

The Patentability of Computer Software — An Overview

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I. Introduction and Summary

The judicial system of the United States has struggled for many years with the patentability of various computer related inventions. The courts have had particular difficulty in determining whether patent claims to certain computer related inventions can properly be considered "statutory subject matter" under 35 USC Section 101. The U.S. Patent and Trademark Office has recently issued a set of guidelines for the examination of computer related inventions that sets forth areas of "statutory subject matter." These guidelines are based upon interpretation of recent case law and statutory definition of patentable subject matter.

This paper reviews the three Supreme Court cases in this area, as well as several cases from the Court of Customs and Patent Appeals, the Court of Appeals for the Federal Circuit, and one case from the Board of Appeals and Interferences of the U.S. Patent and Trademark Office. Finally, an analysis and conclusion of the areas of statutory subject matter is provided in part III.

II. Case Law History

A. Supreme Court Cases

1. Gottschalk v. Benson, 409 U.S. 63 (1972). The Benson case involved the appeal of a patent application that described an invention for a method of converting binary coded decimal numbers into binary numbers in a general purpose digital computer. The issue appealed in the Benson case was whether the method described in the claims constituted a process within the meaning of the Patent Act. The court in Benson held that the claimed invention was simply a mathematical algorithm and not a patentable process under Section 101. With regard to the patentability of abstract ideas, laws of nature and mathematical expressions of scientific truths, the Court made the following statements:

The Court stated in Mackay Co. v. Radio Corp., 306 U.S. 86, 94, 59 S.Ct. 427, 431, 83 L.Ed. 506 that "[w]hile a scientific truth, or the mathematical expression of it, is not patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be." That statement followed the longstanding rule that "[a]n idea of itself is not patentable." Rubber-Tip Pencil Co. v. Howard, 20 Wall. (87 U.S.) 498, 507, 22 L.Ed. 410. "A principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right." Le Roy v. Tatham, 14 How. (55 U.S.) 156, 175, 14 L.Ed. 367. Phenomena of nature, though just discovered, mental processes, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work. As we stated in Funk Bros. Seed Co. v. Kalo Co., 333 U.S. 127, 130, 68 S.Ct. 440, 441, 92 L.Ed. 588, "He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end." We dealt there with a "product" claim, while the present case deals with a "process" claim. But we think the same principle applies.

409 U.S. at 67, 93 S.Ct. at 255.

With regard to substantial practical applications of mathematical formulas, the Court made the following statements:

It is conceded that one may not patent an idea. But in practical effect that would be the result if the formula for converting BCD numerals to pure binary numerals were patented in this case. The mathematical formula involved here has no substantial practical application except in connection with a digital computer, which means that if the judgment below is affirmed, the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself.

409 U.S. at 71, 93 S.Ct. at 257.

The new "Examination Guidelines for Computer-Related Inventions" considers the Benson case as a "primary authority" on which the principles of the Guidelines are based.

2. Parker v. Flook, 437 U.S. 584, 198 USPQ 193 (1978). The Flook case involved the appeal of a patent application that claimed the generation of a number having a value that indicated the status of a petrochemical process. This number was generated from numerical data representative of an operational parameter such as temperature. The numerical data was processed in a general purpose digital computer in accordance with an algorithm to produce the number. The court found that the process was nonstatutory. The court indicated that there were no limitations on the particular apparatus to calculate the number using the algorithm and that the claim contemplated nothing more than determination of that number using the algorithm. The court also stated that the applicant did not disclose anything new except for the algorithm itself. All of the other elements of the claimed subject matter were conventional. The court then employed a novel concept referred to as the "dissection theory." The court stated that the nonstatutory subject matter, i.e. the algorithm, should be dissected from the claim and treated as part of the prior art. If the remaining elements of the claim were not found to be novel and nonobvious, the invention considered as a whole should be considered unpatentable.

3. Diamond v. Diehr, 450 U.S. 175, 209 USPQ 1 (1981). The Diehr case, again, involved the appeal of a patent application. The patent application claimed an invention for molding raw, uncured synthetic rubber into cured precision products, such as tires, using a process that included constantly measuring the actual temperature inside a mold during a curing process. Continuous measurement of the temperature inside the mold allowed continuous recalculation of a cure time using a thermo dynamic equation known as the Arrhenius equation in a general purpose computer. The patent claim included both apparatus limitations and physical activity (post solution activity) that occurred after completion of the numerical calculations relating to the cure time. Specifically, the Diehr patent claims actually included a step that required the mold to be opened upon determination that the rubber had been cured.

The U.S. Supreme Court rejected the analytic dissection approach that it used in Flook. The court indicated that statutory subject matter requirements of Section 101 are met when a claim describes a structure or process that uses a mathematical formula in combination with significant post solution activity, i.e., transforming or reducing an article to a different state or thing. In this case, the process claim of Diehr related to transforming uncured rubber into a cured molded rubber article which constituted statutory subject matter.

B. The Lower Court Decisions

1. The Freeman, Walter, Abele Test. The Court of Customs and Patent Appeals, which was the predecessor to the Court of Appeals for the Federal Circuit, decided three cases in the late 1970s and early 1980s which the U.S. Patent and Trademark Office used to promulgate guidelines for patent examiners in the examination in patent applications. See "Patentable Subject Matter: Mathematical Algorithms and Computer Programs," 1106

Official Gazette Patent Office 5-12 (September 5, 1989). These decisions were In re Freeman, 573 F2d 1237 (CCPA 1978), In re application of Walter, 618 F2d 758 (CCPA 1980) and In re Abele, 684 F2d 902 (CCPA 1982). According to the guidelines established by the United States Patent and Trademark Office, the first step of the Freeman-Walter-Abele Test is to determine whether or not the claim directly or indirectly recites a mathematical algorithm. If a mathematical algorithm is found to be present, then the next step is to determine whether or not the algorithm is applied in any manner to physical elements or process steps. Several factors were to be considered as part of this test in performing the second step such as: post solution activity, field of use limitations, data gathering steps, transformation of something physical, and structural limitations in process claims. The second step of this test as set forth in Arrhythmia Research Technology Inc. v. Corazonix Corp., 3 USPQ2d 1033, 1037 was to "determine whether the claimed invention as a whole is no more than the algorithm itself; that is, whether the claim is directed to a mathematical algorithm that is not applied to or limited by physical elements or process steps. Such claims are nonstatutory." In other words, these guidelines and the rule adopted in the Arrhythmia case, looks to whether the algorithm has preempted a particular area or whether it is limited by physical elements or process steps. The "Examination Guidelines for Computer-Related Inventions" has dropped the two-part Freeman, Walter, Abele test in favor of the primary authorities analysis.

2. In re Lowrey, 32 F3d 1579, 32 USPQ2d 1031 (CA FC 1994). The Court of Appeals for the Federal Circuit held in In re Lowrey that a data structure stored in an electronic memory is patentable subject matter because the data structure imposes a physical organization on the data. Additionally, the court held that the data structures of

Lowrey were not shown to "lack a new and nonobvious functional relationship with the memory." See In re Lowrey, 32 F3d at 1584, 32 USPQ2d at 1035. Federal Circuit also overturned a rejection by the Board of Appeals that the data structures stored in memory were obvious because they constituted printed matter. The Section 103 printed matter rejection that was used in Lowrey is based on the concept that there is not a nonobvious difference between one type of printed matter placed on a recording medium and any other type of printed matter placed on such a recording medium as long as using the medium for recording is known. The court indicated that the printed matter doctrine applies only to information that is primarily human readable such as books, etc. and does not apply to information that is primarily machine readable.

The Lowrey invention implemented an attributive data model which uses the concept that a data base can be a collection of attributions in which information is represented in terms of a relationship to other information. The invention covered a memory that contains organizational structures called attribute data objects. Attribute data objects allow programs, such as application programs, to effectively use a data base, such as that disclosed by Lowrey. The court ruled that the organization of attribute data objects described in the patent constitutes a form of "electronic structure" that can serve as a basis for a patentable invention.

3. In re Warmerdam, 33 F3d 1354, 31 USPQ2d 1754 (CA FC 1994). The Warmerdam invention related to computer programs that are stored in an electronic memory rather than data structures stored in an electronic memory. The specific computer program of the Warmerdam invention related to the control of a robot to prevent collisions with other moving or fixed objects. The Warmerdam invention included the known concept of the use of the bubble zones which are spherical zones surrounding

an object. Bubble bursting occurs when the path of the robot impinges the bubble around an object causing the bubble to burst. When that bubble is burst, a set of more refined bubbles are generated in a hierarchical manner. If these bubbles are burst, an even more refined set of bubbles are revealed. This process of hierarchical bubble bursting continues to determine whether or not a collision will actually occur. The Warmerdam invention related to the placement of the bubbles along a "medial axis" of the object with which the collision would occur. The definition of the medial axis, as described in the Warmerdam specification, included a complex mathematical algorithm.

Several of the claims of the Warmerdam application set forth methods for generating a data structure that represented the position of the object and the medial axes of the hierarchical sets of bubbles. In considering these claims, the Federal Circuit panel did not use the Freeman-Walter-Abele Test or any consideration of whether the Warmerdam invention involved the use of a mathematical algorithm. Instead, the court simply considered these claims to constitute a manipulation of "an abstract idea."

Claim 5 of Warmerdam application claimed a machine having a memory that stores data representing a bubble hierarchy generated by the method of the other claims. The U.S. Patent Office Board of Appeals and Interferences had rejected Claim 5 as being vague because it was unclear how a memory was produced by this method and that the bubble hierarchy data structure was not clearly defined. The Federal Circuit panel reversed the board's rejection and found that the storage of data in memory alters the memory and gives rise to what can be considered to be a new memory. The court further found that one skilled in the art should not have particular difficulty in determining whether a machine with memory containing a bubble hierarchy structure is within the scope of Claim 5.

4. In re Beauregard, 53 F.3d 1995, 35 USPQ2d 1383 (CA FC 1995). decided September 29, 1993. The Beauregard invention related to an algorithm for use in a computer graphics program for filling in a polygon on a screen display of a computer. The claims on appeal related to an article of manufacture which included a storage medium, such as a floppy diskette, encoded with a machine readable computer program code for carrying out this mathematical algorithm. IBM, the assignee of this application, had already received U.S. Patent 4,962,468 on computer graphic methods and systems that operated in accordance with the algorithm. In other words, the U.S. Patent and Trademark Office had already granted, at the time of the appeal of Ex parte Beauregard, a patent on the computer program that included this algorithm. This application simply claimed the Beauregard computer program stored on a storage medium. The board applied a Section 103 printed matter rejection against these claims which was similar to the Section 103 printed matter rejection in In re Lowrey. The Patent, Trademark and Copyright Section of the Colorado Bar Association prepared and filed an Amicus brief in the name of the Colorado Bar Association before the Court of Appeals for the Federal Circuit in this appeal. The position taken in the Amicus brief was that placement of a statutory method on articles of manufacture (a storage medium) should also be considered to present statutory subject matter since articles of manufacture are one of four categories of statutory subject matter set forth in 35 USC Section 101. The overall importance of the claims in this appeal, of course, is that software pirates can be sued for direct infringement through the act of selling, or offering for sale, diskettes that include the patented computer programs. Otherwise, these pirates could only be sued as inducers to infringement or contributory infringers under 35 USC Section 271(b) or (c).

These sections require additional proofs such as intent or knowledge of the infringing activities which can constitute a severe burden on a plaintiff patent holder.

On appeal to the Federal Circuit, the U.S. Patent and Trademark Office withdrew with prejudice. The current examination guidelines for computer related inventions have since recognized the statutory nature of the Beauregard-type claims.

5. In re Alappat, 33 F3d 1526, 31 USPQ2d 1545 (CA FC 1994) (en banc). The Alappat invention relates to a system for improving the appearance of digital oscilloscope screen displays. The screen display of an oscilloscope comprises a large number of small picture elements called "pixels." These pixels, which normally comprise phosphors, are illuminated by a electron beam. The illumination of a narrow line or trace on the screen, particularly when it was disposed at an angle, causes certain discontinuities and flickering that were mostly eliminated by the Alappat invention. The discontinuities and flickering were caused by aliasing that was lessened by an anti-aliasing technique used by Lowrey that decreased the illumination of pixels on the outer regions of the illuminated portions. The anti-aliasing algorithm devised by Alappat employed a mathematical formula that related to the vertical distances between pixels. The patent specification of Alappat identified a specific machine that was used to execute the mathematical functions of the anti-aliasing algorithm. As a result, a trace on the oscilloscope appeared to the eye to be much smoother and without jagged discontinuities.

The Court of Appeals for the Federal Circuit again abandoned the Freeman-Walter-Abele Test and considered whether or not the patent specification disclosed a specific machine or was merely directed to an "abstract idea." The preamble of the Alappat patent claim particularly recited a "rasterizer" that converts waveform data into illumination data. The Federal Circuit held that the claims were patentable because the

claims used means- plus-function language which the court interpreted as covering specific electronic hardware described in the patent specification.

Hence, the court was able to find structural limitations applied to the Alappat claims in the same manner as in the Arrhythmia claims which also constituted means plus function type claims that were construed to operate on electrical signals.

6. In re Trovato, 42 F3d 1376, 33 USPQ2d 1194 (CA FC 1994). The invention disclosed and claimed by Trovato related to a method of determining the shortest or least distance between two points, where the shortest or least distance was defined in terms of some material parameters such as cost, time, or physical distance. The invention modeled the potential movements of objects in the real world using a graph referred to as a "configuration space." The court found that the Trovato method claims indirectly recited a mathematical algorithm. Although the claims in the Trovato application were also written in a means-plus-function format, in which the court could read these limitations on physical hardware or circuitry disclosed in the specification, the court found that the Trovato application did not include a description of any physical hardware circuitry on which it could read the means-plus-function type claims. The only "means" that the court could find were software instructions and flow charts. The court held that such instructions and flow charts did not constitute the kind of structure required to support the usage of means- plus-function claim language and that the means-plus-function claims were drafted in an "illusory" format. The court also stated that the claims of Trovato were not directed to any specific physical activity such as the processing of electronic signals, as disclosed in Arrhythmia, supra. The court held that as such, the claims merely presented "abstract ideas."

III. Analysis and Conclusion

As can be seen in the above cases, the specific manner in which the application is disclosed in the patent specification, and the manner in which it is claimed, is vitally important in computer related inventions for avoiding rejections based on nonstatutory subject matter. It is important, therefore, to include numerous examples of practical applications of the invention. Additionally, tying the invention, in the claims, to specific uses would clearly avoid nonstatutory subject matter rejections. If specific physical hardware circuitry is used to implement a software based invention, it should be disclosed in the specification and at least referred to in the preamble of the claims. Statutory methods that are carried out by computer programs can now be claimed as articles of manufacture in Beauregard-type claims to avoid many of the problems of asserting infringement against software pirates. The Beauregard-type claims should always be considered in the preparation of patent applications for computer related inventions.

These considerations, as well as others, should be carefully considered in the preparation and filing of patent applications that include computer related inventions. Patent attorneys filing patent applications on computer related inventions should carefully consider these issues.