Comparative study on computer implemented inventions/software related inventions

Report 2019 | EPO and CNIPA

This report was prepared
by the EPO and the CNIPA

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Glossary

EPO	European Patent Office
EPC	European Patent Convention
EPO Guidelines	Guidelines for Examination in the European Patent Office "G-II, 3" means Part G, Chapter II, section 3.
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 (English version)
CNIPA Guidelines Update	Guidelines for Patent Examination, 2017 update (no English version available)
Software-related invention	Computer-implemented invention (EPO) Invention relating to computer programs (CNIPA)

I. Introduction

The EPO and CNIPA are long-standing partners whose cooperation 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 "Computer Implemented Inventions" (CII) which have resulted in significant increases in CII-related patent applications. This represents a challenge to patent offices and applicants alike, as does the increasing penetration of CII 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 CII patent applications.

In response to these challenges, the EPO and CNIPA have jointly conducted a comparative study on software 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 this study has found that the approaches taken by both offices towards CII-related patent applications are very similar. As might be expected, however, there are some differences in practice and how regulations are applied and this report highlights these using concrete examples.

In supporting innovation for the benefit of their stakeholders, both the EPO and CNIPA are providing their users with a clear overview of their CII practices so that they may better understand what to expect when filing such applications. With a clearer understanding of EPO and CNIPA regulations and working practices, it is hoped that applicants will be in a better position to draft their applications with a higher degree of confidence.

II. Comparative study of laws, regulations and guidelines

A   The requirement of "technical character"[1]/ technical effect

1.   Non-excluded/eligible subject-matter

The European Patent Convention (EPC) does not define what is meant by "invention", but Article 52(2) EPC[2] does contain a non-exhaustive list of things which are excluded from patentability and therefore not regarded as "inventions" if claimed as such (see also Article 52(3) EPC[3] and EPO Guidelines G-II, 3). The items on this list are all either abstract (e.g. mental acts or mathematical methods) and/or non-technical (e.g. aesthetic creations or presentations of information). An "invention" within the meaning of Article 52(1) EPC[4] must be of both a concrete and a technical character. It may be in any field of technology.

As far as the CNIPA is concerned, Article 2.2 of the Chinese Patent Law gives a specific definition of "invention": Inventions mean new technical solutions proposed for a product, a process or the improvement thereof.

Furthermore, 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 the Chinese Patent Law Article 2.2.

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 and systems of managing organisation, production, commercial activities or the economy, etc.;
— computer programs per se; and
— methods of presenting information.

As can be seen in the table below, the same type of subject-matter relevant for the assessment of software-related inventions is excluded from patentability at both patent offices.

1   The EPO regards claimed subject-matter as having technical character if it involves the use of any technical means. Therefore, any computer-implemented method has technical character and is thus not excluded from patentability under Article 52(2) and (3) EPC. In the context of assessing inventive step, a feature is said to contribute to the technical character of an invention if it contributes to producing a technical effect. The CNIPA does not use the concept of "technical character" in practice. Correspondingly, when determining whether a solution is a technical solution as required by Article 2.2, the technical means, the technical problem, and the technical effect are three important factors, and should be considered in combination.
2   Article 52(2) EPC reads:
The following in particular shall not be regarded as inventions within the meaning of paragraph 1:
(a) discoveries, scientific theories and mathematical methods;
(b) aesthetic creations;
(c) schemes, rules and methods for performing mental acts, playing games or doing business, and programs for computers;
(d) presentations of information.
3   Article 52(3) EPC reads:
Paragraph 2 shall exclude the patentability of the subject-matter or activities referred to therein only to the extent to which a European patent application or European patent relates to such subject-matter or activities as such.
4   Article 52(1) EPC reads:
European patents shall be granted for any inventions, in all fields of technology, provided that they are new, involve an inventive step and are susceptible of industrial application.

EPO	CNIPA
Under Article 52(2) and (3) EPC, the following are not regarded as "inventions" if claimed as such: (a) discoveries, scientific theories and mathematical methods; (b) aesthetic creations; (c) schemes, rules and methods for performing mental acts, playing games or doing business, and programs for computers; (d) presentations of information.	Under Article 25.1 Chinese Patent Law, patent rights shall not be granted for any of the following: (1) scientific discoveries; (2) rules and methods for mental activities; (3) methods for the diagnosis or treatment of diseases; (4) animal or plant varieties; (5) substances obtained by means of nuclear transformation; and (6) designs that are mainly used for marking the pattern, colour or the combination of the two of prints.

2.   Claim formats

Under the EPC, the claims shall be supported by the description and define the extent of patent protection sought in a clear and concise manner (Articles 83 and 84 EPC). With regard to computer implemented inventions, different claim formulations are acceptable at the EPO, these are shown below along with (non-exhaustive) examples of claim formulations for each (see EPO Guidelines F-IV, 3.9.1):

(1) Method claim:[5]
    A computer-implemented method comprising steps A, B, ...
    A method carried out by a computer comprising steps A, B, ...

(2) Apparatus/device/system claim:
    A data processing apparatus/device/system comprising means for carrying out [the steps of] the method of claim 1.
    A data processing apparatus/device/system comprising means for carrying out step A, means for carrying out step B, ...
    A data processing apparatus/device/system comprising a processor adapted to/configured to perform [the steps of] the method of claim 1.

(3) Computer program/product claim:
    A computer program [product] comprising instructions which, when the program is executed by a computer, cause the computer to carry out [the steps of] the method of claim 1.

A computer program [product] comprising instructions which, when the program is executed by a computer, cause the computer to carry out steps A, B, ...

(4) Computer-readable storage medium/data carrier claim:
    A computer-readable [storage] medium comprising instructions which, when executed by a computer, cause the computer to carry out [the steps of] the method of claim 1.
    A computer-readable [storage] medium comprising instructions which, when executed by a computer, cause the computer to carry out steps A, B, ...
    A computer-readable data carrier having stored thereon the computer program [product] of claim 3.
    A data carrier signal carrying the computer program [product] of claim 3.

"A medium storing a data structure ..." or "an electromagnetic carrier wave carrying a data structure ..." are also acceptable claim formats. The patentability of such computer data structures is examined according to EPO Guidelines G-II, 3.6.3. These sections of the Guidelines reflect pertinent case law of the EPO boards of appeal.

As the claim set as a whole must be concise, Rule 43(2) EPC[6] requires that there should only be one independent claim

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5   With regard to the EPO, see EPO Guidelines F-IV, 3.9.1, which stipulate: "A computer-implemented method ..." or "A method carried out by a computer ...".

6   Rule 43(2) EPC reads:
    Without prejudice to Article 82, a European patent application may contain more than one independent claim in the same category (product, process, apparatus or use) only if the subject-matter of the application involves one of the following:
    (a) a plurality of interrelated products,
    (b) different uses of a product or apparatus,
    (c) alternative solutions to a particular problem, where it is inappropriate to cover these alternatives by a single claim.

per category in the claim set. The claim categories are: product, process, apparatus and use.

This requirement is further described in F-IV, 3.2 of the EPO Guidelines. For software-related inventions, claims to a computer program or a computer program product are allowed alongside corresponding product claims, for example to an apparatus, a device or a system. (see part F-IV, 3.2 (iv)).

At the CNIPA, the claims of an application relating to computer programs may be drafted as either process or product claims, the latter for instance for the apparatus for executing the process.

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 c.[7]
(3) A computer apparatus, including a memory in which a computer program is stored, and a processor, characterised 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, characterised in that the computer program can carry out the following steps when implemented by a processor...

Under Article 26.4 Chinese Patent Law, the claims shall be supported by the description and define the extent of patent protection sought in a clear and concise manner. The requirement that the claims be concise means both that individual claims and that the claims as a whole must be concise. For example, an application should not contain two or more claims that have substantially the same extent of protection.

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

The EPO's approach for assessing whether a software-related invention is an "invention" within the meaning of Article 52(1), (2) and (3) EPC is described in the EPO Guidelines, G-II, 3 and its subsections.

Inventions involving programs for computers can be protected in different forms of a "computer-implemented invention", an expression intended to cover claims which involve computers, computer networks or other programmable apparatus whereby prima facie one or more of the features of the claimed invention are realised by means of a program or programs.

The basic patentability considerations in respect of claims for computer programs are in principle the same as for other subject-matter. While "programs for computers" are included among the items listed in Article 52(2) EPC, if the claimed subject-matter has a technical character it is not excluded from patentability by the provisions of Article 52(2) and (3) EPC.

Technical character should be assessed without regard to the prior art, i.e the features which contribute to technical character may be known already (see T 1173/97, confirmed by G 3/08). Features of the computer program may potentially lend technical character to the claimed subject-matter, as explained below.

A claim to a computer program is not excluded from patentability if it is capable of bringing about, when running on a computer, a further technical effect going beyond the "normal" physical interactions between the program (software) and the computer (hardware) on which it is run (see T 1173/97 and G 3/08). The normal physical effects of the execution of a program, e.g. electrical currents, are not in themselves sufficient to lend a computer program technical character, and a further technical effect is needed. A further technical effect which lends technical character to a computer program may be found, for instance, in the control of an industrial process or in the internal functioning of the computer itself or its interfaces under the influence of the program which could, for example, affect the efficiency or security of a process, the management of computer resources required or the rate of data transfer in a communication link. A computer program implementing a method that itself makes a technical contribution would also be considered to be capable of bringing about a further technical effect when it is run on a computer. Assessing whether a computer program brings about a further technical effect does not involve a comparison with the prior art, i.e. the further technical effect may be known. The activity of programming, in the sense of writing code, is an intellectual, non-technical activity and therefore does not contribute to the production of a technical effect (see G 3/08 and T 1539/09).

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7   Original Chinese terminology:
这种装置权利要求的各组成部分应当理解为实现该程序流程各步骤或该方法各步骤所必须建立的功能模块，由这样一组功能模块限定的装置权利要求应当理解为主要通过说明书记载的计算机程序实现该解决方案的功能模块架构，而不应当理解为主要通过硬件方式实现该解决方案的实体装置。

Claims directed to a computer-implemented method, a computer-readable storage medium or a device cannot be objected to under Art.52(2) and (3) as any method involving the use of technical means (e.g.a computer) and any technical means itself (e.g.a computer or a computer-readable storage medium) have technical character and thus represent inventions in the sense of Art.52(1) (T258/03, T424/03, G3/08). This approach has also been called the "any-technical-means approach". Such claims should not contain program listings, but should define all the features which assure the patentability of the process which the program is intended to carry out when it is run. Short excerpts from programs might be accepted in the description.

If claimed subject-matter relating to a computer program does not have technical character, it should be rejected under Article 52(2) and (3) EPC. If the subject-matter passes this test for technicality, the examiner then proceeds to the questions of novelty and inventive step.

Following the any-technical-means approach, a storage medium has technical character. Therefore claims directed towards the following can be considered as inventions within the meaning of Article 52(1) EPC:

– Computer-implemented methods using data formats and/or structures.
– Data formats and/or structures embodied on a medium or on an electromagnetic carrier wave

Technical effects associated with data structures or formats when used during the operation of a computer system could give rise to, for example: efficient data processing, efficient data storage, data retrieval based on technical criteria, or enhanced security. On the other hand, features merely describing data collections on a logical level do not provide a technical effect, even if such a description might involve a particular modelling of the described data.

Therefore, when assessing **inventive step** of physically embodied data structures and data formats, their nature needs to be assessed. Functional data are used to control a device which processes the data and inherently comprise technical features of the controlled device. Cognitive data, on the other hand, are only relevant to human users. Functional data may form the basis of a technical effect whereas cognitive data do not.

In order to confirm that a claim is directed to functional data EPO examiners check whether the claimed data structures inherently comprise or reflect the technical features of the system or the steps of a corresponding method which forms the basis of the technical effect.

At the EPO the patentability of computer data structures is examined according to Guidelines G-II, 3.6.3. These sections of the Guidelines reflect pertinent case law of the EPO boards of appeal.

With regard to 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.

Examination focuses on the solutions for which protection is sought, i.e. the solutions defined by each claim, and applies Articles 2.2 and 25.1 Chinese Patent Law.

If a claim merely relates to an algorithm, mathematical computing rules, computer programs per se, computer programs per se recorded on media (such as tapes, discs, optical discs, magnetic optical discs, ROMs, PROMs, VCDs, DVDs or other computer-readable media) or rules or methods for games, etc., it falls under the scope of rules and methods for mental activities and does not constitute subject-matter for which patent protection can be sought.

If the entire content of a claim, except the title of the subject matter,[8] merely relates to an algorithm, mathematical computing rules, 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 subject-matter for which patent protection can be sought.
If the content of a claim includes 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 too – then the claim as a whole is not considered to amount to rules and methods for mental activities, and is not excluded from patentability under Article 25 Chinese Patent Law.

Under Article 2.2 Chinese Patent Law:
Inventions mean new technical solutions proposed for a product, a process or the improvement thereof.
An application relating to computer programs can be awarded a patent only if it constitutes a technical solution.

If an 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 way of 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 can be the subject-matter of patent protection. If the solution of an 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 way of 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 cannot be the subject-matter of patent protection.

If the solution of an 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 processing steps 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 can be the subject-matter of patent protection.

If the solution of an 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 steps for 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 computer system performance improvement effects in conformity with the laws of nature are obtained, the solution is a solution as provided for in Article 2.2 and can be the subject-matter of patent protection.

When determining whether the solution is technical as required by Article 2.2, the technical means, technical problem, and the technical effect are three important factors, and should be considered in combination.

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8   In the example "a system/method for doing ..., the system/method comprising the following components/steps: ...", usually the part "a system/method for doing ...," is considered to be the title of the subject-matter, and the part "the system/method comprising the following components/steps: ..." is considered to be the characterising portion.

B   Novelty

At the EPO, an invention can only be patented if it is new. An invention is considered to be new if it does not form part of the state of the art. The first step is to compare the invention with the prior art and see whether the invention differs from it. If it does, the invention is novel. The case law is not settled as to whether non-technical features in a claim can contribute to novelty. However, the relevant parts of the EPO Guidelines encourage EPO examiners to deal with non-tech-

nical features under inventive step rather than novelty. Further details on the examination of novelty can be found in EPO Guidelines G-VI.

At the CNIPA, the novelty standards used for general technical fields apply to the novelty of software-related inventions too. The steps for assessing novelty are described in CNIPA Guidelines, Part II, Chap. 3. All features included in the claim which are related to the extent of protection should be considered when determining novelty.

C Inventive step for claims comprising technical and non-technical features

With regard to the EPO, the treatment of claims comprising technical and non-technical features is described in EPO Guidelines G-VII, 5.4.

It is legitimate to have a mix of technical and non-technical features in a claim, as is often the case with computer-implemented inventions. The non-technical features may even form a major part of the claimed subject-matter. However, in the light of Article 52(1), (2) and (3) EPC, the presence of an inventive step under Article 56 EPC requires a non-obvious technical solution to a technical problem (see T 641/00 and T 1784/06).

When assessing the inventive step of such a mixed-type invention, the problem-solution approach is applied in such a way as to ensure that all the features which contribute to the technical character of the invention are taken into account. These also include the features which, when taken in isolation, are non-technical, but do, in the context of the invention, contribute to producing a technical effect serving a technical purpose, thereby contributing to the technical character of the invention. However, features which do not contribute to the technical character of the invention cannot support the presence of an inventive step (see T 641/00). Such a situation may arise, for instance, if a feature contributes only to the solution of a non-technical problem, e.g. a problem in a field excluded from patentability.

The problem-solution approach is applied to mixed-type inventions in such a way as to ensure that inventive step is not acknowledged on the basis of features not contributing to the technical character of the invention, while all those features which do contribute are properly identified and taken into account in the assessment. To the extent that non-technical features do not contribute to producing a technical effect, they can be included in the problem formulation as a constraint to be met. This has the desirable effect that the non-technical aspects of the claimed invention, which generally relate to non-patentable desiderata, ideas, and concepts and belong to the phase preceding any invention, are automatically cut out of the assessment of inventive step and cannot be mistaken for technical features positively contributing to inventive step

The steps below outline the application of the problem-solution approach to mixed-type inventions:

(i) The features which contribute to the technical character of the invention are determined on the basis of the technical effects achieved in the context of the invention.

(ii) Based on the features contributing to the technical character of the invention identified in step (i), the closest prior art is selected.

(iii) The differences between the closest prior art and the claimed invention are identified. The technical effect(s) of these differences, in the context of the claim as a whole, is (are) determined in order to identify from these differences the features which make a technical contribution and those which do not.

  (a) If there are no differences (not even a non-technical difference), a novelty objection is raised (Article 54 EPC)

  (b) If the differences do not make any technical contribution, a lack of inventive step objection is raised (Article 56 EPC). The reasoning for the objection should be that the subject-matter of a claim cannot be inventive if there is no technical contribution to the prior art.

  (c) If the differences include features making a technical contribution, the following applies:
    – The objective technical problem is formulated on the basis of the technical effect(s) achieved by these features. In addition, if the differences include features making no technical contribution, these features, or any non-technical effect achieved by the invention, may be used in the formulation of the objective technical problem as part of what is "given" to the skilled person, in particular as a constraint that has to be met.
    – If the claimed technical solution to the objective technical problem is obvious to the person skilled in the art, a lack of inventive step objection is raised (Article 56 EPC)
    – If the claimed technical solution to the objective technical problem is deemed not obvious to the person skilled in the art, the claim is considered to be inventive.

The determination of the features contributing to the technical character of the invention should be performed for all claim features in step (i) (see T 172/03 and T 154/04). However, in practice, due to the complexity of this task, the examiner can normally perform the determination in step

(i) on a prima facie basis only and perform a complete and detailed analysis at the beginning of step (iii). In step (iii), the technical effects achieved by the differences over the selected closest prior art are determined. The extent to which the differences contribute to the technical character of the invention is analysed in relation to these technical effects. This analysis, limited to the differences, can be performed in a more detailed manner and on a more concrete basis than the one performed in step (i). It may therefore reveal that some features considered in step (i) prima facie to not contribute to the technical character of the invention do, on closer inspection, make such a contribution. The reverse situation is also possible. In such cases, the selection of the closest prior art in step (ii) might need to be revised. When performing the analysis in steps (i) and (iii) above, care should be taken to avoid missing any features that might contribute to the technical character of the claimed subject-matter, in particular if the examiner reproduces his understanding of the subject-matter of the claim in his own words during the analysis (see T 756/06).

Section 2.2). An invention represents notable progress if it can produce an advantageous technical effect as compared with the prior art (CNIPA Guidelines, Part II, Chap. 4, Section 2.3).

The steps for judging the inventive step of a claim are described in CNIPA Guidelines, Part II, Chap. 4, Section 3.2.1.1. Usually the following three steps are taken to determine whether a claimed invention is obvious as compared with the prior art:

(1) Determine the closest prior art.
(2) Determine the distinguishing features of the invention and the technical problem actually solved by the invention.
(3) Determine whether or not the claimed invention is obvious to a person skilled in the art.

In step (3), the examiner makes a judgment, starting from the closest prior art and the technical problem actually

Figure 1: Summary of how the inventive step for mixed inventions is assessed at the EPO

Those parts of the features making no technical contribution cannot contribute to inventive step
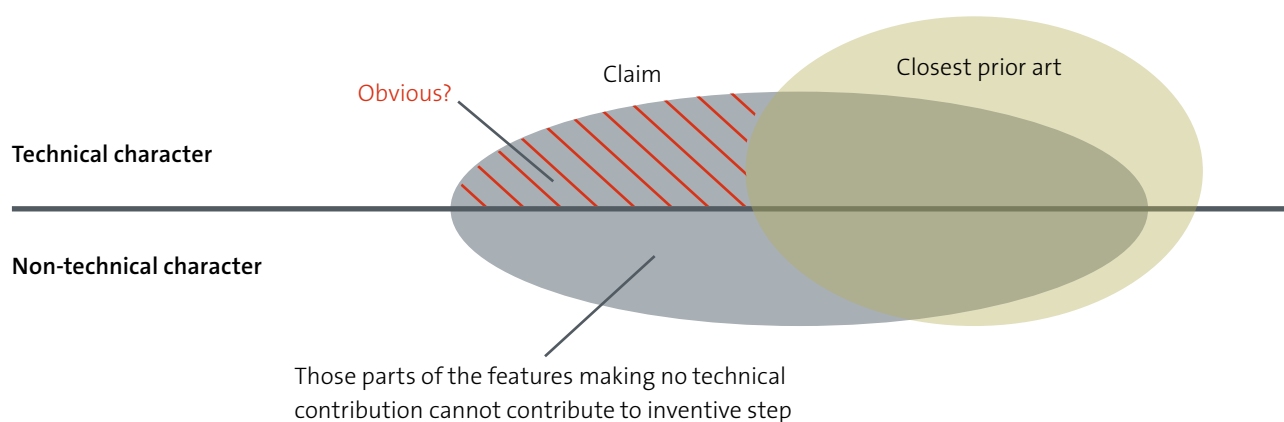
With regard to the CNIPA, currently there are no special provisions in the CNIPA Guidelines on the inventive step assessment of software-related inventions. Therefore, the standards used for other technical fields apply to software-related inventions too.

At the CNIPA, inventiveness means that, as compared with the prior art, the invention has prominent substantive features and represents notable progress (Article 22.3 Chinese Patent Law). An invention has prominent substantive features if, having regard to the prior art, it is non-obvious to a person skilled in the art (CNIPA Guidelines, Part II, Chap. 4,

solved by the invention, as to whether or not the claimed invention is obvious to a person skilled in the art. What is to be determined in this step is whether or not there is such a technical motivation in the prior art as to apply said distinguishing features to the closest prior art in order to solve the 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 is such a technical motivation in the prior art, the invention is obvious and thus does not have prominent substantive features.

It is usually thought that there is such a technical motivation in the prior art in the following circumstances:

(i)   The said distinguishing feature is common knowledge.

(ii)   The said distinguishing feature is a technical means related to the closest prior art, such as a technical means disclosed in another 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 existing 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 existing technical problem.

In practice, when assessing the inventive step of a software-related invention, after identifying the features distinguishing the claim from the closest prior art, there may be a situation in which the problem actually solved is non-technical due to the non-technical features included in the claim. If the problem actually solved is non-technical, the solution does not make a technical contribution to the prior art, and thus it can be directly concluded that the technical solution of the claim lacks inventive step. If the problem actually solved is technical, then according to the general standards for the assessment of inventive step, the examiner determines whether there is a technical motivation in the prior art and whether the solution is obvious, and then whether it involves an inventive step.

If the technical and non-technical features are used in combination to solve the technical problem of the invention, both of them will be taken into account when assessing inventive step.

D   Comparison of examination practices

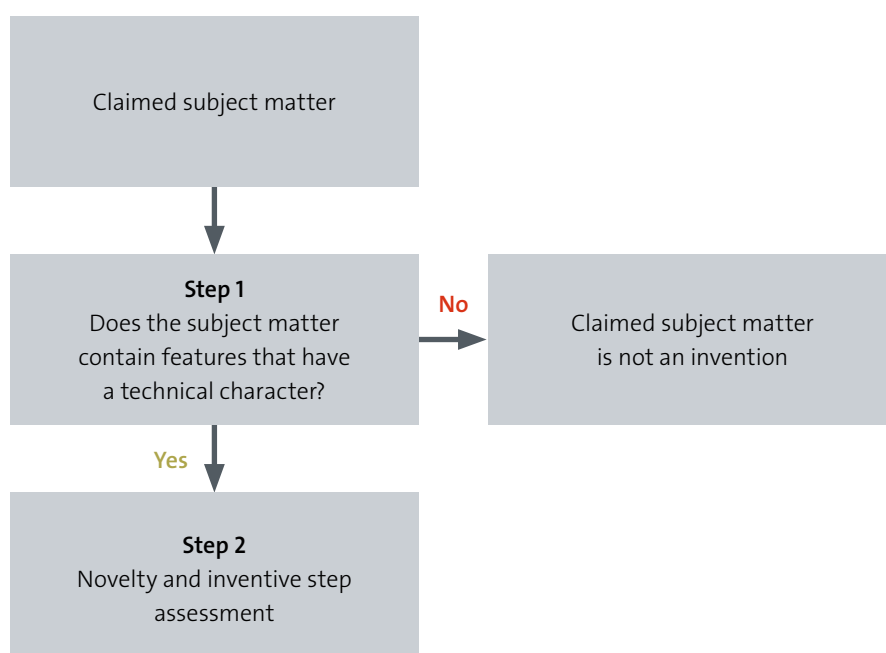In general, patents on software-related inventions are granted at both the EPO and the CNIPA.

At both, a claimed invention must firstly be an "invention" and secondly be novel and involve an inventive step.

The EPC does not give a positive definition of the term "invention". However, having technical character is an implicit requirement for an invention within the meaning of Article 52 EPC. Since an invention is only excluded from patentability if it relates to the items listed in Article 52(2) EPC as such, the EPO follows the "any-technical-means approach"; accordingly, a claim to a method that requires the presence of technical means to be carried out, like a computer, a network or the internet, is regarded as an "invention" within the meaning of Article 52 EPC. Similarly, systems or devices are always regarded as "inventions" since, by definition, they require technical means. A claim to a computer program, on the other hand, requires the presence of a further technical effect. As a further consequence of the any-technical-means approach, claimed subject-matter is an invention irrespective of whether a claim comprises, in addition to any technical means, non-technical features too.

Article 25.1 Chinese Patent Law is the counterpart to Article 52 EPC. Its requirements are met when a claim, as a whole, not only defines a rule or method for mental activities, but also contains technical features. If so, the claim, viewed as a whole, is not a rule or method for mental activities and is not excluded from patentability. Unlike at the EPO, if the features of a claim, independent of the claim category, are non-technical, then patentability may be excluded under Article 25.1. Thus, usually, the claim's method steps or structural features need to be technical. A purpose statement ("a method for purpose X") may or may not help in meeting the requirements of Article 25.1, depending on the circumstances.

The Chinese Patent Law, unlike the EPC, gives a positive definition of what constitutes an invention (in Article 2.2). For an invention not to be excluded under that Article, it must be a new technical solution proposed for a product, a process or the improvement thereof. The CNIPA Guidelines further define a technical solution as an aggregation of technical means applying the laws of nature to solve a technical problem, whereby, 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

Figure 2: Summary of the two-step approach for assessment of CII applications at the EPO

Claimed subject matter

↓

Step 1
Does the subject matter contain features that have a technical character?   —No→   Claimed subject matter is not an invention

Yes ↓

Step 2
Novelty and inventive step assessment

nature does not constitute an invention. All technical and non-technical features that contribute to solving a technical problem are considered. When assessing whether the requirements of Article 2.2 Chinese Patent Law are met, the examiner keeps in mind the technical means adopted, the technical problem to be solved and the technical effect to be achieved by the application. If the claim lacks the necessary technical features so that it cannot solve a technical problem, then it is excluded under that Article.

The EPC does not have a counterpart to Article 2.2 Chinese Patent Law, and the requirement to claim an invention which produces a technical effect that solves a technical problem is assessed only in relation to inventive step. It thus appears that it is significantly easier to comply with the "invention" requirement at the EPO than at the CNIPA. The table on the next page summarises the situation for four claim formats typically used by applicants:

Figure 3: Summary of the three-step approach for assessment of CII applications at the CNIPA
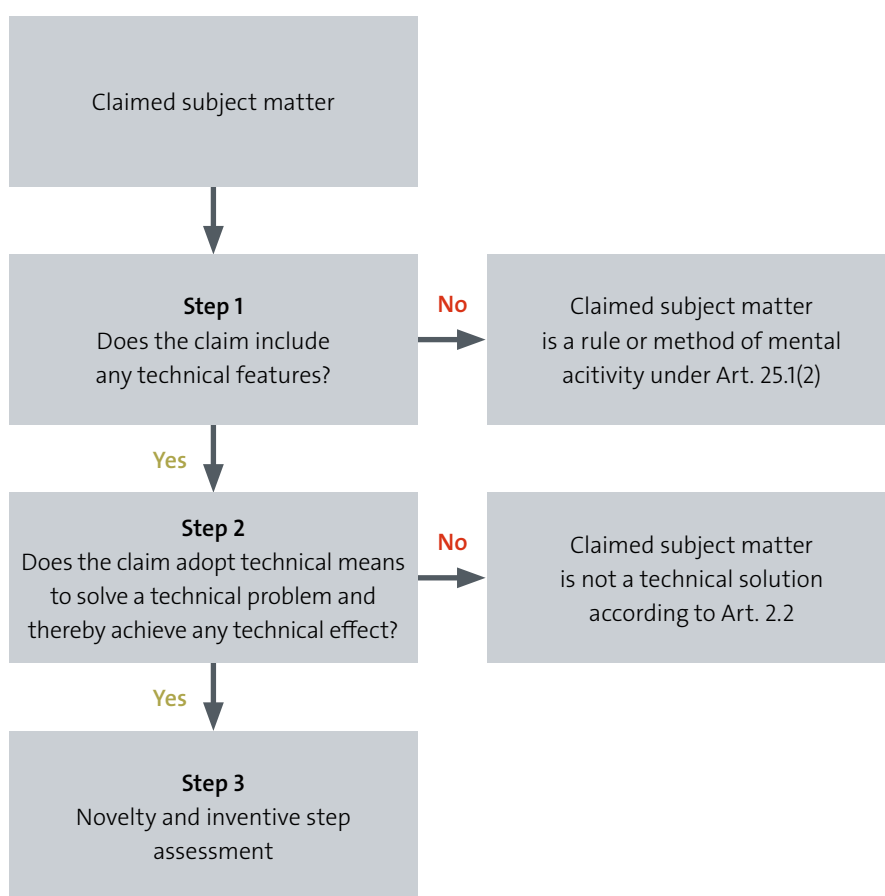
	EPO requirements met	EPO requirements not met	CNIPA requirements met	CNIPA requirements not met
Claim 1: method with no technical features		Art. 52		Art. 25, Art. 2.2
Claim 2: computer program which … performs the method of claim 1		Art. 52		Art. 25, Art. 2.2
Claim 3: computer-readable medium on which a computer program is recorded, whereby the computer program when performed by a processor implements the method of claim 1	Art. 52		Art. 25	Art. 2.2
Claim 4: computer program of claim 2 on a medium	Art. 52		Art. 25	Art. 2.2, Art. 26.4
Claim 5: method with technical and non-technical features	Art. 52		Art. 25, Art. 2.2*	Art. 2.2*
Claim 6: computer program which … performs the method of claim 5	Art. 52		Art. 25, Art. 2.2*	Art. 2.2*, Art. 26.4
Claim 7: computer-readable medium on which a computer program is recorded, whereby the computer program when performed by a processor implements the method of claim 5	Art. 52		Art. 25, Art. 2.2*	Art. 2.2*
Claim 8: computer program of claim 6 on a medium	Art. 52		Art. 25, Art. 2.2*	Art. 2.2*, Art. 26.4

* Requirement met only if the claim adopts technical means, solves a technical problem and achieves technical effect.

When assessing inventive step under Article 56 EPC, the EPO employs the problem-solution approach to answer the question whether claimed subject-matter is obvious, or not, to the skilled person in the light of the state of the art. According to that approach, all those features which contribute to the technical character of the invention are taken into account. These also include the features which, when taken in isolation, are non-technical, but do, in the context of the invention, contribute to producing a technical effect serving a technical purpose, thereby contributing to the technical character of the invention. However, features which do not contribute to the technical character of the invention cannot support the presence of an inventive step.

When the CNIPA assesses inventive step, it examines whether or not the invention has prominent substantive features and whether or not it represents notable progress. To determine whether an invention has prominent substantive features, the examiner has to decide whether the claimed invention is non-obvious to the skilled person as compared to the prior art. Like the EPO, the CNIPA examines inventive step (under Article 22 Chinese Patent Law) by applying a problem-solution approach. Accordingly, all features that contribute to solving a technical problem are considered. Non-technical features that are not associated with solving a technical problem cannot contribute to inventiveness. For further details of the two offices' approaches, see part, II, chapter C of this comparative study.

At the EPO, mathematical methods, which are excluded if claimed as such, can contribute to technical character either by their application to a field of technology, or by being adapted to a specific technical implementation. In the former case, the claim must be functionally limited to a technical purpose. This can be achieved by establishing a sufficient link between the technical purpose and the mathematical method steps, for example by specifying how the input and the output of the sequence of mathematical steps relate to the technical purpose so that the mathematical method is causally linked to a technical effect.

The CNIPA follows a comparable approach and considers a mathematical method to make a technical contribution if it is applied to a field of technology, or if it contributes to improving the performance of a device. The claim must provide sufficiently detailed technical context of the field of technology to ensure that the technical problem is solved. Usually, parameters must be given technical meanings. At the EPO, following the any-technical-means approach, a claim involving technical features and features defining a business method is not excluded. However, an inventive step is usually only acknowledged if a technical implementation of a business method is claimed which solves a technical problem in a technical field.

Similarly, at the CNIPA, claims which solve a technical problem are not excluded, even if they comprise features defining a business method. Pure business method steps usually do not contribute to inventiveness.

In relation to data structures, the practices at the EPO and CNIPA differ substantially. At the EPO, physically embodied data structures are not excluded from patentability under Article 52 EPC as a consequence of the any-technical-means approach. However, only functional data can make a contribution to technical character and inventive step. In order to establish the presence of functional data, the examiner needs to check whether the data structure as claimed inherently comprises or reflects the technical features of the system or the steps of a corresponding method which forms the basis of the technical effect.

On the other hand, at the CNIPA data structures are excluded from patentability, even if they relate to functional data and are physically embodied. However, the use of data structures by a method is allowable, provided that the method fulfils all other requirements, including the provisions of Articles 2.2, 22 and 25 Chinese Patent Law.

In summary, overall the approaches followed by both offices are very similar, although the EPC does not have counterparts to every provision of the Chinese Patent Law. Article 25.1 Chinese Patent Law is the counterpart to Article 52 EPC regarding the excluded subject-matter. The Chinese Patent Law, unlike the EPC, also gives a positive definition of what constitutes an invention. Namely, the CNIPA will determine whether an invention is a technical solution which solves a technical problem. Therefore, it appears that the CNIPA focuses more on excluded subject-matter, whereas the EPO focuses more on inventive step. However, since the criteria applied at the various stages of examining claimed subject-matter are alike, similar outcomes are to be expected. These findings were corroborated by an in-depth comparison of specific example cases; see part III of this comparative study.

Regarding the EPO, as general guidance to applicants it can be said that applicants cannot rely on those features in a claim that do not contribute to producing a technical effect, in order to support inventive step (see T 641/00). It can also be said that applicants should include enough technical detail in the description as a fall-back position, such that technical features can possibly be introduced in a claim in support of a technical effect and/or inventive step (EPO Guidelines G-VII, 5.4).

Regarding the CNIPA, as general guidance to applicants it can be said that applicants cannot rely on those features in a claim that do not contribute to solving a technical problem, producing a technical effect, in order to support inventive step. It can also be said that applicants should include enough technical features in the description, such that the technical features can form a complete solution which could solve a certain technical problem.

III. Comparative study of example cases

Case 1: Friction coefficient

1. Claim

A method of automatically computing the coefficient of kinetic friction μ using computer programs, characterized in that it includes the following steps:
calculating the ratio of the position variables, S1 and S2, of the friction plate;
calculating the logarithm, logS2/S1, of the ratio S2/S1;
solving the ratio of the logarithm logS2/S1 to e.

2. EPO analysis

As the method according to the claim is computer-implemented, it involves technical means and therefore has technical character; hence the claimed method constitutes an invention within the meaning of Article 52 EPC (i.e. the first hurdle is overcome).

However, the question arises whether the method steps, which on the face of it appear to define no more than a mathematical method, contribute to the technical character of the invention.

According to the description, the claimed method relates to the computation of a coefficient of kinetic friction, μ, using computer programs. The traditional method of measuring the coefficient of kinetic friction is to draw a body to be measured at a fixed speed so as to obtain the position variables of the friction plate, S1 and S2 respectively, and then to calculate the coefficient of kinetic friction, μ, of the body, according to the following formula: $μ=(logS2-logS1)/e$.

The pertinent case law of the EPO's boards of appeal is T 208/84 (VICOM), which held that a mathematical method applied to two-dimensional image data was not a mathematical method as such, but related to a technical process. Importantly, in that case, the two-dimensional image was not measured itself, but was merely the input for the mathematical algorithm. Similarly, here it is clear from the description, and also reflected in the claim language, that variables S1 and S2 "of the friction plate" are physical measurements (which are obtained a priori by drawing a body at a fixed speed). In that sense, S1 and S2 are similar to the image in T 208/84. Of course, in case of doubt, the nature of S1 and

S2 could be clarified in the claim by further specifying that S1 and S2 are obtained by measurement. Furthermore, it has to be stressed that, in T 208/84, the claim was drafted as "A method of digitally processing images in the form of a two-dimensional data array …". It was thus clearly stated that digital processing of images (and not the mathematical algorithm as such) was at the core of the method.

When assessing the contribution made by a mathematical method to the technical character of an invention, it must be taken into account whether the method, in the context of the invention, serves a technical purpose. By applying the mathematical method of the claim to the physical measurements S1 and S2, an estimate of a technically relevant parameter, the kinetic friction coefficient, μ, is obtained. The mathematical method thus serves a technical purpose. Similar examples include: estimating a channel in wireless communications from received signals and deriving body temperature from in-ear measurements (see also EPO Guidelines G-II, 3.3, on mathematical methods, and in particular the exemplary list of technical purposes given under the heading "Technical applications").

In other words, although the claimed mathematical method may be regarded as non-technical when taken in isolation, in the context of the invention it contributes to its technical character. As pointed out in EPO Guidelines, G-VII, 5.4, the next step is to work out the differences from the prior art. As compared to the prior art mentioned in the description itself (the traditional method summarised above), it appears that the only distinguishing feature is the computer implementation of an otherwise well-known method. Solving the technical problem of automating a well-known method by means of computer software is obvious. Therefore, the claimed method lacks an inventive step (Article 56 EPC).

3. CNIPA analysis

The solution of the application relates to a method of computing the coefficient of kinetic friction, μ, using computer programs. The traditional method of measuring the coefficient of kinetic friction is to use a device to draw the restiform body to be measured at a fixed speed so as to obtain the position variables of the friction plate, S1 and S2 respectively, and then to calculate the coefficient of kinetic friction, μ, of the restiform body, according to the following formula: $μ=(logS2-logS1)/e$.

The solution is not an improvement of the measurement method but a numerical computing method executed by a

computer program. The position variables of friction plate S1 and S2 are only used as input values of calculation, and there are not any features about how to measure the position variables. Although the outcome of the solution is a physical quantity, the origin/application of the coefficient of kinetic friction to any equipment/process is not mentioned in the solution, that is, the mathematic formula does not applied into a technical field. The method is a kind of numerical computing, and the solution on the whole is a mathematical computing method. Therefore, this invention falls under the category of rules and methods for mental activities as provided for in Article 25.1(2) Chinese Patent Law and cannot be the subject of patent protection (CNIPA Guidelines, Part II, Chap. 9, Section 3, Example 2).

Case 2: Keyword identifier

1. Claim

A Keyword Identifier used for addressing or accessing of Electronic Resources, comprising of a keyword, followed immediately by a character '#', followed immediately by a domain name, followed immediately by a '.', followed immediately by a Top Level Domain (keyword#domain_name.TLD).

2. EPO analysis

The claim seems to relate to a data structure or data format (at the EPO, data structures are not regarded as presentations of information; see EPO Guidelines G-II, 3.7, second paragraph). However, a data structure or data format needs to be physically embodied, either on a medium or as an electromagnetic carrier wave, in order to be regarded as an invention within the meaning of Article 52 EPC (see EPO Guidelines G-II, 3.6.3). Since the claimed keyword identifier does not comprise any feature which would ensure a physical embodiment, it falls under the non-exhaustive list of exclusions defined in Article 52(2) and (3) EPC, and is thus not an invention (i.e. the claim fails the first hurdle). In particular, the claim does not exclude a realisation of the keyword identifier which exists either only in the mind of an internet user or on a piece of paper. Whereas the former embodiment can be regarded as a rule, scheme or method for performing a mental act, the latter falls under the category of the presentation of information.

In what follows, two amended versions of the claim are considered. The first version comprises, in addition to the claim recited above, a limitation to a carrier medium:
*A Keyword Identifier **on a carrier medium, said Keyword Identifier being** used for addressing or accessing of Electronic Resources, comprising of a keyword, followed immediately by a character '#', followed immediately by a domain name, followed immediately by a '.', followed immediately by a Top Level Domain (keyword#domain_name.TLD).*

Such subject-matter would be an invention within the meaning of Article 52 EPC, since it requires technical means. When assessing the patentability of data structures and data formats, a distinction is made between functional data and cognitive data. Functional data serve to control the operation of a device processing the data. They inherently comprise, or reflect, corresponding technical features of the device in which the data are used. Cognitive data, on the other hand, are those data whose content and meaning are only relevant to human users. Functional data contribute to producing a technical effect whereas cognitive data do not (see EPO Guidelines G-II, 3.6.3).

In the case of the claimed keyword identifier, having the domain name followed immediately by a top-level domain reflects at least the hierarchy used by the internet's domain name system (DNS) to translate domain name and top-level domain into a numerical IP address. It is therefore not possible to speak of purely cognitive data whose content and meaning are relevant only to users. Moreover, it is common general knowledge of the skilled person that domain name and top-level domain serve the technical purpose of addressing, or accessing, webpages. The skilled person thus understands that the additional keyword followed by the "#" character serves the function of addressing, or accessing, items or electronic resources on a webpage (the character "#" being used to separate keyword and domain name). In other words, the keyword identifier of the claim constitutes functional data, the technical contribution of which needs to be considered when assessing inventive step.

Since the claimed keyword identifier contributes to the technical character of the invention, the next step is to perform the problem-solution approach for mixed-type inventions as outlined in EPO Guidelines G-VII, 5.4.

Assuming that the closest prior art is a standard address comprising only domain name and top-level domain, the distinguishing feature would be the keyword and the "#" character that precede the domain name and top-level domain. Hence, the next step would be to apply step (iii)(c) of the problem-solution approach. As mentioned earlier, the additional keyword followed by the "#" character serves the function of addressing, or accessing, items (electronic resources) on a webpage (the character "#" being used to distinguish the keyword from the domain name and the top-level domain). The technical problem then is: "How to modify a known webpage address in the form of domain name and top-level domain to enable the addressing or accessing of electronic resources on the webpage?"

The solution to use an additional keyword to point to some item or electronic resource on a webpage is an obvious workshop measure in view of the known standard webpage address. Moreover, to use any character as a separator is also regarded as a known and obvious workshop measure. Therefore, the claim lacks an inventive step (Article 56 EPC).

The second amended version is drafted as a method claim:
A method comprising a step of addressing or accessing Electronic Resources by means of a keyword identifier, said

Keyword Identifier comprising of a keyword, followed imme-diately by a character '#', followed immediately by a domain name, followed immediately by a '.', followed immediately by a Top Level Domain (keyword#domain_name.TLD).

The proposed solution seems to rely on the use of a "Keyword Identifier". As mentioned above, said "Keyword Identifier" can be understood as functional data (as distinct from cognitive data, whose content and meaning are only relevant to human users). In addition, the accessing of electronic resources by means of a method step implies the use of technical means.

Therefore, the claim appears to contain features that contribute to technical character. Hence the claimed subject-matter constitutes an invention within the meaning of Article 52 EPC.

As the next step, it has to be assessed whether the specific data structure in the claim, namely "keyword#domain_ name.TLD", can be regarded as contributing to a technical solution to a technical problem. To this end, the relevant considerations are similar to those used to assess the inventive step of the first amended version of the claim.
It is noted in passing that the use of expressions involving "or" and the like might lead to an objection of lack of clarity (Article 84 EPC) if doubt arises as to exactly which features the claim includes, and so for which features protection is sought.

3. CNIPA analysis

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 (Chapter 9, Part II, CNIPA Guidelines).

The solution proposes a keyword identifier for addressing or accessing an electronic resource. Although addressing or accessing electronic resources appears in the title of the solution, it does not describe how each element of the keyword identifiers, such as "," or ".", is functioned in addressing or accessing, respectively. As a whole, the solution only involves artificially defining the composition of the keyword identifier, i.e. only defines a composition framework for the keyword identifier. It is therefore a method of presenting information and falls within the scope of Article 25.1(2) Chinese Patent Law. So it is not eligible for patent protection.

As for the first amended version of the claim, although the keyword identifier is recorded on a carrier medium, the claim is still for the keyword identifier per se. Therefore, the claim is still for an expression of information and falls within the scope of Article 25.1(2) Chinese Patent Law.

As for the second amended version of the claim, the subject-matter is a method for addressing or accessing an electronic resource using the key identifier. The solution can solve the technical problem of addressing or accessing an electronic resource, adopt technical means from the computing field and obtain the technical effect of navigation on the internet. So the claim is a technical solution, and meets the requirements of Article 25.1(2) and Article 2.2 Chinese Patent Law. Further, all the features in the claim are used to solve the technical problem, and should be taken into account when assessing inventive step.

Case 3: Block mining

1. Claim

A method for mining a block comprising a block header, as a function of a selected hash function applied on the block header, the selected hash function comprising an expansion operation and a compression operation, the method comprising the steps of:
developing a plurality, m, of mid-states, each as a function of selectively varying a selected first portion of the block header;
performing the expansion operation on a selected second portion of the block header to produce a message schedule; and
for each of the m mid-states, performing the compression operation on the mid-state and the message schedule, to produce a respective one of m results.

2. EPO analysis

The problem to be solved by the block mining method is that, in the existing bitcoin SHA-256 hash algorithm, incrementing the extraNonce field entails recomputing the Merkle tree, thus requiring the full block header to be reprocessed.

The terms "mining" and "block" are used in relation to blockchains, which are a form of distributed, tamper-proof, computer-implemented database. As such, blockchains are generally considered technical and belonging to a field of technology. Here, it is questionable whether the terms "mining" and "block" already imply, to the person skilled in the art, a computer implementation. If the subject-matter defined by the claim was understood to encompass a non-technical embodiment (by regarding the terms "mining" and "block" as not limited to a computer implementation) then the exclusion of either mathematical methods or mental acts would apply (Article 52(2)(a) and 52(3) EPC).

However, in the following, it is assumed that the claim excludes non-technical embodiments: either implicitly, or explicitly by specifying a computer implementation.

As such, the mathematical method defined by the claim contributes to producing a technical effect that serves a technical purpose by its application to a field of technology (i.e. blockchains as distributed, tamper-proof, computer-implemented databases). It is stressed at this point that methods purporting to increase data integrity and/or security in the context of data storage, processing and retrieval are considered inherently technical. Therefore, all the method steps of the claim contribute to the technical character of the invention, such that examination of the claim proceeds with the problem-solution approach specified in EPO Guidelines G-VII, 5.4. The search for the closest prior art must include the mathematical method, since it fully contributes to the technical character of the claimed subject-matter.

3. CNIPA analysis

It is based on a whole solution rather than on the features of "blockchains", "mining" or "hash function" appearing in the claim to determine whether the scheme involving blockchains is eligible.

The current solution is relating to the method for mining a block, which solves the problem of hash algorithm itself on mining. The method is neither to improve the performance of the computer hardware platform nor to be applied in a specific technical field.

The problem to be solved by the block mining method is that, in the existing bitcoin SHA-256 hash algorithm, incrementing the extraNonce field entails recomputing the Merkle tree, thus requiring the full block header to be reprocessed. However, this problem is a problem of the SHA-256 hash algorithm itself, not a technical problem; the means applied are simply to design a pure mathematical algorithm and are not technical; and the big expanded nonce space and good mining effect are achieved by the algorithm itself and are not a technical effect. Therefore, the solution is not a technical solution under Article 2.2 Chinese Patent Law, and cannot be the subject of patent protection.

Case 4: Seat allocation

1. Claim

A customer sea*ting system for allocating seats to a group of customers, comprising:*

a memory for storing data, said data comprising a plurality of sets of the predetermined geometric shapes corresponding to arrangements of seats, a specific one of a geometrical set corresponding to the number of customers in the particular group, and a hierarchical order within the set hierarchical geometry, and
a processor for processing data, where in operation of the processor in accordance with a computer program stored in a non-transitory computer-readable medium cause the system to:
calculate a satisfaction value for each available seat for each customer of a group of customers,
compute a global satisfaction value for each seat, said global satisfaction value is the sum of the calculated satisfaction values for each customers of the group,
select a particular geometric shape of a set of predetermined geometric shapes that corresponds to the number of customers in the group of customers,
identify groups of available seats that match the arrangement of seats corresponding to the particular geometric shape,
for each identified group of available seats, compute an average global satisfaction value based on the global satisfaction values of all seats of the identified group of available seats,
select a particular identified group of available seats that corresponds to a maximum average global satisfaction value,
*assign the corresponding seats of the selected one of the identified group of avail*able seats to the group of customers.

2. EPO analysis

Since the claim is drafted as a system that comprises technical means (memory and processor), the subject-matter of the claim has a technical character and constitutes an invention within the meaning of Article 52 EPC (the first hurdle is thus overcome). Hence, the claimed subject-matter is subsequently examined with respect to novelty and inventive step. The examination of inventive step requires an assessment of which features contribute to the technical character of the invention (EPO Guidelines G-VII, 5.4).

According to the claim, the technical means (memory and processor) are suitable, in the sense of being adapted or configured, for performing a number of steps that have the effect of allocating seats to a group of customers, thereby achieving a maximum average global satisfaction value. If these steps were claimed as such, they would be excluded under Article 52(2)(c) and (3) EPC as a method for doing business. The business method defined in the claim does not contribute to the technical character of the invention.

The technical means specified by the claim (memory, processor) are all known from general-purpose computers and are used merely to automate said business method.

Assuming a general-purpose computer to be the closest prior art, the claim thus differs from that prior art in that known technical means are used merely to implement, or automate, an otherwise non-technical business method.

Therefore, according to step (iii)(c) of the problem-solution approach defined in EPO Guidelines G-VII, 5.4, the objective technical problem to be solved may be regarded as how to automate the business method. The solution, namely automation via a general-purpose computer, is obvious to the person skilled in the art. Therefore, the claim fails to meet the requirements of Article 56 EPC due to a lack of inventive step.

3. CNIPA analysis

The subject-matter claimed relates to the customer seat system, which includes technical features such as a memory, a processor and is not a rule and method for mental activity defined under Article 25.1(2) Chinese Patent Law.
When multiple passengers are allocated seats as a group, the traditional seat allocation method is accomplished manually. Or the passengers can be placed separately, resulting in the problem that the group can not be placed together. In order to solve this problem, the subject-matter of the claim adopts a natural technical means by selecting and identifying the geometric shape corresponding to the number of passengers and allocating the available seat groups accordingly, and achieves the technical effect of automatic seat allocation. Therefore, the subject-matter claimed is a technical solution under Article 2.2 Chinese Patent Law.

The subject-matter of the claim differs from the prior art document D1 in the specific seat allocation rule, which is merely a rule for determining seat allocation according to commercial purposes. The problem to be solved is not a technical problem and the above-mentioned rule does not make any technical contribution. The subject-matter of the claim therefore lacks inventive step.

Case 5: Determining an optimal (low) fare

1. Claim

A method for determining an optimal fare for a trip comprising a departure location, an arrival location, the method comprises the following steps:

- *sending a request (105) for the trip wherein the request (105) comprises a departure location, an arrival location and a corresponding fare for the trip;*
- *automatically modifying the request by searching in a predetermined database (104) to determine a set of additional requests wherein each comprises at least one of the departure location, the arrival location or one or more additional locations which may form at least a part of the requested route wherein the predetermined database (104) comprises said additional requests and a corresponding fare for each additional request;*
- *selecting one or more additional requests to form one or more alternative requests which include at least one of the departure location or the arrival location as the request (105);*
- *calculating the up to date fares for each alternative request in order to determine a resulting fare for each alternative request;*
- *comparing the fare and the resulting fares in order to determine the lowest resulting fare for the trip.*

2. EPO analysis

The method as defined in the claim involves technical means ("automatically ... searching in a predetermined database") and hence the subject-matter constitutes an invention within the meaning of Article 52 EPC (i.e. the first hurdle is overcome). Hence, the claimed subject-matter is subsequently examined with respect to novelty and inventive step. The examination of inventive step requires an assessment of which features contribute to the technical character of the invention (EPO Guidelines G-VII, 5.4).

The claim specifies a number of method steps which, with the involvement of technical means in the form of a database, specify a method that serves the non-technical purpose of determining the lowest fare for a trip. The only step that is performed with technical means is the step of "automatically modifying the request by searching in a predetermined database ...", whereas all other steps could also be performed by a human being. Said human being would also be capable of performing the step that involves the database, if they had access to the additional trip requests stored in it. Therefore, if the method were claimed without the involvement of a database, it would be excluded under Article 52(2)(c) and (3) EPC as a method for doing business. The business method defined in the claim does not contribute to the technical character of the invention.

The only technical means specified by the claim (a database) are known and used merely to automate said business method.

Assuming a database as the closest prior art, the claim thus differs from that prior art in that known technical means are used merely to automate an otherwise non-technical business method.

Therefore, according to step (iii)(c) of the problem-solution approach defined in EPO Guidelines G-VII, 5.4, the objective technical problem to be solved can be seen as how to automate the business method. The solution, namely automation that stores and retrieves from a database information used as an input for the business method, is obvious to the person skilled in the art. Therefore, the claim fails to meet the requirements of Article 56 EPC due to a lack of inventive step.

3. CNIPA analysis

The method claimed involves technical means, such as "automatically modifying the request by searching in a predetermined database to determine a set of additional requests", and "comparing the fare and the resulting fares". Although this method is relatively simple, it is not a pure business rule. The comparison and modification in the database are combined with the determination of the associated fares. Hence, the claimed subject-matter is a technical solution under Article 2.2 Chinese Patent Law.

The subject-matter of the claim differs from that of the prior art document D1 in that the associated fare stored in the database is compared and the fare stored in the database is modified accordingly. Document D2 discloses a means for searching and comparing fares in the database and giving a recommended resulting fare. Although the specific nature of the recommended resulting fare is different, the content is not related to the technical problem to be solved. The subject-matter of the claim therefore lacks inventive step.

Case 6: Facilitating shopping

1. Claim

Method of facilitating shopping on a mobile device wherein:
(a)   the user selects two or more products to be purchased
(b)   the mobile device transmits the selected products' data and the device location to a server;
(c)   the server accesses a database of vendors to identify vendors offering at least one of the selected products;
(d)   the server determines, on the basis of the device location and the identified vendors, an optimal shopping tour for purchasing the selected products by accessing a cache memory in which optimal shopping tours determined for previous requests are stored; and
(e)   the server transmits the optimal shopping tour to the mobile device for displaying.

2. EPO analysis

Application of the problem-solution approach according to EPO Guidelines G-VII, 5.4:

Step (i): The features contributing to the technical character are at first glance a distributed system comprising a mobile device connected to a server computer which has a cache memory and is connected to a database.

Step (ii): Document D1, which discloses a method for facilitating shopping on a mobile device wherein the user selects a single product and the server determines from a database the vendor selling the selected product nearest to the user and transmits this information to the mobile device, is selected as the closest prior art.

Step (iii): The differences between the subject-matter of claim 1 and D1 are:
(1)   The user can select two or more products to purchase (instead of a single product only).
(2)   An "optimal shopping tour" for purchasing the two or more products is provided to the user.
(3)   The optimal shopping tour is determined by the server by accessing a cache memory in which optimal shopping tours determined for previous requests are stored.

Differences (1) and (2) represent modifications of the underlying business concept, since they define producing an ordered list of shops to visit which sell these products. No technical purpose is served, and no technical effects can be identified from these differences. Hence, these features make no technical contribution over D1. On the other hand, difference (3) makes a technical contribution as it relates to the technical implementation of differences (1) and (2) and has the technical effect of enabling rapid determination of the optimal shopping tour by accessing previous requests which are stored in a cache memory.

Step (iii)(c): The objective technical problem is to be formulated from the perspective of the person skilled in the art as an expert in a technical field (EPO Guidelines G-VII, 3). Such a person is not deemed to have any expertise in business-related matters. In the present case, he can be defined as an expert in information technology who gains knowledge of the business-related features (1) and (2) as part of the formulation of the technical problem to be solved, as would be the case in a realistic situation in the form of a requirement specification. The objective technical problem is thus formulated as how to modify the method of D1 to implement in a technically efficient manner the non-technical business concept defined by the differences (1) and (2), which is given as a constraint to be met.

Obviousness: Concerning requirement (1), it would have been a matter of routine for the skilled person to adapt the mobile device used in D1 so as to enable the user to select two or more products instead of a single one. It would also have been obvious to assign the task of determining the optimal shopping tour (arising from requirement (2)) to the server, by analogy with the server likewise determining the nearest vendor in D1. Since the objective technical problem further requires a technically efficient implementation, the skilled person would have looked for efficient technical implementations of the determination of a tour. A second document, D2, discloses a travel planning system for determining travel trips, listing a set of places to visit, and addresses this technical problem: the system of D2 accesses for this purpose a cache memory storing results of previous queries. The skilled person would thus have considered the teaching of D2 and adapted the server in D1 to access and use a cache memory as suggested in D2 so as to provide a technically efficient implementation of the determination of the optimal shopping tour, i.e. difference (3). Hence, no inventive step is involved within the meaning of Articles 52(1) and 56 EPC.

3. CNIPA analysis

A method of facilitating shopping on a mobile device is claimed.

Firstly, it can be seen that the claim contains technical features, such as mobile device, server, database. So the claim is not the mental activity and method under Articles 25.1(2) Chinese Patent Law.

Secondly, the technical problem to be solved is facilitating online shopping on a mobile device (rather than a simple shopping method). The means adopted are that the user selects products on the mobile device, the mobile device transmits the selected products' data and the device location to a server, the server accesses the database of vendors (a query is performed), and the server determines an optimal shopping tour on the basis of the device location and vendors. In order to solve the online shopping problem of providing the optimal shopping tour/vendor of the plurality of selected products on the mobile device, the technical means of determining an optimal shopping tour on the basis of the device location and the interaction between the mobile device, the server and the database are adopted. Moreover, the technical effect of facilitating shopping for two or more products selected on a mobile device through an optimal shopping tour is achieved. Therefore, the claim is eligible for patent protection (i.e. it is not excluded under Articles 25 and 2.2 Chinese Patent Law).

Finally, The CNIPA would determine whether the claim has the inventive step. As for the same document D1, CNIPA would determine the same distinguishing features as the EPO, and agree with its reasoning regarding the obviousness of the invention. The solution is thus regarded as obvious.

Case 7: Brokering offers

1. Claim

A computer-implemented method for brokering offers and demands in the field of transporting freight, comprising the following steps:
a) *receiving transportation offers/demands from users, including location and time data;*
b) *receiving current location information of the users from GPS terminals with which the users are equipped;*
c) *after receiving a new offer/demand request, verifying if there are previous offers/demands not yet satisfied that can respond to the new request;*
d) *if so, selecting the one for which the current locations of both users are closest; and*
e) *otherwise storing the new request.*

2. EPO analysis

Application of the steps of the problem-solution approach according to EPO Guidelines G-VII, 5.4:

Step (i): Underlying the claimed method is the following business method:
A method for brokering offers and demands in the field of freight transportation, comprising:
− receiving transportation offers/demands from users, including location and time data;
− receiving information regarding the current location of the users;
− after receiving a new offer/demand request, verifying if there are previous offers/demands not yet satisfied that can respond to the new request;
− if so, selecting the one for which the current locations of both users are closest; and
− otherwise storing the new request.

Such a business method is per se non-technical and excluded under Article 52(2)(c) and (3) EPC. Brokering offers and demands is a typical business activity. Using the geographical location of users is the kind of criterion which a transportation broker could specify as part of a business method based on non-technical, business considerations only. This business method does not serve any technical purpose in the context of the invention and thus does not contribute to its technical character.
Therefore, only the features related to the technical implementation of this business method can be identified as the features contributing to the technical character of the invention:

- The business method steps are carried out by a computer.
- The current location information is received from GPS terminals.
Step (ii): As a suitable starting point, document D1, which discloses a method of order management in which a server computer receives location information from GPS terminals, is selected as the closest prior art.
Step (iii): The difference between the subject-matter of claim 1 and D1 is thus the computer implementation of the steps of the business method defined above.
The technical effect of this difference is merely the automation of the business method underlying claim 1. The conclusion reached in step (i) holds, since the only distinguishing feature making a technical contribution is the technical implementation of this business method.
Step (iii)(c): The objective technical problem is formulated as how to adapt the method of D1 so as to implement the business method of brokering offers and demands according to the user's current location. The person skilled in the art is considered to be a software project team and is given the knowledge of the business method in the form of a requirement specification.
Obviousness: Adapting the method of D1 to execute the business method steps is straightforward and requires routine programming only. Therefore, no inventive step is involved within the meaning of Articles 52(1) and 56 EPC.

3. CNIPA analysis

Firstly, the claimed subject-matter comprises receiving location information from users from GPS terminals, which is technical feature. So the claim is not the mental activity and method under Articles 25.1(2) Chinese Patent Law.
Secondly, almost features in the claim are business method step, and it is definitely determined that the claim does not involve the detailed embodiments about how to locate a user. The transportation offers/demands problem solved is actually a business problem when considered as a whole. The means adopted are to broker the offers and demands on the basis of the geographical location and time data. The means are merely a business activity rule rather than technical means, and achieve only a corresponding business effect. Therefore, the claim does not comply with Article 2.2 Chinese Patent Law.

Case 8:
Transmission of a broadcast media channel

1. Claim

A system for the transmission of a broadcast media channel to a remote client over a data connection, said system including:
(a) means for storing an identifier of the remote client and an indication of an available data rate of the data connection to the remote client, said available data rate being lower than the maximum data rate for the data connection to the remote client;
(b) means for determining a rate at which data is to be transmitted based on the indication of the available data rate of the data connection; and
(c) means for transmitting data at the determined rate to said remote client.

2. EPO analysis

Application of the steps of the problem-solution approach according to EPO Guidelines G-VII, 5.4:

Step (i): At first glance, all the features appear to contribute to the technical character of the invention.

Step (ii): Document D1, which discloses a system for broadcasting video over an xDSL connection to the set-top boxes of subscribers, is selected as the closest prior art. The system comprises a database storing identifiers of subscribers' computers and, in association with them, an indication of the maximum data rate for the data connection to each subscriber's computer. The system further comprises means for transmitting the video to a subscriber's computer at the maximum data rate stored for said computer.

Step (iii): The differences between the subject-matter of claim 1 and D1 are:
(1) Storing an indication of an available data rate of the data connection to the remote client, said available data rate being lower than the maximum data rate for the data connection to the remote client.

(2) Using said available data rate to determine the rate at which the data is transmitted to the remote client (instead of transmitting the data at the maximum data rate stored for said remote client as in D1).

The purpose served by using an "available data rate" which is lower than a maximum data rate for the data connection

to the remote client is not apparent from the claim. Therefore, the relevant disclosure in the description is taken into account. In the description, it is explained that a pricing model is provided which allows a customer to choose from several service levels, each service level corresponding to an available data-rate option having a different price. A user may select an available data rate lower than the maximum data rate possible with his connection in order to pay less. Hence, using an available data rate which is lower than the maximum data rate for the connection to the remote client addresses the aim of allowing a customer to choose a data-rate service level according to that pricing model. This is not a technical aim, but an aim of a financial, administrative or commercial nature and thus falls under the exclusion applying to schemes, rules and methods for doing business in Article 52(2)(c) EPC. It may thus be included in the formulation of the objective technical problem as a constraint to be met.

The features of storing the available data rate and of using it to determine the rate at which the data is transmitted have the technical effect of implementing this non-technical aim. Step (iii)(c): The objective technical problem is therefore formulated as how to implement in the system of D1 a pricing model which allows the customer to choose a data-rate service level (i.e. to pay a lower amount to receive broadcast media channels at a quality of service lower than the highest possible quality of service). The pricing model is considered to be provided to the skilled person as part of the objective technical problem.

Obviousness: Given the task of implementing this choice of data-rate service level in accordance with the pricing model, it would be obvious to the skilled person that the data rate purchased by a subscriber (i.e. the "available data rate" of claim 1), which can only be lower or equal to the maximum data rate of the data connection to the subscriber's computer (i.e. the "remote client" of claim 1), would have to be stored for each subscriber and used by the system to determine the rate at which data is to be transmitted to a subscriber. Therefore, no inventive step is involved within the meaning of Articles 52(1) and 56 EPC.

3. CNIPA analysis

The features in the claim are considered to be technical and the claim is not the mental activity and method under Articles 25.1(2) Chinese Patent Law.

The claim can solve the problem of controlling data transmission by using different data transmission rates for differ-

ent clients, and the means adopted are also technical means. Although the aim of the solution disclosed in the description is to set different data rates according to the different pricing levels and is a commercial purpose, the means by which this commercial purpose is achieved are technical means. In other words, compared with the prior art, the claim can set different data rates for different users, which is technical no matter what aim it is. For example, the aim of the solution may balance the load on the network. User A watches video online, so he needs higher data rate. User B browses web pages online, so he needs lower data rate. If the server sets the same data rates for users A and B, as the total bandwidth is limited, it will cause that user A can not watch the video smoothly, and it will waste the bandwidth for user B. The claim can solve the technical problem that matched data transmission rates is not allocated for different user

requirements, and can achieve the technical effect for making the network utilization rate maximum. Therefore, the subject-matter of the claim is eligible for patent protection (i.e. it is not excluded under Articles 2.2 and 25 Chinese Patent Law).

It is considered that the invention is based on the fact that different data transmission rates can be set for different clients, instead of having a fixed maximum data transmission rate. If the prior art fails to disclose this, an inventive step can be recognised. A further search of the prior art needs to be conducted with regard to the distinguishing features (1) and (2), and if there is no prior art that discloses these features, then the claim will be considered to involve an inventive step compared with D1.

Case 9: Numerical simulation of a circuit

1. Claim

A computer-implemented method for the numerical simulation of the performance of an electronic circuit subject to 1/f noise, wherein:

(a) the circuit is described by a model featuring input channels, noise input channels and output channels;

(b) the performance of the input channels and the output channels is described by a system of stochastic differential equations;

(c) an output vector is calculated for an input vector present on the input channels and for a noise vector y of 1/f-distributed random numbers present on the noise input channels; and

(d) the noise vector y is generated by the following steps:
(d1) setting the number n of random numbers to be generated;
(d2) generating a vector x of length n of Gaussian-distributed random numbers;
(d3) generating the vector y by multiplying the vector x with a matrix L defined according to equation E1*.

*   It is assumed that equation E1 is explicitly specified in the claim.

Background: The claim is directed to a method carried out by a computer for the numerical simulation of the performance of an electronic circuit subject to 1/f noise, which is one of the main sources of noise in electronic circuits. Features (a)-(c) specify the mathematical model used in the numerical simulation. It involves a noise vector y of 1/f-distributed random numbers, i.e. random numbers having a particular statistical property typical of real (physical) 1/f noise. Steps (d1)-(d3) define the mathematical algorithm used for generating these random numbers. According to the description, this mathematical algorithm is particularly efficient in terms of computation time and storage resources required to generate the random numbers needed for the simulation.

2. EPO analysis

Application of the steps of the problem-solution approach according to EPO Guidelines G-VII, 5.4:

Step (i): The use of a computer to carry out the claimed method is a clearly technical feature. The question is whether the other features, in particular the mathematical

algorithm of steps (d1)-(d3), also contribute to the technical character of the claimed subject-matter. Considered in isolation, steps (d1)-(d3) represent a mathematical method with no technical character. However, the claim is not directed to this mathematical method as such (which would be excluded from patentability under Article 52(2)(a) and (3) EPC) but is limited to a computer-implemented method in which this mathematical method serves the numerical simulation of the performance of an electronic circuit subject to 1/f noise, which is considered to be a technical purpose (EPO Guidelines G-II, 3.3). Features (a)-(c) ensure that the claim is functionally limited to this technical purpose by specifying the mathematical model used in the simulation and how the generated noise vector y is used in it, i.e. they establish the link between the stated purpose of the method and steps (d1)-(d3). Furthermore, the mathematical model specified by features (a)-(c) defines how the numerical simulation is performed and thus also contributes to the above-mentioned technical purpose. As a result, all the steps relevant to the circuit simulation, including the mathematically expressed claim features (d1)-(d3), contribute to the technical character of the method to the extent that they are relevant for circuit simulation.

Step (ii): Document D1, which discloses a method for numerical simulation of the performance of an electronic circuit subject to 1/f noise with steps (a)-(c) but with a different mathematical algorithm for generating the 1/f-distributed random numbers, is selected as the closest prior art.

Step (iii): The difference between the methods of claim 1 and D1 is the mathematical algorithm used to generate the vector of 1/f-distributed random numbers, i.e. steps (d1)-(d3). The algorithm defined by steps (d1)-(d3) requires fewer computer resources than used in D1. In the context of the claimed method, this results directly in a reduction of the computer resources required for the numerical simulation of the performance of an electronic circuit subject to 1/f noise, which is the technical effect achieved over D1.

Step (iii)(c): The objective technical problem solved with respect to D1 is formulated as how to generate the 1/f-distributed random numbers used in the numerical simulation of the performance of an electronic circuit subject to 1/f noise in a manner which requires fewer computer resources. Obviousness: No prior art suggests the algorithm defined by steps (d1)-(d3) as a solution to the objective technical problem. The invention as claimed is therefore considered to involve an inventive step.

3. CNIPA analysis

The claim is eligible for patent protection (i.e. it is not excluded under Articles 2.2 and 25 Chinese Patent Law).

Firstly, the claim contains technical features, such as electronic circuit, model featuring input channels, noise input channels and so on. It is not pure mathematical algorithm, and is applied to specific application field, numerical simulation of the performance of an electronic circuit. So the claim is not the mental activity and method under Articles 25.1(2) Chinese Patent Law.

Secondly, although this computer-implemented method involves a mathematical algorithm, it does so in a specific technical field, and can serve the numerical simulation of the performance of an electronic circuit subject to 1/f noise, which is considered to be a technical purpose. The solution solves a specific technical problem, adopts technical means to achieve a technical effect and constitutes a technical solution. Therefore, the claim is the technical solution under Articles 2.2 Chinese Patent Law.

All the features including features (a)-(c) and features (d) are involved with the technical problem described above, so all the features of the claim including the mathnical steps must be considered when assessing the inventive step. If the prior art fails to disclose the features relating to the mathematical algorithm, as suggested in the EPO analysis, then the invention as claimed would be considered to involve an inventive step.