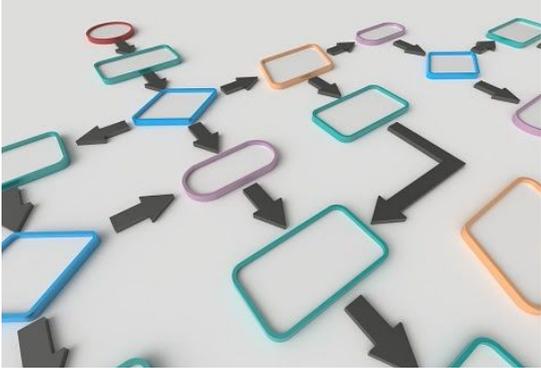
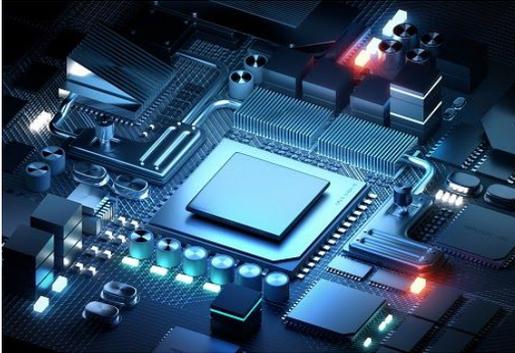


Intellectual Property Rights of Computer Software

Are they Copyrightable and/or Patentable?



```
e = m(b, " ");
-1 < e && b.splice(e, 1);
e = m(b, void 0);
-1 < e && b.splice(e, 1);
e = m(b, " ");
-1 < e && b.splice(e, 1);
for (c = 0; c < d && c < b.length; c++) {
  a += b[c].b + " ", n.push(b[c].b), "parameter"
}
for (g = 0; g < f; ) {
  e = Math.floor(b.length * Math.random()), d =
  d.c + "</span></li>"); b[e] = void 0, g++;
}
for (; c < b.length; c++) {
  void 0 != b[c] && ("parameter" = b[c].c ? $
}
function(b);
ingle").h("mode_selected") ? $(#i
nt().d("wobble animated
```



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Manjula Sandirigama

BSc (Electrical Engineering)
MSc, PhD (Computer Science)
Attorney-at-Law (Sri Lanka)

Table of Contents

Computer Software - Patentable and/or Copyrightable?	2
Literature Review on the Current State	3
WIPO (World Intellectual Property Organization)	3
EPO (European Patent Office)	4
Key Points in the Current State in Literature	4
Copyrightability of Computer Software	5
Legal Provisions	5
Copyrightability of Computer Software - Conventional Thinking	5
Patentability & Copyrightability of Computer Software	6
Legal Provisions	6
Process of Software Development - Use of an Inventive Step	7
Method of Solving a Technical Problem - Algorithm	7
Conversion of the Algorithm to a Computer Program	8
Conversion of the Computer Program to Executable Code - Software	8
Patentability & Copyrightability of Computer Software - Non-conventional Thinking	9
Embedded Software in Products	10
An Example of a Patented Software	11
Mathematical Equations in Computer Software	11
An Example - Patents Claims for Computer Programs	13
Conclusion	15
References	17
Reviews	18

1. Computer Software - Patentable and/or Copyrightable?

Let's begin with the Conclusion.

- Computer programs, also known as computer software, are both patentable and copyrightable. The software can be used in any type of digital device, including mobile and devices.
 - Copyrightable parts
 - The executable object code in digital format
 - The source code written in high-level languages
 - The algorithms (steps of solving the problem)
 - Patentable part
 - The algorithms (or source codes in addition to algorithms) that are steps of solving the problem which can be used in another process
 - The processes involving mathematical equations
- Products and processes that embed computer programs are patentable.

The reason for starting with the Conclusion is not to prejudice the readers' mind but to keep the focus on the logic behind the Conclusion in order to comprehend the logic easily.

The following discussion is based on the Intellectual Property Act, No. 36 of 2003 of Sri Lanka (Referred to as SL IP Act in the discussion). However, these provisions are the same in all the countries.

2. Literature Review on the Current State

The following are some related background knowledge that gives validity and authority for the following discussion.

Sections 2.1 and 2.2 depict some facts in the literature and Section 2.3 summarizes the key information to support the facts and arguments in the following discussion.

2.1. WIPO (World Intellectual Property Organization)

Quoted below are some parts from the following webpage

<https://www.wipo.int/copyright/en/activities/software.html>

“In the 1970s and 1980s, there were extensive discussions on whether the patent system, the copyright system, or a *sui generis* system, should provide protection for computer software.”

“These discussions resulted in the generally accepted principle that computer programs should be protected by copyright, whereas apparatus using **computer software or software-related inventions should be protected by patent.**”

“The law relating to the patentability of software is still not harmonized internationally, but some countries have embraced the patentability of computer software and others have adopted approaches that **recognize inventions assisted by computer software.**”

Quoted below are some parts from the following webpage

https://www.wipo.int/wipo_magazine/en/2017/01/article_0002.html

“Final thoughts on software-related inventions

The aim, surely, is to create conditions that allow innovators and engineers to dedicate resources to software development to find new ways to help us connect and do business. As digitization gathers pace in all areas of our lives, the time is ripe for the global community to re-examine the current state of play and to weigh up the merits of **enhancing patent protection for computer programs that embody software-related inventions.**”

2.2. EPO (European Patent Office)

Quoted below are some parts from the following webpage

https://www.epo.org/law-practice/legal-texts/html/guidelines/e/g_ii_3_6.htm

“Computer programs are excluded from patentability under **Art. 52(2)(c)** and **(3)** if claimed as such. However, following the generally applicable criteria for **Art. 52(2)** and **(3)** (**G-II, 2**), the exclusion does not apply to computer programs having a **technical character**.”

“Examples of further technical effects which confer technical character to a computer program are the control of a technical process or of the internal functioning of the computer itself or its interfaces”

“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 within the meaning of Art. 52(1) (T 258/03, T 424/03, G 3/08).**”

2.3. Key Points in the Current State in Literature

The following three key points in Sections 2.1 and 2.2 help corroborate the arguments presented in the following sections of patentability as well as copyrightability of computer software.

- In the 1970s and 1980s, lawmakers seriously thought about patentability of computer software (programs) which were conventionally thought copyrightable only.
- Inventions embodying computer programs are considered patentable now.
- Computer software (programs) having a further technical character - **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** and therefore patentable.

3. Copyrightability of Computer Software

3.1. Legal Provisions

The following is a part of Section 6 of SL IP Act that relates to work that is copyrightable.

6.

(1) The following works shall be protected as literary, artistic or scientific works (hereinafter referred to as "works") which are original intellectual creations in the literary, artistic and scientific domain, including and in particular -

(a) books, pamphlets, articles, **computer programs** and other writings ;
(b) speeches, lectures, addresses, sermons and other oral works ; (c) dramatic, dramatic musical works, pantomimes, choreographic works and other works created for stage productions ; (d) stage production of works specified in paragraph (c) and expressions of folklore that are apt for such productions ; (e) musical works, with or without accompanying words ; (f) audiovisual works ; (g) works of architecture ; (h) works of drawing, painting, sculpture, engraving, lithography, tapestry and other works of fine art ; (j) photographic works ; (k) works of applied art ; (l) illustrations, maps, plans, sketches and three dimensional works relative to geography, topography, architecture or science.

3.2. Copyrightability of Computer Software - Conventional Thinking

All literary work falls under the copyrightable category. The simple meaning of copyrightability is that it is the action of copying some information - writing, aesthetic appearance (arts, sculpture), digital information - from one media to another.

Digital data, in this way, can be thought of as something that can be copied from one media to another. In this context, computer programs, in their executable format, are solely copyrightable.

4. Patentability & Copyrightability of Computer Software

4.1. Legal Provisions

The following is a part of Section 62 and Section 63 of SL IP Act that relates to work that is patentable -

62.

(1) For the purposes of this Part, "invention" means an **idea of an inventor which permits in practice the solution to a specific problem in the field of technology.**

(2) **An invention may be, or may relate to, a product or process.**

(3) The following, notwithstanding they are inventions within the meaning of subsection (1), shall not be patentable.

(a) discoveries, scientific theories and **mathematical methods** ;

63.

An invention is patentable if it is **new, involves an inventive step and is industrially applicable.**

Accordingly, if one finds something that is a technical solution to a problem satisfying the legal criteria in Section 63, there is an Invention and it is patentable.

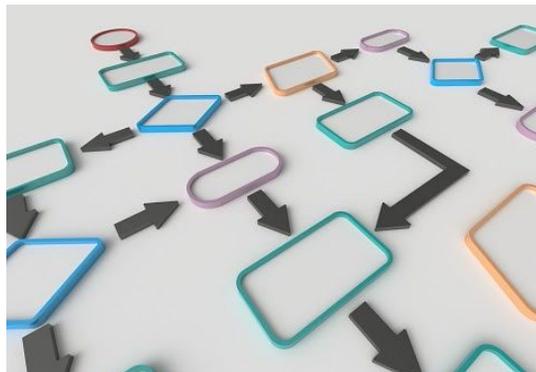
4.2. Process of Software Development - Use of an Inventive Step

If we look at the process of software development carefully, it is very obvious that inside the computer program, that is a technical solution to a problem which according to the law is patentable.

Let's briefly analyze the software development process in order to identify patentable and copyrightable parts.

4.2.1. Method of Solving a Technical Problem - Algorithm

The initial step of software development is to identify the problem and write the steps of the solution in simplified human-understandable language. The steps can also be converted into a slightly technical perspective known as a Flow Chart or an Algorithm. In any case, this is a solution to the technical problem.

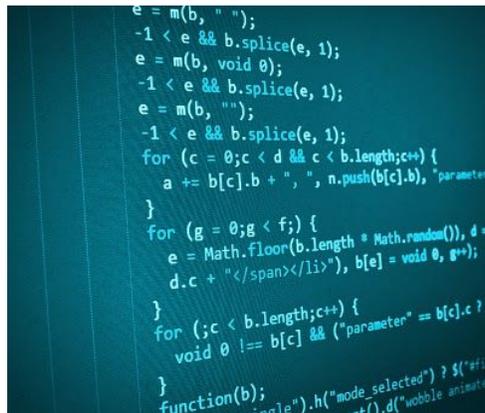


These steps can be copied and can be used as a solution or part of the solution to another problem.

4.2.2. Conversion of the Algorithm to a Computer Program

Thereafter, the algorithm is coded using a desired high-level language.

This is also the solution to the technical problem but represented in a different way, one that a computer can interpret.



```
e = m(b, " ");
-1 < e && b.splice(e, 1);
e = m(b, void 0);
-1 < e && b.splice(e, 1);
e = m(b, "");
-1 < e && b.splice(e, 1);
for (c = 0; c < d && c < b.length; c++) {
  a += b[c].b + " ", n.push(b[c].b), "parameter"
}
for (g = 0; g < f; ) {
  e = Math.floor(b.length * Math.random()), d =
  d.c + "</span></li>"), b[e] = void 0, g++;
}
for (; c < b.length; c++) {
  void 0 !== b[c] && ("parameter" == b[c].c ? $
}
function(b);
ingle").h("mode_selected") ? $("afin
nt().d("wobble animated
```

This step can also be copied and can be used as a solution or part of the solution to another problem.

4.2.3. Conversion of the Computer Program to Executable Code - Software

Finally, the coded solution in a high-level language is converted into machine-readable binary digits by a process known as compilation. The resultant is stored in a portable and machine-independent media in binary digital form that can be run on a digital system.

In fact, this is also a technical solution that can be readily executable.



However, at this point, it is not comprehensible to humans and is used solely for the intended purpose as portable files mostly on a commercial basis.

4.3. Patentability & Copyrightability of Computer Software - Non-conventional Thinking

When we carefully look at the arguments in sections 4.2.1, 4.2.2 and 4.2.3, we can make the following premises and conclusions.

4.2.1 is a technical solution to a problem. It can be copied and used as the solution or part of the solution to another problem, and thus it is primarily patentable. It can be thought of as copyrightable if the mere literary work is copied.

4.2.2 is also a technical solution to a problem. It can be copied and used as the solution or part of the solution to another problem, and thus it is primarily patentable. It can be thought of as copyrightable if the mere literary work is copied.

4.2.3 is also a technical solution to a problem. However, at this point, it is only used for the intended purpose, and the copying of the contents (0 and 1 s) is solely a copyright issue.

Thus, we can justify that computer programs are both copyrightable and patentable.

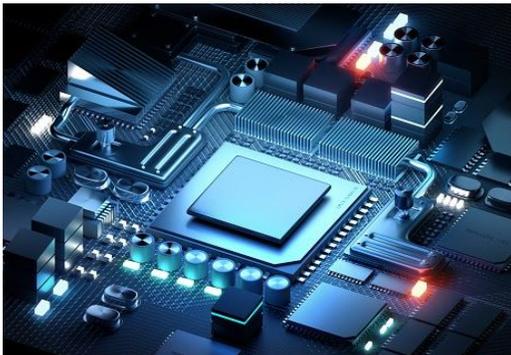
In patent legislations, computer programs are classified as copyrightable and there is no need to change it. The patentable part is the technical solution in the computer program and technical solutions are patentable under existing legislations.

4.4. Embedded Software in Products

Most of the products nowadays are digitally controlled. They can either be microprocessor controlled or run on a predetermined digital logic. In both cases, there is some computer software that operates the system. The programs are loaded into a RAM or ROM memory.

Such program-controlled devices have electro-mechanical parts controlled by the computer program.

In systems like this, the whole product is patentable. The Algorithms and Source Codes could also be copyrightable. The executable program in binary format is solely copyrightable.



4.5. An Example of a Patented Software

The first United States software patent was issued in 1968 for a sorting system, which is a computer software.

A part of the main claim of the patent (A Sorting System US 3,380,029, 1968) is depicted below. What is claimed is not a computer program or a software but a method of solving a problem. This is how computer software products are claimed as a patentable right.

1. In a data processing system including a plurality of magnetic tape units for serially storing data signal combinations and having means for reading and writing signals during reeling thereof in a forward direction, and means for rewinding to an initial position, a memory, and control and arithmetic units including means for transferring data signals between said tape units and said memory and between said arithmetic unit and said memory, and means for performing sort operations on groups of said data signal combinations via said memory to form strings thereof and for performing merge operations on said signal strings via said memory to form longer strings;

a control system for directing the operation of said data processing system to process a body of said data signal combinations of a sorted sequence on one of said tape units; said control system comprising:

(a) a first iterative control loop means having means for initiating operation of said sort performing means to sort sets of said data signal combinations into sorted strings of a first order, means for initiating writing by said writing means of said strings on said tape units, and

5. Mathematical Equations in Computer Software

In patent legislations (see Section 63 of SL IP Act in Section 3.3), mathematical methods (equations) are not patentable among other non-patentable ones).

However, when we look at some issued patents, it can be observed that a process involving a mathematical equation can be patented. The following is an example of how mathematical equations incorporated in data encryption and decryption are patented. What is patented is not the mathematical equation per se but the process (Algorithm) that incorporates the mathematical equation.

RSA Algorithm : US 4405829 Cryptographic communications system and method

1. A cryptographic communications system comprising:

A. a communications channel,

B. an encoding means coupled to said channel and adapted for transforming a transmit message word signal M to a ciphertext word signal C and for transmitting C on said channel, where M corresponds to a number representative of a message and $0 \leq M \leq n-1$ where n is a composite number of the form $n=p \cdot q$ where p and q are prime numbers, and where C corresponds to a number representative of an enciphered form of said message and corresponds to $C \equiv M \cdot \text{sup.} e \pmod{n}$ where e is a number relatively prime to $1 \text{ cm}(p-1, q-1)$, and

C. a decoding means coupled to said channel and adapted for receiving C from said channel and for transforming C to a receive message word signal M' where M' corresponds to a number representative of a deciphered form of C and corresponds to $M' \equiv C \cdot \text{sup.} d \pmod{n}$ where d is a multiplicative inverse of $e \pmod{1 \text{ cm}((p-1), (q-1))}$.

One might argue that it is an equation that is patented and that argument is also true. There are some exceptional and controversial rare cases which can be argued in both ways. Another such example is the patentability of animals which is not allowed in law. However, a genetically modified mouse - Harvard Mouse - has been patented in the US despite the fact that animals are not patentable according to legislation. In some countries, of course, the product claim (mouse) was rejected and only the process claim (process of genetic modification) was allowed. The countries that allowed the product argued that if not for the genetic modification, such a product would not have resulted while the countries that rejected the product argued that even if the genetic modification is an invention, the subsequent growth of the animal was natural. Both arguments are right. A judgment remains until it is overruled by a subsequent superior judgement, and the superior judgment may be based on the other side of the argument which was earlier rejected.

6. An Example - Patents Claims for Computer Programs

The following are some tips that can be used when drafting patent claims so that the claim appears as a patentable claim and not a mere copyrightable computer program.

- Write the claim as the steps of solving the problem.
- Do not use the words Algorithm, Software etc.
- If mathematical equations are used, embed the equations in the process.

Let's look at an overly simplified system and overly simplified claims to understand the art.

Example Product:

An ice cream vending machine that produces an instant customized ice cream by:

- Getting some input of your choice (flavor, proportion, etc.) from a keypad, and
- Looking at the customer's previous choices (stored in a memory)

And combining the present choice and previous choices according to a new algorithm ABC and using a mathematical equation PQR.

The Main Claim (Not recommended way)

A process of making customized ice cream wherein the said process is controlled by a computer program.

A customized ice cream vending machine comprising a software.

The Main/ Sub Claims (Recommended way)

Process claims

1. A process of making a customized ice cream comprising the steps of :
obtaining an input of customer's present choice and

combining the customer's present choice and previous choices stored in a memory.

2. The process claimed in claim 1 wherein the said combining is done by (include the steps in the Algorithm ABC) and using the mathematical function PQR.

Product claim

1. A customized ice cream vending machine comprising a unit for getting the input of customer's choice and a memory for storing customer's previous choices.

As a more realistic example, let's have a look at the patent of the Google Search Engine. All of us know very well it is a software program that is inside the search engine, so in the conventional thinking, Google Search Engine is only copyrightable. But a patent was granted for the Google Search Engine in 1998 for the method of doing the search, which is the algorithm or the steps involved in the search. The Abstract and the first claim of the patent is depicted below.

Abstract

The present invention provides for a method of updating an internet search engine database with the results of a user's selection of specific web page listings from the general web page listing provided to the user as a result of his initial keyword search entry. By updating the database with the selections of many different users, the database can be updated to prioritize those web listings that have been selected the most with respect to a given keyword, and thereby presenting first the most popular web page listings in a subsequent search using the same keyword search entry.

Claims

1. In a computer network having a plurality of user sites, a method of weighting the relative importance of a plurality of data items stored in a database on a server computer comprising the steps of: receiving at said server computer one or more keywords from user sites; generating at said server computer a plurality of listings corresponding to said keyword, each listing also corresponding to one of said data items; transmitting from said server computer to one of said user sites said plurality of listings; detecting at said server computer which ones of said plurality of data items are selected by said user site, said user site being transmitted each selected one of said data items upon selection of

said corresponding listing by said user site; updating said database to weight said selected ones of said data items as relatively more important than unselected ones of said data items with respect to said keyword; wherein said step of detecting only detects each keyword one time from each user site during a determined interval of time; and wherein said step of generating uses a history factor associated with each keyword in determining said plurality of listings, wherein said history factor is a number less than or equal to 1 and greater than or equal to 0.

7. Conclusion

It is now clear that computer programs and products that embed computer programs have intellectual property rights that are both patentable and copyrightable.

The following table summarizes the conclusions and the logic behind the arguments.

Type of Creative Work	Copyrightable	Patentable	Argument
Executable Object Code	Yes		Pure literary work
Algorithm/ Source Code	Yes	Yes	* Literary Work and a Method of Solving a Problem
Digitally Controlled Systems (Executable Object Code)	Yes		Pure literary work
Digitally Controlled Systems (Algorithm/ Source Code)	Yes	Yes	*Literary Work and a Method of Solving a Problem
Digitally Controlled Systems		Yes	Method/ Device of Solving a Problem

*The mere source code cannot be patented unless the algorithm is written as a claim

Care should be taken, when drafting the patent claims, to make the software solution appear as the method of solving a technical problem. The detailed description of the Algorithm and the related Flow Charts should be in the Description.

Once the patent document is drafted accordingly, it should be submitted, along with the patent application, to the National Intellectual Property Office to acquire the right after an examination.

Since copyright is obtained by virtue of developing the literary work, in case of the executable code, it is not necessary to register it in the National Intellectual Property Office to obtain the copyright. However, it is recommended that the registration is done, in the local office, or in a foreign office if there is no copyright registration available in the local office, in order to safeguard the right easily in case of a dispute.

Copyright registration can be done in the United States Copyright Office at <https://www.copyright.gov/>. Anybody, including foreigners can do so and the cost is between 35 - 55 USD. Once the registration is done, the Copyright Registration Certificate will be mailed within a few months.

References

- Intellectual Property Act, No. 36 of 2003 of Sri Lanka
- World Intellectual Property Organization

https://www.wipo.int/wipo_magazine/en/2017/01/article_0002.html

<https://www.wipo.int/copyright/en/activities/software.html>

- European Patent Office (EPO)

https://www.epo.org/law-practice/legal-texts/html/guidelines/e/g_ii_3_6.htm

- United States Patent and Trademark Office - Patent Database
- United States Copyrights Office
- The History of Software Patents in the United States

<https://www.ipwatchdog.com/>

Reviews

- It is definitely useful and nicely done. As a guide, it is very good.
 - Roshan Ragel, Professor of Computer Engineering, University of Peradeniya
- The report is very interesting. The author has clearly a deep knowledge about copyrights and patent rights for computer software.
 - Kurt Larsen, Senior Education Specialist, World Bank
- I had to read quite a lot of literature to understand and realise the logic behind patentability of computer software, but this guide gives all that knowledge briefly using simple arguments.
 - Nissansala Abhayaruwan, Patent Examiner/ Head of the Branch - Patent and Industrial Design Division, National Intellectual Property Office of SL

Dedicated to the readers for adding value to it

Simple Logic Solves Even Complex Problems

The Author

Appreciate Your [Feedback](#)