For the correlation between the shape change data except for ellipticity, rugosity and oblateness and the incidence rate of a certain allergic reaction, and the correlation between the shape change in an ellipticity, rugosity and oblateness and the incidence rate of allergic reactions other than the incidence rate of contact dermatitis have not been recorded. An antibody or cell associated with allergic reaction and a development mechanism varies among many types of allergic reaction. Accordingly, it is difficult for a person skilled in the art to determine and evaluate in advance the above correlations other than those recorded in the description and the estimation effect of artificial intelligence model trained using the above associations on the incidence rate of different types of allergic reactions. That is, the generalizations of claim 1 include contents speculated by the applicant and the effect thereof is difficult to determine or evaluate beforehand. Therefore, the generalizations of claim 1 go beyond the scope of the contents disclosed in the description. Claim 1 is not supported by the description, and does not comply with the provisions of Article 26.4 Chinese Patent Law.

About Claim 2:

Claim 2 defines the generalizations of claim 1 to the specific mode for carrying out the invention described in the description, so that the technical solution claimed in claim 2 is a technical solution that a person skilled in the art can obtain from the contents sufficiently disclosed in the description, and does not go beyond the scope of the contents disclosed in the description. Claim 2 is supported by the description, and complies with the provisions of Article 26.4 Chinese Patent Law.

4. Case C-4

(from JPHB, Annex A, Chap.1, Case 51)

Title of the Invention

ANAEROBIC ADHESIVE COMPOSITION

What is claimed is:

Claim 1

An anaerobic adhesive composition comprising:
a 0.08 - 3.2 mass % compound A,
a 0.001 – 1 mass % compound B, and
a residue containing an anaerobically curable (meth)acrylate monomer,
wherein the anaerobic adhesive composition shows the curing strength equal to or exceeding 30 % of the curing strength after 24 hours have passed, within 5 minutes from the start of curing.

Overview of the description

Conventionally, various combinations of a free radical initiator and a free radical reducing agent have been used for a curing system to enhance the cure rate of an anaerobic adhesive composition. Nevertheless, any optimal combination has not been found among numerous combinations, which realizes the curing strength equal to or exceeding 30 % of the curing strength after 24 hours have passed, within 5 minutes from the start of curing.

It is an object of the present invention to provide an anaerobic adhesive composition with an optimal component that shows the curing strength equal to or exceeding 30 % of the curing strength after 24 hours have passed, within 5 minutes from the start of curing.

In an embodiment, in order to derive an anaerobic adhesive composition attaining such an object, a conventionally known component data of an anaerobic adhesive composition, a curing strength data within 5 minutes from the start of curing, and a curing strength data after 24 hours have passed were input to a neural network; and then a trained model was prepared in a manner that a component of the anaerobic adhesive composition and a ratio between the curing strength within 5 minutes from the start of curing and the curing strength after 24 hours have passed were associated with each other. Further, an estimation result is disclosed showing the possibility where an anaerobic adhesive composition containing an anaerobically curable (meth)acrylate monomer can be obtained using the trained model, which realizes the curing strength equal to or exceeding 30% of the curing strength after 24 hours have passed within 5 minutes from the start of curing, by adding a 0.08 - 3.2 mass % compound A and a 0.001 – 1 mass % compound B in combination.

Notes

The description does not disclose any embodiment in which an anaerobic adhesive composition is actually produced within the above combination ratio and then the curing

strength is measured. Further, there is no verification shown on the estimation accuracy of the trained model. Furthermore, it is not known that the curing strength is enhanced within 5 minutes after the start of curing, by adding any one of a compound A, a compound B, and the combination thereof. Meanwhile, a measurement method and condition are specifically disclosed to measure the curing strength within 5 minutes after the start of curing and the curing strength after 24 hours have passed.

It is assumed that it is a common general technical knowledge at the time of filing that it is difficult to control an anaerobic adhesive composition so as to rapidly raise the curing temperature within 5 minutes or so after the start of curing, and that various conditions for production such as a type, combination, or combination ratio of polymer material, free radical initiator, or free radical reducing agent closely interact with each other. Meanwhile, it is not assumed that it is a common general technical knowledge at the time of filing that an estimation result by a trained model can be a substitution for an actual experimental result.

JPO analysis

Claim 1: Article 36(4)(i) (enablement requirement) / Article 36(6)(i) (support requirement)

It is the common technical knowledge at the time of filing that it is difficult to control an anaerobic adhesive composition so as to rapidly raise the curing temperature within 5 minutes or so after the start of curing, and that various conditions for production such as a type, combination, or combination ratio of polymer material, free radical initiator, or free radical reducing agent closely interact with each other.

The description only discloses that a trained model predicted that, as long as a composition meets the combination ratio prescribed in Claim 1, the composition has the curing strength equal to or exceeding 30% of the curing strength after 24 hours have passed, within 5 minutes from the start of curing. Further, the accuracy of an estimation value by the trained model is not verified, and there was no such a common technical knowledge at the time of filing that an estimation result by a trained model can be a substitution for an actual experimental result.

Any embodiment is not disclosed supporting the fact that the claimed composition shows the curing strength equal to or exceeding 30 % of the curing strength after 24 hours have passed within 5 minutes from the start of curing, by actually producing a composition including a 0.08 - 3.2 mass % compound A, a 0.001 – 1 mass % compound B, and a residue containing an anaerobically curable (meth)acrylate monomer, and then measuring the curing strength.

Thus, it does not seem that the description provides a sufficient disclosure of the invention in a manner that a person skilled in the art can produce the anaerobic adhesive composition as in Claim 1 that shows the curing strength equal to or exceeding 30 % of the curing strength after 24 hours have passed, within 5 minutes from the start of curing.

Therefore, the description does not provide a clear and sufficient disclosure so as to enable a person skilled in the art to carry out the invention as in Claim 1, in which an

anaerobic adhesive composition comprises a 0.08 - 3.2 mass % compound A, a 0.001 – 1 mass % compound B, and a residue containing an anaerobically curable (meth)acrylate monomer, and the curing strength of the composition is equal to or exceeds 30% of the curing strength after 24 hours have passed, within 5 minutes from the start of curing.

Claim 1 discloses an invention of an anaerobic adhesive composition comprising a 0.08 - 3.2 mass % compound A, a 0.001 – 1 mass % compound B, and a residue containing an anaerobically curable (meth)acrylate monomer, in which the curing strength of the composition is equal to or exceeds 30% of the curing strength after 24 hours have passed, within 5 minutes from the start of curing. Meanwhile, in view of the disclosure in the description and the common general technical knowledge at the time of filing, the description does not provide a sufficient disclosure so as to enable a person skilled in the art to recognize that an object of the present invention to provide an anaerobic adhesive composition showing the curing strength equal to or exceeding 30 % of the curing strength after 24 hours have passed within 5 minutes from the start of curing can be attained.

Therefore, the invention as in Claim 1 is not disclosed in the description.

Measures to be taken by the Applicant

Even if the common general technical knowledge is taken into consideration, the description does not provide a sufficient disclosure for a person skilled in the art to recognize that an object of the present invention to provide an anaerobic adhesive composition showing the curing strength equal to or exceeding 30% of the curing strength after 24 hours have passed within 5 minutes from the start of curing can be attained. Further, the description does not provide a clear and sufficient disclosure for such a person to carry out the invention.

Therefore, the insufficient disclosure in the description cannot be overcome and accordingly, the reasons for refusal cannot be overcome, even if the applicant actually produces, after the filing of the present invention, an anaerobic adhesive composition as in Claim 1 and then submits a certificate of experimental results that supports the estimation by the trained model to make an argument that an object of the invention can be attained.

CNIPA analysis

Conclusion (CNIPA)

Description does not disclose the invention sufficiently, and the invention does not comply with the provisions of Article 26.3 Chinese Patent Law.

Explanation (CNIPA)

The technical problem to be solved by the invention is "any optimal combination has not been found among numerous combinations, which realizes the curing strength equal to or exceeding 30% of the curing strength after 24 hours have passed, within 5 minutes from

the start of curing". The description describes in detail the specific mode of the invention, that is "a conventionally known component data of an anaerobic adhesive composition, a curing strength data within 5 minutes from the start of curing, and a curing strength data after 24 hours have passed were input to a neural network; and then a trained model was prepared in a manner that a component of the anaerobic adhesive composition and a ratio between the curing strength within 5 minutes from the start of curing and the curing strength after 24 hours have passed were associated with each other ". In addition, the description discloses "an estimation result is disclosed showing the possibility where an anaerobic adhesive composition containing an anaerobically curable (meth) acrylate monomer can be obtained using the trained model, which realizes the curing strength equal to or exceeding 30% of the curing strength after 24 hours have passed within 5 minutes from the start of curing, by adding a 0.08 - 3.2 mass % compound A and a 0.001 – 1 mass % compound B in combination ". Although the specific technical solution is given in the description, it only involves the process of training the neural network model and the estimation result obtained by using the trained neural network model. The experimental data proving the reliability of the estimation result is not given in the description. It is also not a common knowledge before the filing date to use the estimation result by a trained model instead of an actual experimental result. Therefore, it is not possible for a person skilled in the art to prove that an anaerobic adhesive composition obtained by adding a 0.08 - 3.2 mass % compound A, a 0.001 – 1 mass % compound B and a residue containing an anaerobically curable (meth) acrylate monomer can achieve the curing strength equal to or exceeding 30 % of the curing strength after 24 hours have passed, within 5 minutes from the start of curing. In summary, the description does not set forth the invention in a manner sufficiently clear and complete to such an extent that a person skilled in the art can carry it out. The description does not disclose the invention sufficiently.

In addition, Section 3.5, Chapter 10, Part II, CNIPA Guidelines states: "The examiner shall examine the supplementary experimental data submitted after the filing date. The technical effect proved by the supplementary experimental data should be available to a person skilled in the art from the contents disclosed in the patent application". Whether the supplementary experimental data submitted by the applicant is accepted or not needs to be judged based on the information given in this case and the specific content of the supplementary experimental data.

* Explanation of Support Requirement Omitted.