Minnesota Intellectual Property Review

Volume 1 | Issue 1 Article 2

2000

Patent Protection of Computer Programs

James P. Chandler

Patent Protection of Computer Programs

James P. Chandler[*]

INTRODUCTION

On April 14, 1999, in *AT&T Corp. v. Excel Communications Marketing, Inc.*, the United States Court of Appeals for the Federal Circuit ("C.A.F.C.") wrote that "this case asks us once again to examine the scope of [computer program patentability under] section 101 of the Patent Act."[1]

This article examines whether computer programs are, or ought to be, patentable subject matter under section 101 of the Patent Act. Second, it considers whether computer programs satisfy the utility and novelty requirements of section 102. And finally, it examines the problem of obviousness, and judgments thereabout, as required by section 103. The most nettlesome problem under the statute is whether computer programs, or software, are patentable subject matter. This is troublesome because there is no uniform definition of what constitutes a computer program. The problem is further confounded by the fact that many have presumed that a computer program is analogous to an algorithm, which has been judged non-patentable subject matter; hence, computer programs, like algorithms, are non-patentable subject matter. Some United States Supreme Court decisions have been cited as authority for this proposition.[2] I disagree with such interpretation.

---

[*] A.B., University of California at Berkeley, 1963; J.D., University of California School of Law at Davis, 1970; LL.M. Harvard Law School, 1971; President, National Intellectual Property Law Institute. The research assistance of A. Katbab, Ph.D., Jeffrey A. Divney, Class of 1993, The George Washington University National Law Center, Anthony T. Jacono, Class of 2000, University of Minnesota Law School, and Kimberlee N. Smith, Class of 1998, Georgetown University Law Center is gratefully acknowledged. Finally, thanks to Kelley E. Clements, Executive Assistant to Professor Chandler, whose assistance was indispensable.

1. AT&T Corp. v. Excel Comm., Inc., 172 F.3d 1352 (Fed. Cir. 1999).

2. *See, e.g.*, Gottschalk v. Benson, 409 U.S. 63 (1972); Parker v. Flook, 437 U.S. 584 (1978); *see also* Diamond v. Diehr, 450 U.S. 175, 191-93 (1981).

Others have suggested that the lower federal courts, in particular the C.A.F.C., have modified the ruling of the United States Supreme Court to permit algorithms to be patented, and hence have approved the patenting of computer programs.[3]

This article examines the development of the law governing the patentability of computer programs, reviews with particularity patents that have been approved by the courts, and identifies the technical legal justification for decisions by the Patent and Trademark Office ("PTO") and the courts to reject applications for patents on computer programs and to allow others. Finally, the article suggests a pathway for the PTO and the courts in resolving issues concerning the future patentability of computer programs.

I. THE LEGAL PROBLEM

Historically, the typical inventor of a patentable invention proceeded from conception of the invention to articulation of the invention into some tangible form. This process became known as reduction to practice; hence, the inventor's progress from conception of the invention to construction of a model or other proof that the invention is indeed workable is reduction to practice. Upon reducing an invention to practice, the subject matter of the invention came to exist in some tangible, workable form. For example, an inventor conceives a new type of pencil. When conceived by the inventor, the pencil exists in contemplation of the mind only. After the inventor manufactures a sample of his pencil, the conception of the pencil has been reduced to a tangible form. He has built a model of the pencil. This is the process of converting the invention from a state of intangibility to a state of tangibility—i.e., reducing it to practice. In such a case, the utility of the non-computer program invention becomes demonstrable.

But an invention of a computer program is different from historic inventions. The computer program is intangible in conception and remains intangible even after reduction to practice. Therefore, from conception to reduction to practice, the invented computer program remains intangible. The

3. *See, e.g.*, J.P. Chandler, *Proprietary Protection of Computer Software*, U. BALT. L. REV. 195, 230-34 (1982).

computer program at conception is perceivable only in contemplation by the mind. And after reduction to practice, it is still only perceivable in contemplation by the human mind. As a result of the continuing intangibility of computer programs, even after they have been reduced to practice, it is difficult to apprehend how a computer program can, or ought to, be one of the useful arts. Patentability of computer programs thus presents an ongoing challenge.[4]

The primary legal obstacle to issuing patents for computer programs has been that computer programs are generally developed using principles of mathematics and logic. This has lead some to argue that all computer programs are mere algorithms, and that all algorithms are mathematical and therefore unpatentable as principles of nature.[5] Mathematical algorithms have been held unpatentable by the United States Supreme Court.[6]

II. ARE COMPUTER SOFTWARE PRODUCTS PATENTABLE SUBJECT MATTER?

Doubts about whether computer programs are appropriately patentable subject matter under section 101 have existed from the earliest days of the computer sciences.[7] It is not clear that one can overcome the substantial doubts that were raised at the birth of computer programs and which continue to be a problem. There are doubts about whether computer programs encroach upon the functions of the human brain.[8] There are doubts about whether the existing patent law

4. Indeed, the fact that much of the work done by computer programs cannot be seen with the naked eye itself presents a problem. However, an innate sense of right and wrong suggests that one should be able to protect a computer program or other computer software from being taken and used by someone other than its author. This is particularly relevant in a society that is dependent upon, and is virtually governed by, computer driven technologies. Computer technology is easily duplicated once someone has the technology in hand. Intellectual property laws were written to protect individuals and business entities from having their inventions utilized without permission. *See generally* Chandler, *supra* note 3 (discussing in detail protection methods for computer software).

5. *See id.* at 231.

6. *See* Gottschalk v. Benson, 409 U.S. 63, 67 (1972); *see also* discussion *infra* note 22.

7. *See* Chandler, *supra* note 3, at 234-53.

8. *See id.* at 235-36.

is broad enough to accept programs as patentable.[9] There are doubts about the meaning of court decisions on program patentability.[10] There are even doubts about the wisdom of protecting computer programs under patent law.[11]

A. COMPUTER PROGRAM ALGORITHMS AND PATENTABLE SUBJECT MATTER

Before the advent of computer programs, the mental steps doctrine had been developed by the courts to help define the scope of patentable inventions.[12] Under the doctrine, if the process on which a patent was sought was also performable in the human brain, the patent application should be denied, for to grant a patent on the process would preclude others from performing the process as mental steps in the brain.[13] Such a monopoly, it was reasoned, would be too broad as it would include the power to stop others from using their brains to perform the mental steps in the process.[14]

B. SCOPE AND DESIRABILITY OF PATENT PROTECTION FOR COMPUTER PROGRAMS

The large number of articles published on the subject of computer software patentability during the last twenty years illustrates the great interest of both the software industry and the legal community in this form of proprietary protection.[15]

---

9. *See id.* at 234.
10. *See id.* at 230.
11. *See id.* at 231-34.
12. *See id.* at 234-36.
13. *See id.* at 236.
14. *See id.* at 234-37.
15. From 1970-79, there were over 200 articles on patenting computer programs; from 1980-89, there were over 500 articles on patenting computer programs; and from 1990-2000, there were well over 1000 articles. The following is a select list of important articles, comments, and notes: John Kasdan, Symposium, *Obviousness and New Technologies*, 10 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 159 (1999); David A. Rice, *Third Party Intellectual Property Rights and Contractual Restrictions: Implications for Implementation of the Telecommunications Act of 1996*, 5 ROGER WILLIAMS U. L. REV. 159 (1999); Comment, *Are Beauregard's Claims Really Valid?*, 17 J. MARSHALL J. COMPUTER & INFO. L. 347 (1998); Dennis S. Karjala, *The Relative Roles of Patent and Copyright in the Protection of Computer Programs,* 17 J. MARSHALL COMPUTER & INFO. L. 41 (1998); Dean Ronald Cass, Symposium, *Protecting Software and Information on the Internet*, 3 B.U.

J. SCI. & TECH. L. 2 (1997); John A. Gibby, *Software Patent Developments: A Programmer's Perspective*, 23 RUTGERS COMPUTER & TECH. L.J. 61 (1997); Brian Richard Yoshida, *Claiming Electronic and Software Technologies: The Effect of the Federal Circuit Decisions in Alappat, Warmerdam, and Lowry on the Claiming of Mathematical Algorithms and Data Structures*, 45 BUFF. L. REV. 457 (1997); Karen E. Georgenson, Comment, *Reverse Engineering of Copyrighted Software: Fair Use or Misuse?*, 5 ALB. L.J. SCI. & TECH. 291 (1996); Lawrence D. Graham and Richard O. Zerbe, Jr., *Economically Efficient Treatment of Computer Software: Reverse Engineering, Protection, and Disclosure,* 22 RUTGERS COMPUTER & TECH. L.J. 293 (1996); Charles R. McManis, *Taking Trips on the Information Superhighway: International Intellectual Property Protection and Emerging Computer Technology*, 41 VILL. L. REV. 207 (1996); Judith A. Szebes, Comment, *Maximizing Protection for Computer Software,* 12 COMPUTER & HIGH TECH L.J. 173 (1996); David L. Bohan, Note, *Computer Programs: Abstract Ideas or Patentable Subject Matter?*, 29 SUFFOLK U. L. REV. 809 (1995); Michael A. Dryja, *Looking to the Changing Nature of Software for Clues to Its Protection*, 3 U. BALT. INTELL. PROP. J. 109 (1995); Sunny Handa, *Reverse Engineering Computer Programs Under Candian Copyright Law*, 40 MCGILL L.J. 621 (1995); Lawrence Kass, Comment, *Computer Software Patentability and the Role of Means-Plus-Function Format in Computer Software Claims*, 15 PACE L. REV. 787 (1995); C. Mark Kittredge, *The Federal Circuit and Non-Patentable Subject Matter Under In Re Alappat and In Re Warmerdam*, 11 COMPUTER & HIGH TECH. L.J. 261 (1995); Sunil R. Kulkarni, *All Professors Create Equally: Why Faculty Should Have Complete Control Over the Intellectual Property Rights in Their Creations*, 47 HASTINGS L.J. 221 (1995); Joseph G. Aresenault, Comment, *Software Without Source Code: Can Software Produced by a Computer Aided Software Engineering Tool Be Protected?*, 5 ALB L. J. SCI. & TECH. 131 (1994); Thomas P. Burke, Note, *Software Patent Protection: Debugging the Current System,* 69 NOTRE DAME L. REV. 1115 (1994); S. Carran Daughtrey, Note, *Reverse Engineering of Software for Interoperability and Analysis,* 47 VAND. L. REV. 145 (1994); Susan E. Dallas, Comment, *Computer Copyright Protection Narrows as Video Game Giants Battle in Atari v. Nintendo*, 71 DENV. U.L. REV. 739 (1994); Aram Dobalian, Note and Comment, *Copyright Protection for the Non-Literal Elements of Computer Programs: The Need for Compulsory Licensing,* 15 WHITTIER L. REV. 1019 (1994); David A. Rice, *Sega and Beyond: A Beacon for Fair Use Analysis . . . At Least As Far As It Goes*, 19 DAYTON L.REV. 1131 (1994); A. Samuel Oddi, *An Uneasier Case for Copyright Than for Patent Protection of Computer Programs,* 72 NEB. L. REV. 351 (1993); Rafael X. Zahralddin, Note, *The Effect of Broad Patent Scope on the Competitiveness of United States Industry,* 17 DEL. J. CORP. L. 949 (1992); Stephen A. Becker, Note, *Drafting Patent Applications on Computer-Implemented Inventions*, 4 HARV. J.L. & TECH. 237 (1991); John Swinson, *Copyright or Patent or Both: An Algorithmic Approach to Computer Software Protection*, 5 HARV. J.L. & TECH. 145 (1991); Randall M. Whitmeyer, Comment, *A Plea for Due Processes: Defining the Proper Scope of Patent Protection for Computer Software*, 85 NW. U.L. REV. 1103 (1991); Pamela Samuelson, *Benson Revisited: The Case Against Patent Protection for Algorithms and Other Computer Program-Related Inventions,* 39 EMORY L.J. 1025 (1990); Peter S. Menell, *Tailoring Legal Protection for Computer Software*, 39 STAN. L. REV. 1329 (1987); Note, *Patentability of Computer-Related Inventions: A Criticism of the PTO's View on Algorithms*, 54 Geo Wash. L. Rev. 871 (1986); Pamela Samuelson, Symposium, *The Seminconductor Chip Protection Act of 1984 and Its Lessons: Creating a*

Patent protection is comprehensive, surpassing copyright and trade secret law in its benefits to the holder.[16] Patents would afford software manufacturers protection for both the substance and form of the inventive concepts embodied in computer programs, giving the patent holders a limited monopoly on their invention, enforceable without a showing of unethical acquisition.[17] These advantages make it easy to understand why the software industry has sought to have its products included within the scope of federal patent protection.[18] However, the questions of whether and to what extent computer programs are patentable remain unresolved. Courts and the PTO are constantly seeking resolution of these questions, within the precedents set and latitude left by prior case law, and the language and requirements of the patent statute.[19]

Patent, as a means of protecting computer software-related intellectual property, is a relatively new doctrine. It should be noted that, unlike copyright and trade secret, patent protection, to the extent it is available at all, has only involved computer programs and not databases. While it is conceivable that an application for a patent on a computer program might include a

---

New Kind of Intellectual Property: Applying the Lessons of the Chip Law to Computer Programs, 70 MINN. L. REV. 471 (1985); Lynne B. Allen, Note, *The Patentability of Computer Programs: Merrill Lynch's Patent for a Financial Services System,* 59 Ind. L.J. 633 (1983). For a comprehensive bibliography, see Robert O. Nimtz, *Development of the Law of Computer Software Protection*, 61 J. PAT. OFF. SOC'Y 3, 26-43 (1979).

16. *See* Eric Cohen, *Patentability of Computer Programs*, 27 U. MIAMI L. REV. 494, 496-97 (1973). *See generally* Susan Nycum, *Legal Protection for Computer Programs*, 1 COMPUTER/L.J. 1, 72-73 (1978).

17. *See* Cohen, *supra* note 16, at 496.

18. Nevertheless, conflicting opinions exist as to the desirability of patent protection for computer software. The hardware industry, perhaps the strongest opponent to software patentability, cites two adverse effects on that industry if software patents are allowed. Scaffetta, *Computer Software Protection: The Copyright Revision Bills and Alternatives*, 8 J. MAR. J. PRAC. & PROF. 381, 393 (1975). First, the existence of patent monopolies on computer software may impede effective development and utilization of computers. *See id.* Second, hardware manufacturers believe that the acceptance of software as a machine process will lead to the conclusion that the bundling of free software and priced hardware constitutes an antitrust violation as an illegal tie-in arrangement. *See id.* at 394. In contrast, software manufacturers assert that if patents are not allowed, software developers will be forced to seek protection from state trade secret laws. *See id.* at 394-95. Moreover, unpatentability allegedly thwarts university research and diminishes the staying power of minority groups in the software industry. *See id.*

19. The Patent Act of 1952 is codified at 35 U.S.C. §§ 1-376 (1999).

database as one of its elements, it is unlikely that any patent protection for the contents of the database will exist. To do so would be to grant a monopoly on the use of information, seemingly the province of copyright.

Section 101 of the Patent Act provides that "[w]hoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of [the Act]."[20] A method, apparatus, or combination of the two may be patented, including a new use of a known process, machine, manufacture, composition of matter, or material.[21] However, the Act has been interpreted to exclude mathematical, mental, and logical formulae, methods or steps, ideas, discoveries of natural laws or physical phenomena, methods of doing business, and printed matter.[22] The question arising as to software patentability is whether such products fall within the statutory classes of subject matter, which evolved before the advent of computer technology and, therefore, understandably fail to expressly include computer software.[23]

Any submission for patent protection must be novel, useful, and nonobvious.[24] The invention cannot have been previously "known or used by others in this country, or patented or described in a printed publication in this or a foreign country."[25] "Usefulness" has been interpreted to mean that the submitted invention must do something, in the technological sense.[26] The Patent Act explains the nonobvious requirement as follows:

> A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to

---

20. *Id.* § 101.

21. *See id.* § 100(b). As terms of art in patent law, "process" is interchangeable with "method" and "apparatus" with "machine." *In re* Chatfield, 545 F.2d 152, 160-61 (C.C.P.A. 1976) (Rich, J., dissenting), *cert. denied*, 434 U.S. 875 (1977) ("[G]iven an invention which is in essence a new program for a general purpose digital computer, a competent draftsman can readily define the invention as either a process or machine or both.").

22. *See* Gottschalk v. Benson, 409 U.S. 63, 67 (1972).

23. *See generally Chatfield*, 545 F.2d at 159 (Rich, J., dissenting).

24. *See* 35 U.S.C. §§ 101-103 (1999).

25. *Id.* § 102.

26. *See* Isenstead v. Watson, 157 F. Supp. 7, 9 (D.D.C. 1957). *See generally* 35 U.S.C. § 101.

> which said subject matter pertains.[27]

Sections 111 through 146 of the Act detail the procedure that a patent applicant must follow.[28] Section 112, for example, requires the applicant to disclose his invention with specificity:

> The specificity shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.[29]

The successful applicant, as patentee, is granted "the right to exclude others from making, using, or selling" the invention throughout the United States for a period of twenty years from the application date.[30] Sections 271 through 293 of the Act define patent infringement,[31] providing for a civil action[32] in

---

27. *Id* § 103. In *Graham v. John Deere Co.*, 383 U.S. 1 (1966), the United States Supreme Court shed some light on how nonobviousness is to be measured. First, the prior art must be determined; next, the differences between it and the claimed invention must be assessed; and then the ordinary level of skill in the pertinent art must be resolved. *Id.* at 17. Consideration will also be given to "commercial success," "the failure of others," and "long felt but unsolved needs." *Id.*

28. 35 U.S.C. §§ 111-146. A person seeking a patent must file the application with the Commissioner of Patents so that the application may be inspected by an examiner. *See id.* § 111. The claim can be submitted and rejected several times before it is refined to an acceptable level of novelty. *See id.* § 132. If a rejected claim is not prosecuted within six months, it is considered abandoned. *See id.* § 133. An applicant may take a twice-rejected claim to the Patent Office Board of Appeals. *See Id.* § 134. If denied relief there, he may either appeal to the United States Court of Appeals for the Federal Circuit or bring suit against the Commissioner of Patents in the United States District Court for the District of Columbia. *See id.* §§ 134, 141. Should the applicant prevail in either of these courts, then a patent is directed to be issued by the Commissioner of Patents and Trademarks. *See id.* §§ 145-146.

29. *Id.* § 112.

30. *See id.* § 154; *see also* Marshall Leaffer, *Understanding Copyright Law* 26 (1995).

31. 35 U.S.C. § 271. The meaning of infringement has been defined by the courts through the doctrine of equivalents. *See, e.g.*, Graver Tank & Mfg. Co. v. Linde Air Prods., 339 U.S. 605, 608-09 (1950). Under this judicially developed doctrine, a court may find literal infringement "where the infringing device . . . is identical to the supporting disclosure of the patent or can be found as taught within the disclosure of the patent." Scafetta, *Programming Technology as an Infringement*, 5 AM PAT. L. ASS'N Q. J. 35, 38 (1977). However, if the infringing device "performs substantially the same function in substantially the same way to obtain the same result," a patentee may invoke the doctrine of equivalents even if the infringing device is not identical to that suggested by his disclosure. *Graver Tank,* 339 U.S. at 608-09 (quoting Sanitary Refrigerator Co. v. Winters, 280 U.S. 30, 42 (1929)). One

which a patentee can recover damages "adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer."[33]

Despite the apparent inclusion of computer programs within the statutory framework of the Patent Act, the PTO declared them unpatentable in its 1968 guidelines.[34] The PTO eventually rescinded these guidelines,[35] largely because the Court of Customs and Patent Appeals ("C.C.P.A.") refused to adhere to them.[36] Today, the PTO has established Technology Center 2700, which issues 25,000 computer technology patents per year.[37] During the last two decades, decisions of the C.A.F.C. have contributed most to the growth of the law.[38] Only rarely has the United States Supreme Court spoken on the issue, and on all but one occasion,[39] it has reversed the C.C.P.A.[40] Therefore, the status of program patentability can

---

commentator has noted that "the doctrine of equivalents, which is especially applicable to a many-stepped process such as a computer program, prevents a prospective infringer from avoiding infringement liability by substituting for a part of the process its equivalent." Cohen, *supra* note 16, at 496.

When a software inventor succeeds in obtaining a patent, how much practical protection will it afford him? Certainly if literal infringement is found, as where a software programming method is copied by an unauthorized infringer, the software patent holder will be entitled to damages. *See* Milgo Elec. Corp. v. United Telecomm., Inc., 200 U.S.P.Q. 639 (D. Kan. 1978).

Since the commercial debut of computer software and hardware, the Supreme Court has not spoken on the effect of the doctrine of equivalents or on the broadness of patent protection for means plus function claims. *See id.* at 38. Some lower courts, however, have addressed these issues. *See, e.g.*, York Racing Assoc. Inc., 187 U.S.P.Q. (BNA) 602 (E.D.N.Y. 1975), *aff'd*, 553 F.2d 740 (2d Cir. 1977); Bullard Co v. General Electric Co., 234 F. Supp. 995 (W.D. Va. 1964), *aff'd*, 348 F.2d 985 (4th Cir. 1965).

32. 35 U.S.C. § 281.

33. *Id.* § 284.

34. 33 Fed. Reg. §§ 15609-10 (1968).

35. 34 Fed. Reg. § 15724 (1969).

36. *See, e.g.*, *In re* Prater, 415 F.2d 1378 (C.C.P.A. 1968), *aff'd on reh'g*, 415 F.2d 1393 (C.C.P.A. 1969).

37. *See* Gerald Goldberg, Original Patents Issued Per Fiscal Year for TC 2700, (unpublished study, available in app. 1, *infra*).

38. *See* National Intellectual Property Law Institute, Occasional Paper #19, 1999 (unpublished paper, on file with the *Minnesota Intellectual Property Review*).

39. Diamond v. Diehr, 450 U.S. 175 (1981), *aff'g* 602 F.2d 982 (C.C.P.A. 1979).

40. *See, e.g.*, Parker v. Flook, 437 U.S. 584 (1978), *rev'g In re* Flook, 559 F.2d 21 (C.C.P.A. 1977); Gottschalk v. Benson, 409 U.S. 63 (1972), *rev'g In re* Benson, 441 F.2d 682 (C.C.P.A. 1971); Dann v. Johnston, 502 F.2d 765

best be understood in light of the history of Patent Office Board of Appeals, C.A.F.C. and the U.S. Supreme Court.

Patentability requirements, oversimplified, dictate that in order to obtain the monopoly given by Congress in Title 35, the invention or discovery must be patentable subject matter,[41] it must be novel and unknown,[42] and it must not have been obvious to someone of ordinary skill in the art at the time of invention or discovery.[43] Disclosure must be in sufficient detail and clarity that a person skilled in the art can make and use the invention or discovery.[44]

Computer program patentability's greatest obstacle to date has been section 101. Initially it was thought that because computer programs involved math, which consists of universal principles akin to laws of nature, programs were not patentable subject matter.[45] The cases below show the PTO's slow and painful acceptance of computer programs as patentable subject matter. Since the sequence in which the PTO examines applications for patents requires first a determination of whether the subject matter is patentable (traditionally the Achilles heel for programs), many courts have focused mainly on that question.[46]

C. THE MENTAL STEPS DOCTRINE

A process that comprises mental activity, such as "selecting," "determining," or "observing," is devoid of any physical manipulation.[47] These processes, under the mental steps doctrine, were unpatentable.[48] The rationale for the mental steps doctrine was to insure that a patentee could not obtain a monopoly on thought processes.[49] It was based on the

---

(C.C.P.A. 1974).

41. 35 U.S.C. § 101 (1999).

42. *Id.* § 102.

43. *Id.* § 103.

44. *See id.* § 112.

45. *See generally* John A. Gibby, *Software Patent Developments: A Programmer's Perspective*, 23 RUTGERS COMPUTER & TECH. L.J. 293 (1997).

46. *Compare* Gerald Goldberg, Examination Procedures for Computer-Related Inventions, (Feb. 27, 1996) (unpublished chart, available in app. 2, *infra*), *with* Gerald Goldberg, Revised Examination Procedures for Computer-Related Inventions, (2000) (unpublished chart, available in app. 2, *infra*).

47. *See generally* Chandler, *supra* note 3, at 234-39.

48. *See id.* at 236-39.

49. *See id*. at 238.

idea that only processes that manipulate physical things were patentable.[50] There is and ought to be a continuing concern about the possibility that a process performable on a computer with a computer program might overreach and empower a computer program owner to restrict human thought. It is important to understand the mental steps doctrine because it existed before the issue of the patentability of computer programs matured and it reflects the general societal concern that human thought should remain free and unfettered. The value of free thought and protection of creations of the mind are mutually dependent values in every human society. Individual freedom of thought and protection of the creations of the mind of the individual for the benefit of the individual are paramount values and should always be preserved for the good of all in human society.

The question of whether the mental steps doctrine constitutes a barrier to patentability of certain inventions was presented in *In re Abrams*.[51] The appellant in *Abrams* sought a reversal of the PTO Board of Appeals's decision rejecting a method (or process) claim for prospecting for petroleum products.[52] The *Abrams* court proposed three rules for analyzing claims that included mental steps.[53]

---

50. *See id*. at 234-39.

51. 89 U.S.P.Q. 266 (C.C.P.A. 1951).

52. *See id.* at 267.

> Claim 4 read: A method of prospecting for petroliferous deposits comprising, sinking a number of boreholes in an area under investigation, sealing off each of said boreholes from the atmosphere at any desirable depth below the level of atmospheric breathing in such manner that a known area of the inner surface thereof is made available for diffusion of subsurface gases into said borehole, reducing the pressure in said borehole to a value substantially below atmospheric, measuring the rate of pressure rise per unit area of surface available for diffusion of subsurface gases into said borehole for a number of timed intervals, determining the rate of pressure rise in said borehole at a standard reference pressure from the values obtained in step (4), and comparing the rates determined in step 5 for the different boreholes to detect anomalies which are indicative of the presence of petroliferous deposits.

Id.

53. *See id.* at 267-68. (1) If all the steps of a method claim are purely mental in character, the subject matter thereof is not patentable within the meaning of the patent statutes; (2) if a method claim embodies both positive and physical steps as well as so-called mental steps, yet the alleged novelty or advance over the art resides in one or more of the so-called mental steps, then the claim is considered unpatentable for the same reason that it would be if all the steps were purely mental in character; and (3) if a method claim embodies both positive and physical steps as well as so-called mental steps, yet the

The court affirmed the Board of Appeals's rejection of Abrams's patent application because the claims were within the second proposed rule:

> Rule 2: If a method claim embodies both positive and physical steps as well as so-called mental steps, yet the alleged novelty or advance over the art resides in one or more of the so-called mental steps, then the claim is considered unpatentable for the same reason that it would be if all the steps were purely mental in character.[54]

In addition, the court quoted the statement of the examiner following appeal to the Board that steps such as "correcting," "determining," "registering," "counting," "observing," "measuring," "comparing," "recording," and "computing" were mental steps.[55]

Later courts would distinguish Abrams's method, which could only be performed using mental steps, from methods that could be performed with or without using mental steps. In *In re Prater*,[56] Prater claimed a method and apparatus for determining concentrations of components in a substance by analyzing its spectrograph.[57] The examiner argued that if the

---

novelty or advance over the art resides in one or more of the positive and physical steps and the so-called mental step or steps are incidental parts of the process which are essential to define, qualify, or limit its scope, then the claim is patentable and not subject to the objections contained in (1) and (2) above. *Id.*

54. *Id.* at 271.

55. *Id.* at 268.

56. 415 F.2d 1378 (C.C.P.A. 1968).

57. *Id.* at 1380. Claim 17 of the application read:

> The *method of determining* with minimum error from the spectra of spectral analysis the *concentration of the components of a mixture* where the components are known and the concentration-determining peaks of the spectral analysis are present in number exceeding the number of said components, which comprises *generating physical representations* of the magnitudes of the coefficients of simultaneous linear equations defining the concentrations of said components as functions of the heights of said peaks of said spectral analysis, *generating* from said physical representations of the magnitudes of said coefficients the *magnitude of the determinant* of a plurality of sets of said simultaneous equations, the number of equations of each of said sets being equal in number to the number of said components, *comparing* said physical representations *of the magnitudes of said determinants* of said sets of equations *for identification of the set* of said equations *whose determinant has the largest magnitude,* and *generating physical representations of the concentration of each said component of said mixture from said physical representations* of the magnitudes of said coefficients of *said set* of simultaneous *equations having said determinant of largest magnitude* and from said heights of said peaks included in said last names [sic] set of equations.

Id.

novel part of the process was a mental step and therefore non-patentable subject matter under the patent statute,[58] then the whole process was unpatentable.[59] Alternatively, the examiner reasoned that if the claim was a process that could be practiced by a person marking paper during calculation by hand, the claim was unpatentable under section 102.[60] The Board of Appeals affirmed the rejection based on sections 101 and 102, stating that the process recited a mental exercise and was therefore not a statutory process.[61]

The court analyzed the Board's rejection under sections 101 and 102 by comparing the claimed invention to the claims at issue in *Abrams*. The court reasoned that the critical distinction between the inventions in *Abrams* and *Prater* is that the *Abrams* process "could only be performed in the mind."[62] The *Prater* invention, however, performed a process without requiring any steps to be performed in the human mind. The *Prater* court held that such an invention is patentable.[63] The court also made clear that it had not adopted the rules proposed by the appellant in *Abrams*.[64]

The court also analyzed the relevant Supreme Court decisions regarding the patentability of process claims. The court stated that the holding of *Cochrane v. Deener*[65] had been misconstrued to limit processes to operations that manipulate physical things.[66] Rather, the holding was not meant "to *limit* process patentability *but to point out that a process is not limited to the means used in performing it*."[67]

The court said that *Tilghman v. Proctor*[68] clarified *Cochrane* by stating that a process is "an act, or mode of acting" and "a conception of the mind, seen only by its effects when being executed or performed."[69] The court stated that *The*

58. 35 U.S.C. § 101 (1999).
59. *In re Prater*, 415 F.2d 1378, 1381 (C.C.P.A. 1968).
60. *Id.* at 1381.
61. *Id.* at 1382.
62. *Id.* at 1389.
63. *Id.*
64. *Id.* at 1386.
65. 94 U.S. 780 (1876). A process "is an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing." *Id.* at 788.
66. *See Prater*, 415 F.2d at 1381, 1387.
67. *Id.* at 1388.
68. 102 U.S. 707 (1880).
69. *Id.* at 728.

Telephone Cases[70] failed to find any "rule" in *Cochrane* that required a process to manipulate a physical substance.[71] There is no such limit on apparati. The court also pointed to the doctrine that a process that performs a function that occurs naturally was patentable if the means claimed did not occur in nature.[72]

The court then applied its analysis of *Abrams* and the Supreme Court's rulings to the process in *Prater*; it held the process, which read on the human brain, patentable because it was a useful art, capable of performance without human intervention; furthermore, its patentability was not precluded because it could be performed by mental steps alone.[73] The court said the process could be called a natural process but it was patentable because the applicant disclosed other means (other than mental steps as performed by the human brain) by which to conduct the process.[74] The method in *Prater* could be performed on a computer. The PTO successfully petitioned for rehearing because it believed that the decision opened the door for the patentability of computer programs.[75] On rehearing of *Prater*, the court reversed itself.[76] The court gave the *Prater* process claim its broadest reading, stating that because the process could be done by hand as well as by machine, Prater failed to particularly point out and *distinctly claim the subject matter that the applicant regards as his invention* as required by section 112.[77] Prater regarded the invention to be the process performed by the machine, yet the claim could be interpreted as a process that could be performed on the human brain or by hand with pencil and paper.[78] This fails to claim particularly what Prater regarded as the invention; namely, the performance of the process only upon the computer. The decision of the *Prater* court on rehearing is profoundly

70. 126 U.S. 1 (1887).

71. 415 F.2d at 1388.

72. For example, chicken eggs are naturally incubated by hens. A process for artificially incubating chicken eggs is patentable even though it mimics a natural process. *See* Smith v. Snow, 294 U.S. 1 (1935); Waxham v. Smith, 294 U.S. 20 (1935).

73. 415 F.2d at 1389.

74. *See id.*

75. *See id.* at 1390. At the time of the *Prater* decision, the PTO strongly opposed the patenting of computer programs.

76. *Id.* at 1393.

77. *Id.* at 1404.

78. *See id.* at 1393.

important because it elevates the protection of society's freedom of thought to the same plane of protection as an individual's invention for his exclusive benefit. The section 112 rejection was also appropriate because the inventor had not invented the brain nor the program's ability to read on the human brain.[79]

The mental steps doctrine arose again in *In re Musgrave*.[80] Musgrave had invented a method of using seismograms to precisely measure the subsurface formations in the earth's crust.[81] The Board of Appeals sustained the examiner's section 101 rejection.[82] The Board applied the *Abrams* rules and found that the claimed process contained conventional steps used in seismic exploration with the addition of mental calculation of corrective data.[83]

The court reversed,[84] holding that it had not adopted the *Abrams* rules,[85] and that rules two and three of *Abrams* were illogical because a novelty analysis was irrelevant under section 101.[86] Novelty is a requirement of sections 102 and 103,

---

79. *See supra* note 13 and accompanying text.

80. 431 F.2d 882 (C.C.P.A. 1970).

81. *See id.* at 882. Claim 2 read:

> In seismic exploration, the method of establishing weathering corrections in the form of individual static time-corrections for the signals from each of a plurality of seismic detecting stations spaced one from the other along a traverse which comprises (1) generating at generating stations seismic signals adjacent selected ones of said detecting stations whereby the magnitudes of said static corrections at said selected stations are known, (2) applying said known static corrections respectively to signals generated at said selected stations, (3) applying relative to said known corrections interpolated static corrections to the remaining signals generated at the remaining of said detecting stations, and thereafter (4) generating at generating stations further seismic signals at spaced locations along said line, (5) detecting at the location of a first group of said stations and thereafter at other locations of other groups of said stations seismic signals, said locations being selected in reference to the locations of said second-named generating stations for the production of an expanding-spread seismic-section having applied to the signals from each of said detecting stations said static corrections, and (6) applying dynamic normal moveout corrections to the signals of each group of said detectors to correct them for geometrical spreading.

Id. at 886-87.

82. *See id.*

83. *See id.* at 887-89.

84. *See id.* at 893.

85. *See id.* at 888-89. The Board of Appeals decision came before the holding in *In re Prater*, 415 F.2d 1393 (C.C.P.A. 1969).

86. *See id.* at 889.

not section 101.[87] The question is whether a claim is a process as defined by section 100(b).[88] The court did not use the mental steps doctrine to invalidate the *Musgrave* claims; it ruled that the *Musgrave* process was patentable because it manipulated seismic signals and was therefore a useful technological art.[89] The fact that some or all of the process could be carried out in the human mind, or required the person performing the process to think, a function of the brain, did not preclude patentability.[90] The court thus avoided a rigorous application of the mental steps doctrine.

The concurring decision in *Musgrave* sharply criticized the majority's avoidance and criticism of the mental steps doctrine. The concurrence believed the *Musgrave* holding was too broad because the term "technological arts" was not defined.[91] Additionally, criticism of the mental steps doctrine was unnecessary because its application had already been appropriately circumscribed by the court.[92] Both the majority and concurring opinion recognized that it is possible to contribute to the progress of the useful arts through the application of mental calculations.[93]

However, a process that claims only mental processes or calculations is not patentable subject matter under section 101 because it fails to promote the progress of the useful arts and purports to preempt the use of the human brain.[94] These ideas underlie the analysis of process claims that seek patents on computer programs.

D. ALGORITHMS/COMPUTER PROGRAMS

The issue of the patentability of computer programs has also faced objection on the ground that computer programs may

87. 35 U.S.C. §§ 102-03 (1999).

88. *See id.* at 890.

89. *See id.* at 893.

90. *See id.* at 892.

91. *Id.* at 893-94 (Baldwin, J., concurring).

92. *See id*. at 895.

93. For history and analysis of the mental steps doctrine, see generally Katharine P. Ambrose, Comment, *The Mental Steps Doctrine*, 48 TENN. L. REV. 903 (1981), and Norman D. McClaskey, *The Mental Process Doctrine: Its Origin, Legal Basis, and Scope*, 55 IOWA L. REV. 1148 (1970).

94. *See Musgrave*, 431 F.2d at 889-90.

include mathematical algorithms.[95] However, not all computer programs contain algorithms. Moreover, an algorithm is a descriptive term that is applicable to numerous types of logical relationships, some of which may exist in nature such as the binary-coded decimal program in *Gottschalk v. Benson*.[96] But there are others, which could never exist in nature, such as the computer programs that control space flight vehicles. A mathematical algorithm is a procedure for solving a mathematical problem.[97] The patentability of mathematical algorithms expressed as computer programs has been rejected by the Supreme Court.[98] If the core component of a computer program is little more than an expression of a mathematical algorithm, it is not patentable subject matter because such an algorithm is an expression of a fundamental scientific principle, similar to a law of nature, and is not an invention.[99]

In 1939, the Supreme Court ruled that a mathematical algorithm was not patentable subject matter.[100] The Court stated that "[w]hile a scientific truth, or the mathematical expression of it, is not a patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be."[101]

---

95. *See generally* Robert O. Nimtz, *Development of The Law of Computer Software Protection*, 61 J. PAT OFF. SOC'Y 3 (1979) (citing 307 articles on the subject of the legal protection of computer software).

96. 409 U.S. 63, 65 (1972); *see also infra* notes 113-116, 138-152 and accompanying text.

97. *See* Diamond v. Diehr, 450 U.S. 175, 186 (1981); Parker v. Flook, 437 U.S. 584, 585 n.1 (1978); Gottschalk v. Benson, 409 U.S. 63, 65 (1972); *see also* Donald S. Chisum, *The Patentability of Algorithms*, 47 U. PITT. L. REV. 959, 976 (1986) (stating that algorithms are often, but not always, devised to solve mathematical problems).

98. *See* Gottschalk v. Benson, 409 U.S. 63 (1972).

99. *See Diehr*, 450 U.S. at 186; *Parker*, 437 U.S. at 593.

100. *See* Mackay Radio and Tel. Co. v. Radio Corp. of Am., 306 U.S. 86, 94 (1939).

101. *Id.*; *see also Diehr*, 450 U.S. at 188; *Parker*, 437 U.S. 584, 591; *Benson*, 409 U.S. at 67; Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1947); Howes v. Great Lakes Press Corp., 679 F.2d 1023, 1029 (2nd Cir. 1982); National Lead Co. v. Western Lead Prod. Co., 324 F.2d 539, 541 (9th Cir. 1963) (citing Davison Chem. Corp. v. Joliet Chems., Inc., 179 F.2d 793, 794-95 (7th Cir. 1950)); *In re* Abele, 684 F.2d 902, 907 (C.C.P.A. 1982); *In re* Walter, 618 F.2d 758, 763 (C.C.P.A. 1980); *In re* Bergy, 596 F.2d 952, 993 (C.C.P.A. 1979) (Baldwin, concurring); *In re* Johnson, 589 F. 2d. 1070, 1076 n.5 (C.C.P.A. 1978); *In re* de Castelet, 562 F.2d 1236, 1241 (C.C.P.A. 1977); Laitram Corp. v. Deepsouth Packing Co., Inc., 301 F. Supp. 1037, 1054 (E.D. La. 1969); Phillips Petroleum Co. v. Sid Richardson Carbon & Gas Co., 293 F. Supp. 555, 569 (N.D. Tex. 1968).

Forty years later, when the Supreme Court decided *Gottschalk v. Benson*, it again had before it a method claim which expressed a means of converting binary numerals into decimal numerals and decimal numerals into binary numerals.[102] This process, if carried out by hand and paper, is not novel and thus could be rejected under section 102 for lack of novelty. But as a mathematical algorithm, an iterative routine to be performed on an electronic digital computer, it raised the question of whether the computer program performing the conversion is *patentable subject matter*. Since the program performed no other function than to express a mathematic principle in computer program language, the Court had before it the pure question of the patentability of a mathematical algorithm, however expressed, regardless of the means of carrying out the claimed method. The Court's response was the same as its response in 1939 in *MacKay Radio & Telegraph Co.*[103] The mathematical expression of a scientific truth, even in a computer program, is not a patentable invention.[104] The Court thus treated this mathematical algorithm in accordance with existing judicial precedent. The Court clearly left open the possibility that a *process* could be invented with the aid of the knowledge of a mathematical principle or other scientific truth or idea in the form of an algorithm, and which employs the means of an electronic digital computer, expressed in the form of a computer program, to carry out the claimed method as patentable subject matter under section 101 of the Patent Act.

The Supreme Court defined the term "mathematical algorithm" as a process that merely expresses a mathematical principle in the language of a computer program.[105] The terminology "mathematical algorithm" was interpreted by some commentators as covering all "computer programs" in general.[106] But, the C.A.F.C., and its predecessor, correctly interpreted *Benson* in *In re Chatfield*.[107] The C.A.F.C., agreeing with *Benson*, stated: "However, 'these programs' refer to the specific type of claimed program involved in *Benson* and not to

102. 409 U.S. 63, 64 (1972).

103. 306 U.S. 86 (1939).

104. *See Benson*, 409 U.S. at 71-72.

105. *See id.* at 65.

106. This was the conventional wisdom throughout the 1970s-90s. *See, e.g.*, Donald S. Chisum, PATENTS, §§ 1.01, 1.03 (1991).

107. 545 F.2d 152 (C.C.P.A. 1976)

computer programs in general."[108] In *In re de Castelet*, the court wrote, "[t]hat 'computer programs' are not patentable is *not* the 'thrust' of *Benson*."[109] In *In re Freeman*, the court noted, "[t]hat computer programs are not patentable was neither the holding nor the 'thrust' of *Benson*."[110] The Supreme Court revisited *Benson* in *Diamond v. Diehr*, reaffirming its prior holding: "In *Gottschalk v. Benson* we noted: 'It is said that the decision precludes a patent for any program servicing a computer. We do not so hold.'"[111] Therefore, the existence of an algorithm in a computer program does not *per se* render that computer program non-patentable subject matter.

E. MATHEMATICAL ALGORITHMS: THE DEBATE GOES ON

The Supreme Court, in *Benson*, directly addressed the issue of the patentability of mathematical algorithms.[112] Benson and Tabott sought a patent on a process for converting binary-coded decimal numerals into pure binary numerals.[113]

---

108. *Id.* at 156 n.4.

109. 562 F.2d at 1240.

110. 573 F.2d 1237 (C.C.P.A. 1978).

111. 450 U.S. 175, 187 (1981) (quoting *Benson*, 409 U.S. at 71).

112. 409 U.S. 63 (1972).

113. A digital computer operates on data expressed in digits. *See id.* at 65. There are two forms used to express these digits: binary-coded decimal and pure binary. *See id.* A decimal number such as eleven is expressed as two digits 11. In binary-coded decimal, each digit is converted into a sequence of four binary digits consisting of 0s or 1s, so that a two-digit decimal number would be expressed as two sets of four binary digits. *See id.* at 66. In pure binary, the decimal number is converted into one sequence of binary digits. *See id.* at 66-67.

Claim 8 read:

> The method of converting signals from binary coded decimal form into binary which comprises the steps of (1) storing the binary coded decimal signals in a reentrant shift register, (2) shifting the signals to the right by at least three places, until there is a binary "1" in the second position of said register, (3) masking out said binary "1" in said second position of said register, (4) adding a binary "1" to the first position of said register, (5) shifting the signals to the left by two positions, (6) adding a "1" to said first position, and (7) shifting the signals to the right by at least three positions in preparation for a succeeding binary "1" in the second position of said register.

See id. at 73-74.

The importance of this process cannot be overstated. It is the way computer programs operate to convert data into a form that can be understood and manipulated by computers. Fourteen amicus curiae briefs were filed with the court.

The Court defined an algorithm as a procedure for solving a given type of mathematical formula.[114] Because the claim at issue was a generalized formula without any specific application, issuing a patent on such a broad claim would pre-empt use of the algorithm.[115] Although it has been argued that there was no apparent rationale for the Court's holding,[116] a proper basis for the Court's decision is found in the fact that the applicants sought a patent on a computer program that expressed a mathematical principle. Patents on mathematical principles alone, however expressed, are not patentable subject matter.[117] Others have argued that the Court's reasoning is muddled.[118] Chisum argues that the decision merely restates the relevant case law and then holds that algorithms are not patentable because they are ideas.[119] This argument is contradicted by others[120] and may have missed the deeper meaning embodied in the Court's analysis.

Chisum further argues that there was no reason for the Court's belief that an algorithm is an idea.[121] The Court did recognize that its decision might generate confusion:

> 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-

---

114. *See id.* at 65.

115. *See id.* at 72.

116. *See, e.g.*, John M. Griem, Jr., *Against a Sui Generis System of Intellectual Property for Computer Software*, 22 HOFSTRA L. REV. 145 (1993). *But see* Charles Bruzga, *The Benson Court's Approach to Computer Software—or Other—Patent Claims Reciting a Mathematical Algorithm*, 74 J. PAT. OFF. SOC'Y 135 (1992). Bruzga argues that *Benson* was well reasoned and based on the section 112 overbreadth test, i.e., the claims covered any and every use of the conversion of binary decimal to pure decimal. *See id.*

117. *See Benson*, 409 U.S. at 67 (citing Mackay Co. v. Radio Corp., 306 U.S. 86, 94 (1939)).

118. For a detailed attack on the *Benson* decision, see Donald S. Chisum, *The Patentability of Algorithms*, 47 U. PITT. L. REV. 959 (1986). Chisum argues that mathematical algorithms and computer programs should be patentable. *See id.* at 971-92. For the opposing view that computer programs should remain outside the scope of patentable subject matter, see Pamela Samuelson, *Benson Revisited: The Case Against Patent Protection for Algorithms and Other Computer Program-Related Inventions*, 39 EMORY L.J. 1025 (1990).

119. *See* Chisum, *supra* note 118, at 980.

120. *See* Samuelson, *supra* note 118.

121. *See* Chisum, *supra* note 118, at 980-84.

> empt the mathematical formula and in practical effect would be a patent on the algorithm itself.[122]

However, this supposedly direct statement of the holding did little to explain why certain algorithms are unpatentable.

The decision in *Benson* was correct and must be viewed in the context of prior case law concerning the patentability of computer programs. One of the earliest cases that raised the question of the patentability of computer programs was *In re Bernhart*.[123] In *Bernhart*, the applicant sought a patent entitled "Planar Illustration Method and Apparatus."[124] The application disclosed a method for making a two-dimensional portrayal of a three-dimensional object from any angle to any projection (a plotting machine).[125]

The basis of the application involved equations which were related to the geometric relationship between the three-dimensional coordinates.[126] The coordinates were to be inputted into a digital computer.[127] The equations and the computer function together to produce a view of an object on a piece of paper.[128]

The applicants did not claim to have invented either the equations or the computer; however, they argued that their invention was more than just a set of equations or algorithms.[129] The application had been rejected on the grounds that the applicants would preempt the use of the equations that were disclosed in the patent application and that the programmed instructions were part of the method and apparatus.[130]

The Patent Examiner had originally rejected the claim on the basis that the novelty of the application lay in the equations that were programmed in the computer, and that, consequently, the applicants were attempting to patent mental steps.[131] The court disagreed with the examiner's finding, holding that the "the invention as defined by the claims

---

122. *Benson*, 409 U.S. at 71-72.
123. 417 F.2d 1395 (1969).
124. *Id.* at 1396.
125. *See id.* at 1396-98.
126. *See id.* at 1396.
127. *See id.*
128. *See id.* at 1396.
129. *See id.*
130. *See id.* at 1398-99.
131. *See id.* at 1400.

requires that the information be processed not by the mind but by a machine," and that the invention was a statutory process.[132] The court went on to hold that "if a machine is programmed in a certain new and unobvious way, it is physically different from the machine without that program."[133] In addition, the court held that the use of an equation in a patentable process did not constitute a monopoly.[134] This was an important legal development, setting an important precedent for patents on programs that contained mathematical equations and algorithms. Knowledge of mathematical principles was used to invent a new type of computer and the algorithm was inoffensive as it did not merely express a mathematical principle. This development would later be narrowed by holdings of the United States Supreme Court.[135] However, the Court established the principle that patents are not necessarily considered non-statutory if they contain mathematical components.

In contrast to *Bernhart*, *Benson* was one of the first U.S. Supreme Court cases to directly test the limits of section 101.[136] In *Benson*, the applicants sought to gain a patent on a process to convert binary-coded decimal numerals into pure binary numerals.[137] This conversion process is an essential step in enabling a programmer to communicate with the computer. The machine's language is binary; a human's language is decimal. Unlike the plotting machine in *Bernhart*, this conversion process was unrelated to any machine or apparatus.[138] The Court determined that the conversion process was a mathematical algorithm and that patenting such a process would be like patenting Newton's theory of relativity.[139] As a result, the Supreme Court held that the conversion process could not be patented.[140] The Court held that the method was so abstract as to cover both known and unknown uses of binary-coded decimal to pure binary

132. *See id.* at 1399.
133. *See id.* at 1400.
134. *See id.*
135. *See* Diamond v. Diehr, 450 U.S. 175 (1981); *see also* discussion *infra* notes 239248.
136. Gottschalk v. Benson, 409 U.S. 63 (1972).
137. *Id.* at 64.
138. *See id.* at 64.
139. *See id.* at 71.
140. *See id.* at 71-73.

conversion; the end use may vary, such as from the operation of a train to verification of drivers' licenses to researching law books for precedents; the end use may be performed through any existing machinery or without any apparatus;[141] the mathematical formula involved has no substantial practical application except in connection with a digital computer;[142] and the result of granting the patent would be to patent a mathematical formula, wholly preempting the formula involved, and in practical effect, patenting the algorithm itself.[143]

The Court reasoned that "[a] principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, since no one can claim in either of them an exclusive right."[144] *Benson* holds that the mathematical conversion process is a phenomena of nature, not an invention as claimed in the patent application, and is therefore not a process within the meaning of the Patent Act, and hence, is unpatentable.[145] The determining aspect of the case was that the claims were not limited to any particular art or technology, apparatus or machinery, or end use.[146] The applicant's patent purported to cover any use of the claimed method in a general purpose digital computer of any type.[147] A successful patent application would have resulted in the inability of anyone obtaining a patent on a computer program to utilize the function of translation of their program from decimal to binary without licensing the use of the algorithm from the applicant.

The legal principle that emerges from *Benson* is that a scientific truth or mathematical expression of it, without more, is not patentable subject matter.[148] It does not matter whether the mathematical expression takes the form of a mathematical formula or computer program or other type of expression; standing alone, such an expression is not statutory subject matter.[149] Furthermore, a scientific truth is non-statutory, whether expressed as a principle in the abstract, an original

141. *See id.* at 68.
142. *See id.* at 71-72.
143. *See id.* at 72.
144. *Id.* at 67 (quoting Le Roy v. Tatham, 14 How. 156, 175 (1852)).
145. *Id.*
146. *See id.*
147. *See id.*
148. *Id.*
149. *See id.*

cause, a motive, a phenomena of nature, or a mental process.[150] However, *Benson* also teaches that a computer program that applies a law of nature to achieve a new and useful result can be patentable subject matter under the Patent Act.[151]

In *In re Freeman*, the C.C.P.A. addressed the issue of the patentability of a method claim that included an algorithm as an element of the computer program.[152] In *Freeman*, the claim involved a method for controlling a computer display screen.[153] The PTO Board of Appeals rejected the method claims, holding that the only novelty of the method was in a computer program limited to use on a computer, and such a claim, under *Benson*, is unpatentable because it constitutes a mathematical algorithm.[154] The court strongly criticized the Board for two reasons: first, it improperly used a novelty test;[155] and second, the Board made a blanket statement that Freeman's claim preempted a mathematical algorithm without analyzing the claim language.[156]

The *Freeman* claims recited a system and method for typesetting alphanumeric information using a computer-based control system with a phototypesetter; the claims did not recite or expressly purport to preempt an algorithm.[157] The court created a two-part test for analyzing whether a claim preempted an algorithm:

> First, it must be determined whether the claim directly or indirectly recites an "algorithm" in the *Benson* sense of that term, for a claim which fails even to recite an algorithm clearly cannot wholly preempt an algorithm. Second, the claim must be further analyzed to ascertain whether in its entirety it wholly preempts that algorithm.[158]

The court emphasized that the Supreme Court's narrow definition of an unpatentable algorithm is limited primarily to

---

150. *See id.*

151. 35 U.S.C. § 101 (1999).

152. 573 F.2d 1237 (C.C.P.A. 1978).

153. *Id.* at 1238.

154. *See id.* at 1242.

155. *See id.* at 1243. The Board had held that the only point of novelty of the claim was a mathematical algorithm, and since that point of novelty was non-statutory subject matter, the claim was invalid. *See id.* The court held that this was the wrong analysis. *See id.* The claim must be analyzed as a whole, not just at its point of novelty, to determine whether it is within statutory subject matter. *See id.*

156. *See id.* at 1245.

157. *Id.*

158. *Id.* at 1246.

mathematical algorithms.[159] If a broad definition of an algorithm (the step-by-step procedure for solving a problem or accomplishing some end) were adopted, then, under *Benson*, all processes would be unpatentable.[160] The court found that Freeman's claim did not recite a mathematical algorithm because the claims did not recite any mathematical calculations, formulae, or equations.[161]

To avoid the use of the term "algorithm" alone, without the modifying adjective "mathematical," the Supreme Court in *Benson* carefully supplied a definition for "mathematical algorithm": "A procedure for solving a given type of mathematical problem."[162] This definition was later affirmed by the court in *Flook*: "We use the word 'algorithm' in this case as we did in *Gottschalk v. Benson*";[163] and in *Diamond v. Diehr*: "Our previous decisions regarding the patentability of 'algorithms' are necessarily limited to the more narrow definition employed by the Court, and we do not pass judgment on whether processes [or algorithms] falling outside the definition previously used by this Court . . . would be patentable subject matter."[164] In *Walter*, the C.C.P.A. employed the same definition as above:

> [W]e use the word *algorithm* . . . to refer to methods of calculation, mathematical formulas, and mathematical procedures generally. We strongly disagree with the position taken by the PTO . . . that the word *algorithm* as applied by the Supreme Court in § 101 cases is not limited to mathematical algorithms, but extends to the general meaning of the word which connotes a step-by-step procedure to arrive at a given result. Such a proposition, if accepted, would have the effect of totally reading the word "process" out of § 101, since any process is a step-by-step procedure to arrive at a given result.[165]

Thus, the C.C.P.A. correctly distinguishes mathematical algorithms which are non-patentable from other algorithms which may be patentable, if articulated in a computer program.

Walter claimed as his invention a seismic prospecting system and method for cross-correlating returning chirp signals with an original chirp signal; thus, the claims recite cross-

159. *See id.*
160. *See id.*
161. *See id.*
162. Gottschalk v. Benson, 409 U.S. 63, 65 (1972).
163. Parker v. Flook, 437 U.S. 584, 585 n.1 (1978).
164. Diamond v. Diehr, 450 U.S. 175, 186 n.9 (1991).
165. *In re* Walter, 618 F.2d 758, 765 n.4 (C.C.P.A. 1980) (citation omitted).

correlation algorithms.[166]

Walter expanded the *Freeman* two-part test to give guidance to the PTO, the bar, industry, and the general public.[167] The analytical steps were as follows: (1) Does the claim directly or indirectly recite an algorithm? and (2) is the algorithm implemented in a specific manner that enables one to define a structural relationship between the physical elements of the claim or to otherwise define or limit the claim steps?[168]

In *In re Abele* this two-step test was visited and refined by the C.C.P.A., and its second step was sharpened.[169] The C.C.P.A. stated that:

> [The] *Walter* analysis . . . does not limit patentable subject matter only to claims in which structural relationships or process steps are defined, limited or refined by the application of the algorithm. . . . Rather, *Walter* should be read as requiring no more than that the algorithm be "applied in any manner to physical elements or process steps," provided that its application is circumscribed by *more than a field of use limitation or non-essential post-solution activity*. Thus, if the claim would be "otherwise statutory," albeit inoperative or less useful without the algorithm, the claim likewise presents statutory subject matter when the algorithm is included.[170]

In effect, the refined test amounts to the following steps: (1) it must be determined whether the claim directly or indirectly recites a "mathematical algorithm" or "formula";[171] and (2) if the claim without the mathematical algorithm or formula is statutory subject matter (i.e., an apparatus or process), then the whole claim still may present statutory subject matter.[172]

The C.C.P.A. in *Abele* purportedly applied the test of the two conflicting cases decided by the Supreme Court, *Parker v. Flook*[173] and *Diamond v. Diehr*.[174] According to the court,

---

166. *See id.* at 760-61.

167. *Id.* at 767.

168. *See Walter*, 618 F.2d. at 767. The invention involved a topographic scanner or CAT scan imaging technique, using a weighting function in calculations to produce an image with artifacts eliminated. *See id.* at 760-61. The court determined that the method claim for displaying data was non-statutory because it was directed solely to the algorithm. *See id.* at 770. The court stated, however, that the method and apparatus claims directed to the high frequency attenuation data could be statutory, if limited to a unitary device. *See id.* at 768-69.

169. 684 F.2d 902 (C.C.P.A. 1982).

170. *Id.* at 907 (emphasis added).

171. *See In re* Freeman, 573 F.2d 1237, 1245 (C.C.P.A. 1978).

172. *See Abele*, 684 F.2d at 907.

173. 473 U.S. 584 (1978). The case involved:

> A method for updating the value of at least one alarm limit on at

> In *Flook, supra*, "[t]he patent application did not 'explain how to select . . . any of the variables' used in the algorithm and, thus, no process other than the algorithm was present." (citation omitted). *A fortiori*, no process steps to which the algorithm could be applied were present.[175]

Regarding *Diehr*,[176] the C.C.P.A. stated that "were the claim to be read without the algorithm, the process would still be a process for curing rubber, although it might not work as well since the in-mold time would not be as accurately controlled."[177]

The *Freeman-Walter-Abele* test is the direct result of the court's refusal to deny patents in three cases even though the

---

> least one process variable involved in a process comprising the catalytic chemical conversion of hydrocarbons wherein said alarm limit has a current value of B_0 + K, wherein B_0 is the current alarm base and K is a predetermined alarm offset which comprises: (1) determining the present value of said process variable, said present value being defined as PVL; (2) determining a new alarm base B_1 using the following equation: $B_1=B_0(1.0-F)+PVL(F)$, where F is a predetermined number greater than zero and less than 1.0; (3) adjusting said alarm limit to said updated alarm limit value.

Id. at 596-97.

174. 450 U.S. 175 (1981).

175. *Abele*, 684 F.2d at 908.

176. The claim was:

> A method of manufacturing precision molded articles from selected synthetic rubber compounds in an openable rubber molding press having at least one heated precision mold, comprising: (a) heating said mold to temperature range approximating pre-determined rubber curing temperature, (b) installing prepared unmolded synthetic rubber of a known compound in a molding cavity of a predetermined geometry as defined by said mold, (c) closing said press to mold said rubber to occupy said cavity in conformance with the contour of said mold and to cure said rubber by transfer of heat thereto from said mold, (d) initiating an interval timer upon the closure of said press for monitoring the elapsed time of said closure, (e) heating said mold. . ., (f) constantly determining the temperature of said mold. . ., (g) repetitively calculating at frequent periodic intervals throughout closure of said press the Arrhenius equation for reaction time of said rubber to determine total cure time v as follows: Ln v=cz+x wherein c is an activation energy constant determined for said rubber being molded and cured in said press, z is the temperature of said mold at the time of each calculation of said Arrhenius equation, and x is a constant which is a function of said predetermined geometry of said mold, (h) for each repetition of calculation of said Arrhenius equation herein, comparing the resultant calculated total required cure time with the monitored elapsed time measured by said interval timer, (i) opening said press when a said comparison of calculated total required cure time and monitored elapsed time indicates equivalence, and (j) removing from said mold the resultant precision molded and cured rubber article.

Diehr, 450 U.S. at 1780 n.5.

177. *Abele*, 684 F.2d at 907.

inventions applied a mathematical algorithm to an otherwise statutory apparatus or process.[178] The test further articulated an important aspect of the holdings in the *Benson/Flook* algorithm rejections.[179] In both *Benson* and *Flook*, the court rejected programs having mathematical algorithms, but both cases left open the possibility that an invention that applied the knowledge of a mathematical algorithm in a new and useful way might be statutory subject matter.[180] The *Freeman-Walter-Abele* test may be used to determine whether an invention only expresses a mathematical algorithm, or whether the algorithm primarily informs the invention. [181] Thus, the *Freeman-Walter-Abele* test was an important advance in the maturation of patent law.

An algorithm may be defined as a "step-by-step procedure for solving a problem or accomplishing some end."[182] Accepting this definition, it could be argued that every process contains an algorithm.[183] Since the Patent Act states that process patents are statutory subject matter, it follows that a complete bar against inventions that contain algorithms would violate the Patent Act.[184] However, the bar against inventions that contain only mathematical algorithms was appropriate as these inventions were mere expressions of mathematical principles. To grant a patent on such computer programs would be tantamount to granting a monopoly on the tools of the trade for programming an electronic digital computer. Such a decision would not promote the advancement of science, for such supposed invention was in fact a discovery of a law of nature, which is the same mathematical law that makes the computer work and must be utilized by all computer programs. To grant a monopoly on these principles would strangle innovation in the computer sciences.

In *In re Grams*, the applicant sought a patent on a method

178. *See id.*; *In re* Walter, 618 F.2d 758 (C.C.P.A. 1980); *In re* Freeman, 573 F.2d 1237 (C.C.P.A 1978).

179. *See* sources cited *supra* note 178.

180. Parker v. Flook, 437 U.S. 584 (1978); Gottschalk v. Benson, 409 U.S. 63 (1972).

181. *See Abele*, 684 F.2d 902; *Walter*, 618 F.2d 758; *Freeman*, 573 F.2d 1237.

182. *In re* Chatfield, 545 F.2d 152, 156 (C.C.P.A. 1976) (quoting WEBSTER'S NEW COLLEGIATE DICTIONARY (1976)).

183. 958 F.2d 1053, 1063 (Fed. Cir. 1992) (Rader, R. concurring.)

184. 35 U.S.C. § 101 (1999).

of diagnosing an abnormal condition in an individual.[185] This diagnosis was done by gathering data about an individual through laboratory tests, analyzing the data to determine whether there was any indication of the abnormality, and then comparing that data with predetermined data for what the normal conditions should be in an individual.[186] The application required that a computer be used to filter the data and focus on the areas responsible for the abnormal condition.[187]

The court applied the *Freeman-Walter-Abele* test and found that the claims contained an algorithm.[188] The court went on to determine that the only physical aspect of the process was obtaining data to input into the algorithm, and that the gathering was not sufficient for the process to be found statutory.[189]

The *Grams* court applied another touch to the two-step test: introducing necessary steps for "data gathering" would not save an otherwise non-statutory claim.[190] The court held that: "[N]otwithstanding that the antecedent steps are novel and unobvious, they merely determine values for the variables used in the mathematical formulae used in making the calculations. . . . [They] do not suffice to render the claimed methods, considered as a whole, statutory subject matter."[191] This definition of "algorithm" has been commonly referred to as "algorithm in the *Benson* sense."[192]

As stated above, the broader definition of algorithm is "a step-by-step procedure for solving a problem or accomplishing some end."[193] The C.C.P.A. has emphasized the distinction between "algorithm in the *Benson* sense," as defined above, and "algorithm" in general: "It is axiomatic that inventive minds

185. 888 F.2d 835 (Fed. Cir. 1989).

186. *See id.* at 836-37.

187. *See id.*

188. *See id.* at 837.

189. *See id.* at 839-40.

190. *Id.* This was based on the precedent cases. *See In re* Meyer, 688 F.2d 789 (C.C.P.A. 1982); *In re* Sarkar, 588 F.2d 1330 (C.C.P.A. 1978); *In re* Richman, 563 F.2d. 1026 (C.C.P.A. 1977); *In re* Christensen, 478 F.2d 1392 (C.C.P.A. 1973).

191. *Richman*, 563 F.2d at 1030.

192. *In re* Freeman, 573 F.2d 1237, 1245 (C.C.P.A. 1978).

193. *In re* Chatfield, 545 F.2d 152, 156 (C.C.P.A. 1976) (quoting WEBSTER'S NEW COLLEGIATE DICTIONARY (1976)); *see also* 985 F.2d 1053, 1063 (Fed. Cir. 1992) (Rader, R. concurring).

seek and develop solutions to problems and step-by-step solutions often attain the status of patentable invention. It would be unnecessarily detrimental to our patent system to deny inventors patent protection on the sole ground that their contribution could be broadly termed an 'algorithm.'"[194]

In *Paine, Webber, Jackson & Curtis v. Merrill Lynch*, the court distinguished between two distinct uses of the term "algorithm":

> In mathematics, the word algorithm has attained the meaning of recursive computational procedure and appears in notational language, defining a computational course of events which is itself contained, for example $A^2+B^2=C^2$. In contrast, the computer algorithm is a procedure consisting of operation to combine data, mathematical principles and equipment for the purpose of interpreting and/or acting upon a certain data input. In comparison to the mathematical algorithm, which is self contained, the computer algorithm must be applied to the solution of a specific problem. . . . The PTO, in the past, has had the tendency to hold that a computer program, which is expressed in numerical expression, is not statutory subject matter and thus unpatentable because the computer program is inherently an algorithm.[195]

In *In re Iwahashi*, the court "note[d] these discussions of the meaning of 'algorithm' to take the mystery out of the term. . . . [I]t follows that it is no ground for holding a claim is directed to nonstatutory subject matter to say it includes or is directed to an algorithm."[196]

In *Arryhthmia Research Technology, Inc. v. Corazonix Corp.*, the applicants sought a patent on a method to analyze the electrocardiographic signals in order to determine heart functions.[197] The purpose of the invention was to determine

---

194. *Id.* at 156 n.5.

195. 564 F. Supp. 1358, 1366-67 (D. Del. 1983); *accord In re* Pardo, 684 F.2d 214 (C.C.P.A. 1982); *In re* Philips, 608 F.2d 879 (C.C.P.A. 1979); *In re* Toma, 575 F.2d 872, (C.C.P.A. 1978). The court also noted that "[t]he C.C.P.A., however, has reversed the findings of the PTO and held that a computer algorithm, as opposed to a mathematical algorithm [expressed as a computer program], is patentable subject matter." 564 F. Supp. at 1367.

196. 888 F.2d 1370, 1374 (Fed. Cir. 1989).

197. 958 F.2d 1053, 1054 (Fed. Cir. 1992). The claimed statutory subject matter in *Arryhthmia* involved a method and apparatus for gathering and analyzing electrocardiographic signals to determine the presence or absence of certain heart function characteristics. *Id.* These input signals, related to a patient's heart signals, were found not to be abstractions. *Id.* at 1059. The court further found that the claimed steps of "converting," "applying," "determining," and "comparing" were physical steps that transformed one physical, electrical signal into another. *Id.* The court determined that the claims comprised an otherwise statutory process whose mathematical

which heart attack victims were at risk for a condition called "ventricular tachycardia" which leads to ventricular fibrillation.[198] Ventricular fibrillation is a condition that causes the heart to stop pumping blood throughout the body.[199] An individual is particularly susceptible to ventricular fibrillation in the first few hours after suffering a heart attack.[200] Although the ventricular fibrillation is treatable, the drugs used to treat it can have dangerous side effects.[201] The purpose of the invention was to prevent the patient from having to suffer from the fibrillation and to prevent unnecessary risks involved with the treatment.[202]

This was to be accomplished by a process that would monitor an individual's electrocardiographic signals.[203] The invention proposed that this be done by monitoring an individual's electrical heart signals with an electrocardiograph device.[204] A physician would then interpret the signals given off by the patient's heart to determine whether he was at risk for ventricular tachycardia.[205]

The analysis would require converting data from analog to digital, filtering data, computing value, and comparing to predetermined data.[206] The predetermined data consisted of data of frequency energy a heart should give off: "That is, if the

---

procedures were applied to physical process steps. *Id.*

In comparing *Grams* and *Arrhythmia*, both inventions involved a method of diagnosing abnormal medical conditions in patients. *Arrhythmia*, 958 F.2d at 1054; *Grams*, 888 F.2d 835, 836 (Fed. Cir. 1989). Both utilized data-gathering steps and numerical processing of that data using a computer to determine the normality of the patient's condition. *Arrhythmia*, 958 F.2d at 1055; *Grams*, 888 F.2d at 836-37, 840. Further, both methods provided useful information to doctors. *Arrhythmia*, 958 F.2d at 459; *Grams*, 888 F.2d at 836. In *Arrhythmia* and *Grams*, the Federal Circuit applied the *Freeman-Walter-Abele* test. *Arrhythmia*, 958 F.2d at 1058-59; *Grams*, 888 F.2d at 837 n.1, 838-40. In *Arrhythmia*, the court determined that the data-gathering step was not irrelevant; the court recognized that changing one electrical signal into another is physical. 958 F.2d at 1059. In *Grams*, the court found that performing clinical tests on patients, the only physical step, is an irrelevant step. 888 F.2d at 840.

198. *See Ahrrythmia*, 958 F.2d at 1054.
199. *See id.*
200. *See id.*
201. *See id.*
202. *See id.*
203. *See id.*
204. *See id.*
205. *See id.*
206. *See id.* at 1055.

root mean square magnitude is less than the predetermined level," then there is a higher risk of ventricular tachycardia.[207]

The lower court held that the method and apparatus claims of the patent were largely reliant on a mathematical algorithm, and therefore not statutory subject matter under section 101 of the Patent Act, after the PTO had granted the patent without question.[208]

The Federal Circuit found that the patent was statutory subject matter under section 101.[209] The Court applied the *Freeman-Walter-Abele* test[210] and determined that a mathematical algorithm was involved in the patent, and thus proceeded to the second stage of the test, which was to decide whether or not the rest of the patent was statutory.[211] The court found that the "steps of 'converting,' 'applying,' 'determining' and 'comparing' are physical process steps that transform one physical, electrical signal into another."[212] Hence, the court found that the *Freeman-Walter-Abele* standard had been met because the "mathematical procedures are applied to physical process steps."[213] How does this court distinguish this language from every other computer program, including *Gottschalk v. Benson*? The only way this can be justified is an approval of a patent on a business method.

The facts in *Arrhythmia* are analogous to those in *Diehr* in that they "do not seek to patent a mathematical formula,"[214] but rather to "foreclose from others the use of that equation in conjunction with all the other steps in their claimed process."[215] Moreover, the *Arrhythmia* court found that the transformation of the electrocardiographic signals of an individual's heartbeat by a machine utilizing several mathematical formulas was "a practical application of an abstract idea, . . . because it corresponded to a useful, concrete or tangible thing – the condition of a patient's heart."[216]

Arrhythmia set the precedent that, in accessing the

207. *Id.*
208. *See id.*
209. *See id.*
210. *See supra* notes 178-181.
211. *See Arryhthmia*, 958 F.2d at 1060.
212. *Id.* at 1059.
213. *Id.*
214. Diamond v. Diehr, 450 U.S. 175 (1981).
215. *Id.* at 187.
216. *Arrhythmia Research*, 958 F.2d at 1054.

patentability of a process, the focus should be on whether the invention is useful and produces a tangible result; thus, the focus shifted from determining the manner in which a process reached a result to whether its result was tangible.[217] In this case, the waves that were produced on a screen represented the tangible condition of a patient's heart, making the case for the patenting of computer programs more viable.[218]

The applicants in *In re Alappat* sought a patent on an invention that involved a way to generate smooth waveform on the screen of an oscilloscope.[219] The front of a cathode-ray tube (CRT) is made up of an array or raster of pixels arranged in vertical columns and horizontal rows.[220] The pixels are illuminated and produce an image on the screen.[221] Prior to the invention proposed in *Alappat*, the screen would appear jagged and oscillated.[222] The invention made the waves appear more smooth and continuous.[223]

This was accomplished by calculating the different intensities for the pixels on the display.[224] In effect, the display produced numerical representations without generating or displaying the waveform. The patent was drafted as an apparatus claim and was almost purely mathematical. In effect, the patent was for an apparatus that could perform mathematical functions.[225]

The court held that the patent application involved statutory subject matter under section 101 of the Patent Act[226] as a machine.[227] The application was for a "rasterizer."[228] Although it was not necessary, the court went on to determine whether the machine should be barred by the mathematical algorithm exception.[229]

---

217. *Id.*
218. *See id.*
219. 33 F.3d 1526, 1537 (Fed. Cir. 1994).
220. *See id.*
221. *See id.*
222. *See id.*
223. *See id.*
224. *See id.*
225. *See id.*
226. 35 U.S.C.A. § 101 (1999).
227. *See Alappat*, 33 F.3d at 1545.
228. *See id.*
229. *See id.* at 1544.

The court found that mathematical algorithms are not an excluded category; rather, only some mathematical related patents are excluded, such as those that "standing alone, represent nothing more than abstract ideas until reduced to some type of practical application."[230]

The court then went on to apply the Claims-as-a-Whole test.[231] This was done to determine whether the claim in *Alappat* was directed to a mathematical algorithm, which would make it unpatentable subject matter. Applying this test, the court found that the claim was for a "specific machine to produce a useful, concrete, and tangible result."[232] In *Benson*, the rationale for denying the applicants' patent on the mathematical algorithm was not to prevent everyone from using the mathematical algorithm but to prevent anyone from having a monopoly on the mathematical algorithm and thereby to ensure that everyone can use the mathematical algorithm in any application for a new patent on a computer program and as long as the application does not preempt the use of the mathematical algorithm by anyone else. Therefore, every use of a mathematical algorithm in its section 112 disclosure must deny that they, the applicant, has invented the mathematical algorithm as an element of his claimed invention, yet the applicant may properly claim, as this court held, that he has used a mathematical algorithm in his processor apparatus.

The analysis that the court performed in *Alappat* was similar to that in *Arrhythmia*, and further reiterated the fact that the question of whether a patent is proper statutory subject matter should focus on whether the patent produces a tangible result and not on whether it contains a mathematical algorithm.[233] The court in *Alappat* went so far as to say that the holding made an even better case for the patenting of computer-related process patents.[234] The court never intended to create an overly broad fourth category of mathematical subject matter excluded from section 101; rather, at the core of the analysis lies an attempt by the court to explain a rather straightforward concept: that certain types of mathematical

230. *Id.* at 1543.

231. *See id.*; *see also* Diamond v. Diehr, 450 U.S. 175 (1981) (holding that patents that contain algorithms must be looked at as a whole rather than being patently rejected).

232. *Alappat*, 33 F.3d at 1544.

233. *Id.* at 1544.

234. *Id.* at 1545.

subject matter, standing alone, represent nothing more than abstract ideas until reduced to some type of practical application and that this subject matter is not, in and of itself, entitled to patent protection.[235]

The court made clear that the existence of a mathematical algorithm as part of a patent does not make the patent non-statutory subject matter; rather, one simply cannot obtain a patent for a freestanding mathematical algorithm.[236]

In *Arrhythmia*, the test was actually labeled as *Freeman-Walter-Abele* and it was characterized as:

> The law crystallized about the principle that claims directed solely to an abstract mathematical formula or equation, . . . whether directly or indirectly stated, are nonstatutory under section 101. . . . However, when the mathematical algorithm is applied in one or more steps of an otherwise statutory process claim, or one or more elements of an otherwise statutory apparatus claim, the requirements of section 101 are met . . . [p]rovided that its [mathematical algorithm] application is circumvented *by more than field of use limitation or non-essential post-solution activity*.[237]

Arrythmia[238] echoes *Diamond v. Diehr* in which the applicant applied for a patent on a process for molding raw, uncured synthetic rubber into cured molded projects.[239] The process utilized a well-known mathematical equation and a

---

235. *See id.* at 1526.

236. *See id.*

237. Arryhthmia Research Tech., Inc. v. Corazonix Corp., 958 F.2d 1053, 1057-58 (Fed. Cir. 1992) (emphasis added).

238. *Id.*

239. 450 U.S. 175 (1981). The claimed invention involved a process for molding raw, uncured synthetic rubber into cured molded products by constantly monitoring the temperature of the mold and opening the mold automatically when cure time indicated curing completion. *See id.* at 177, 179. The Court determined that claims must be considered as a whole; it is inappropriate to dissect claims into old and new elements and then ignore the presence of old elements. *See id.* at 188. Statutory subject matter exists when a claim containing a formula implements or applies that formula in a structure or process that, when considered as a whole, is performing a function that patent laws were designed to protect. *See id.* at 192.

As a side note, the inventions in *Diehr* and *Flook* are analogous, even though the former was upheld and the latter was not. *See id.* at 192-93; Parker v. Flook, 437 U.S. 584, 596 (1978). Both inventions repetitively calculated updated numbers (new alarm limits and new cure times). *See Diehr*, 450 U.S. at 178; *Flook*, 437 U.S. at 585-86. Both utilized field of use restrictions (catalytic conversion of hydrocarbons and curing rubber). *See Diehr*, 450 U.S. at 177; *Flook*, 437 U.S. at 586. Both involved post-solution activity (changing the alarm limit and opening the mold). *See Diehr*, 450 U.S. at 179; *Flook*, 437 U.S. at 586.

computer to calculate time.[240] The process allowed for constant monitoring of the temperature of the rubber mold and calculation of the proper cure time from the temperature.[241] The mold would then automatically open when the rubber was properly cured.[242] The process involved a mathematical equation and used a computer to calculate when the mold was properly cured.[243] Despite the use of a mathematical algorithm, the Court, in a split decision, held that the claim was statutory subject matter under section 101.[244]

With the decision in *Diehr*,[245] the tide against patenting of computer programs receded. The holding discredits the argument that patents containing mathematical algorithms are *per se* unpatentable.[246] In addition, the holding shows that the *Benson* and *Flook* holdings are limited to those claims involving unapplied mathematical algorithms and laws of nature.[247] The Court held that "claims must be considered as a whole," meaning that a patent could not be rejected solely on the basis of citing a mathematical algorithm.[248]

Most importantly, the court held that "a claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a mathematical formula, computer program, or digital computer."[249] This holding completely derails the notion that no computer programs can be patented and asserts that computer programs are patentable subject matter as a general proposition of law.

In light of the *Benson* decision and its broad prescription that a claim employing mathematical algorithms is patentable subject matter if it does not preempt a mathematical algorithm as a whole,[250] the C.C.P.A., in *In re Freeman*, tried to clarify the issue by introducing a two-step procedure in the analysis of the claim:

> First, it must be determined whether the claim directly or indirectly

240. *See id.* at 177-78.
241. *See id.* at 178.
242. *See id.* at 179.
243. *See id.* at 178.
244. *See id.* at 192-93.
245. 450 U.S. 175.
246. *See id*. at 187, 191.
247. *See id.* at 188, 191.
248. *Id.* at 188.
249. *Id.* at 187.
250. *See* Gottschalk v. Benson, 409 U.S. 63, 71-72 (1972).

> recites an "algorithm" in the *Benson* sense of that term, for a claim which fails even to recite an algorithm clearly cannot wholly preempt an algorithm. Second, the claim must be further analyzed to ascertain whether in its entirety it wholly preempts that algorithm.[251]

The second step of this test was not applicable to the claims in *Freeman*.[252] Later, following *Flook*[253] and *Diehr*,[254] the C.C.P.A. elaborated on the second step of this test in *In re Walter*:

> *Flook* does not require literal preemption of a mathematical algorithm by a claim for a finding that the claim is nonstatutory, we thus deem it appropriate to restate the second step of the *Freeman* test in terms other than preemption. Once a mathematical algorithm has been found, the claim as a whole must be further analyzed. If it appears that the mathematical algorithm is implemented in a specific manner to define structural relationships between the physical elements of the claim (in apparatus claims) or to refine or limit claim steps (in process claims), the claim being otherwise statutory, the claim passes muster under § 101. If, however, the mathematical algorithm is merely presented and solved by the claimed invention, as the case in *Benson* and *Flook*, and is not applied in any manner to physical elements or process steps, *no amount of postsolution activity* will render the claim statutory; nor is it saved by a preamble merely reciting the *field of use* of the mathematical algorithm.[255]

It is noted that the C.C.P.A. actually based its modification of the test on the holding in *Diehr*, where the Court said that:

> A mathematical formula as such is not accorded the protection of our patent laws, *Gottschalk v. Benson*, and this principle cannot be circumvented by attempting to limit the use of the formula to a particular technological environment. Similarly, *insignificant post solution activity* will not transform an unpatentable principle into a patentable process.[256]

The two prescriptions given by the Supreme Court and the C.C.P.A. were not in full harmony, for while the Supreme Court characterized the post-solution activity as "insignificant,"[257] the C.C.P.A. went to the extreme and characterized it as of "no amount,"[258] which in reality foreclosed any application of the mathematical formula. It appears that the Supreme Court in *Diehr* had already asked for the right amount of post-solution activity by stating that:

---

251. *In re Freeman*, 573 F.2d 1237, 1245 (C.C.P.A. 1978).
252. *See id.*
253. 437 U.S. 584 (1978).
254. 450 U.S. 175 (1981).
255. 618 F.2d 758, 759 (C.C.P.A. 1980) (emphasis added).
256. *Diehr*, 450 U.S. at 191-92 (emphasis added) (citations omitted).
257. *Id.* at 191.
258. *Walter*, 618 F.2d at 767.

> A mathematical formula in the abstract is nonstatutory subject matter regardless of whether the patent is intended to cover all uses of the formula or only limited uses. Similarly, a mathematical formula does not become patentable subject matter merely by including in the claim for the formula *token* postsolution activity such as the type claimed in *Flook*.[259]

However, in its decisions in *State Street Bank*[260] and *AT&T*,[261] the C.A.F.C. decisions achieve complete harmony with the holding of the U.S. Supreme Court in *Diehr* [262]and *Flook*.[263]

III. RECENT DEVELOPMENTS IN CREATION OF STATUTORY SUBJECT MATTER

In *State Street Bank & Trust v. Signature Financial Group*, the Federal Circuit further narrowed the holdings barring patents for computer applications containing algorithms.[264] The patent at issue involved a system for managing financial portfolios.[265] The applicants called their invention a machine, which made it statutory subject matter; however, the fact that the machine utilized algorithms called for further analysis.[266]

The district court had concluded that the patent fell into one of two exceptions to statutory subject matter: the

---

259. *Diehr*, 450 U.S. at 192, n.14 (emphasis added).

260. State Street Bank v. Signature Financial Group, 149 F.3d 1368 (Fed. Cir. 1998).

261. *AT&T*, 172 F.3d 1352 (Fed. Cir. 1999).

262. *Diehr*, 450 U.S. 175 (1981).

263. *Flook*, 437 U.S. 584 (1978).

264. 149 F.3d 1368 (Fed. Cir. 1998). The claimed invention involved a data processing system, where mutual funds (spokes) pooled assets in an investment portfolio (hub) that was organized as a partnership. *See id.* at 1368. During the patent prosecution, the examiner contemplated a rejection of all six method claims. *See id* at 1371.

The Federal Circuit determined that the district court erred by applying the *Freeman-Walter-Abele* test to determine whether subject matter claimed was an unpatentable abstract idea. *See id.* at 1373. The court stated that the *Freeman-Walter-Abele* test has little, if any, applicability to determining the presence of statutory subject matter. *See id.* at 1374. The test was misleading because a process, machine, manufacture, or composition of matter employing an abstract idea is patentable subject matter even though the abstract idea would not, by itself, be entitled to such protection. *See id.* The court held that the transformation of data (discrete dollar amounts) by a machine through series of calculations into a final share price constituted a practical application of an algorithm because it produced a useful, concrete, and tangible result. *See id.* at 1373.

265. *See id.* at 1370.

266. *See id.* at 1372.

"mathematical algorithm" exception or the "business method" exception.[267] The district court had applied the *Freeman-Walter-Abele* test and determined that the subject matter was unpatentable because it was an abstract idea.[268] The Federal Circuit held that "[a]fter *Diehr* and *Chakrabarty*, the *Freeman-Walter-Abele* test has little, if any, applicability to determining the presence of statutory subject matter."[269]

According to the court in *State Street Bank*, when determining whether the subject matter is statutory one should look at *Diehr*'s holding[270] that the three areas of unpatentable subject matter are "a law of nature, natural phenomenon, or abstract idea."[271]

In addition to pointing out what the source of exceptions should be for patentable inventions, the court held that the focus of whether a claim is statutory subject matter should not be on which of the four claims it fell under—process, machine, manufacture, or composition of matter—but rather "on the essential characteristics of the subject matter, in particular its practical utility."[272]

This holding has significant advantages for computer program and software patents. The applicants would no longer have to prove that their inventions were process patents or compositions of matter, but rather that their inventions have practical application, which is indeed a much easier standard to prove. Moreover, this case discarded the "business method" exception[273] and reassessed the "mathematical algorithm" exception.[274]

The patent in dispute in *AT&T Corp. v. Excel Communications Marketing, Inc.* was a "Call Message Recording for Telephone Systems."[275] The system consisted of a

---

267. *See id.* at 1372.

268. *See id*.

269. *Id.* at 1374.

270. 450 U.S. 175 (1981). *Diehr* also held that mathematical algorithms were nothing more than abstract ideas and thus not patentable subject matter. *Id.*

271. *State Street Bank*, 149 F.3d at 1374.

272. *Id.* at 1375.

273. *See id.* at 1375 ("We take this opportunity to lay this ill-conceived exception to rest.").

274. *See id.* at 1375-77.

275. 172 F.3d 1352, 1353 (Fed. Cir. 1999). The test for statutory subject matter is whether the algorithm is applied in a practical manner to produce a useful result. *See id.* at 1360. The invention involved a process employing

message recording system for long-distance calls that was enhanced by adding primary interexchange carrier (PIC) indicator.[276] The PIC aids in providing differential billing treatment for subscribers depending on whether or not callers carry the same long-distance company.[277] The District Court of Delaware had determined that the patent was invalid under section 101 of the Patent Act for failing to state statutory subject matter.[278]

The district court held that the method of claims recited a mathematical algorithm.[279] The court reasoned that the one physical step in the claim involved gathering data for the algorithm and was therefore not statutory subject matter.[280] The court reasoned that, although the claim utilized switches and computers, these mechanisms performed "a non-substantive change in the data's format"[281] and such "could not serve to convert non-patentable subject matter into patentable subject matter."[282]

The Federal Circuit held that the invention was a method claim and was a process patent under section 101.[283] The court noted that "[s]ince the process of manipulation of numbers is a fundamental part of computer technology, [the courts] have had to reexamine the rules that govern the patentability of such technology."[284] The court recognized the need to reassess the legal boundaries placed upon computer technology in light of the advances that are being made and the proprietary protection needed as a result. The court cited these "sea-changes in both law and technology . . . as a testament to the

---

subscribers' and call recipients' PIC (primary interexchange carrier) indicator as data. *See id.* at 1358. The process applied Boolean algebra to the data to determine the value of the PIC indicator, and then applied that value through switching and recording mechanisms to create a useful signal for billing purposes. *See id.* at 1358. The claimed process applied the Boolean principle to produce a useful, concrete, and tangible result—i.e., calling a recipient's PIC that facilitates differential billing on long-distance calls made by a long-distance service carrier's subscriber. *See id.* at 1358.

276. *See id.* at 1353.
277. *See id.*
278. *See id.* at 1355.
279. *See id.*
280. *See id.* at 1355.
281. *Id.*
282. *Id.*
283. *See id.* at 1355-56.
284. *Id.* at 1356.

ability of law to adapt to new and innovative concepts."[285]

Indeed, one reason that individuals and corporations seek patents is for fiduciary protection.[286] Today these groups obtain patents on computer related technology with virtually no obstacles.[287] As a result, more patent infringement cases are arising, and these cases are the primary way in which computer related patents are being challenged.[288]

IV. NONOBVIOUSNESS

Significantly, the Supreme Court did not disturb the C.C.P.A.'s reasoning on the section 101 issue when it reviewed *Dann v. Johnston*.[289] Nevertheless, the Court reversed the C.C.P.A.'s decision based on a finding of obviousness.[290] The Court was guided by the factors it had set forth in *Graham v. John Deere Co.*[291] In *Graham*, the Supreme Court had held that the central factors relevant to any inquiry into obviousness are "the scope and content of the prior art," the "differences between the prior art and the claims at issue," and "the level of ordinary skill in the pertinent art."[292] The Court noted that, while it had said in *Graham* that "secondary considerations [such] as commercial success, long felt but unsolved needs, [and] failure of others" might be relevant in determining obviousness,[293] none of those considerations offered substantial support for the claims of nonobviousness.[294]

The obviousness factor may continue to be a major stumbling block to program patentability. Although the Supreme Court in *Johnston* found no basis for applying *Graham*'s secondary indicia of nonobviousness (others having

---

285. *Id.*

286. *See, e.g.*, John P. Sumner & Stephen W. Lundberg, *Software Patents: Are They Here to Stay?*, 8 No. 10 COMPUTER LAW. 8 (1991) (discussing reasons for obtaining patent protection).

287. *See, e.g.*, Hughes Aircraft Co. v. U.S., 148 F.3d 1384, 1385 (Fed. Cir. 1998) (Clevenger, J., dissenting).

288. *See* Denise Sherman, *North Carolina Court Expertise Attractive to Patent Litigators*, TRIANGLE BUS. J., July 23, 1999.

289. 425 U.S. 219, 220 (1976).

290. *See id.* at 230.

291. 383 U.S. 1 (1966).

292. *Id.* at 17.

293. *Id.*

294. *See Johnston*, 425 U.S. at 230 n.4.

attempted and failed to accomplish the same result),[295] it did not reject that test.[296] Many software inventors will probably need to rely on such circumstantial evidence:

> In the context of computer programming, the use of circumstantial indicia of nonobviousness may be crucial in some instances. When presented with the esoteric technology present in the computer software industry, the factual distinctions produced by the *Graham* analysis do not necessarily lend themselves to a clear resolution of the nonobviousness issue. In practice, the only way for courts to meaningfully resolve the section 103 issue may be to place increased emphasis on the probative value of circumstantial evidence. . . .[297]

If it were recognized that the purpose of the patent system is the promotion of the "useful arts," it would be clear that the question of whether a process is statutory should be determined largely in light of its actual contribution to technological progress. In other words, inventions that in fact promote the useful arts should not be discriminated against by court-created barriers to patentability. This type of discrimination would be eliminated by a pure application of the "technological arts" doctrine, unaffected by the fact that a claimed process might contain mental steps. The "technological arts" doctrine clearly encompasses computer programs because a program is a process that is useful in the internal operation of a computer and, as such, within the useful or technological arts.

Resolution of the question of software patentability is

---

295. *Id.* at 226, 228.

296. *See id.* at 226. A sign that the courts may favorably use the *Graham* secondary criteria can be found in the Ninth Circuit's decision in *Reeve's Instrument Corp. v. Beckman Instruments, Inc.*, 444 F.2d 263 (9th Cir. 1971). The court stated that "[w]hen the evidence shows that several others in the art have attempted to solve the same problem and have not arrived at the solution claimed by the patent in suit, the statutory presumption of validity is substantially strengthened." *Id.* at 272. Noting earlier industry attempts and failures, the court held that the plaintiff's patented method for checking an analog computer was not obvious in light of the prior art. *See id.* at 272-73.

297. Gene Commander, Comment, *Patentability of Computer Software: The Nonobviousness Issue*, 62 IOWA L. REV. 615, 630 (1976). Reliance on the *Graham* criteria may be the "best way to achieve a rational disposition of the unique legal problems presented by the highly sophisticated computer industry and at the same time to maintain the constitutional objectives effectuated by the Patent Act." *Id.* at 635.

Interestingly, no question relating to obviousness was ever raised in *Benson*, despite the fact that "often when a programmer may wish to convey data from one format to the other . . . he will devise a series of instructions which are the logical equivalent of the set which Benson tried to patent." Pauline Wittenberg, Note, *Computer Software: Beyond the Limits of Existing Proprietary Protection Policy*, 40 BROOK. L. REV. 116, 135-36 (1973).

unlikely to come without congressional action. Even if Congress does not address the issue in the context outlined in this article, it is likely to at least consider proposals for an alternative form of protection for the unique and complex technology of computer software. Congress is constitutionally authorized to promote the useful arts by extending protection to inventors and their discoveries,[298] but it is not limited to traditional patent protection in doing so.

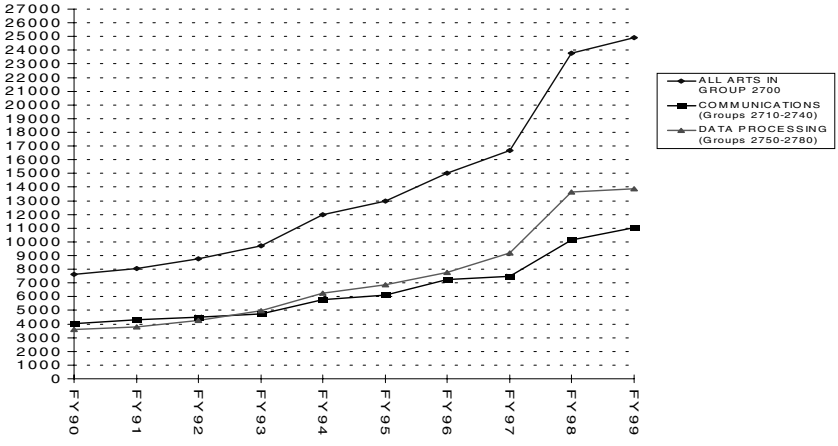
CONCLUSION

The need for proprietary protection of software products is obvious from the competitive nature of the industry and the growing number of articles and decisions published on the subject. As with any new technological advance, however, judicial and legislative bodies are slow in adapting the law to meet the needs of these advances. Nevertheless, on both state and federal levels, software manufacturers are increasingly achieving success in recovering for misappropriation of the products they have expended large amounts of time and money developing. Despite this fact, proprietors should be aware of the possible impediments to legally safeguarding their products and should take independent action to prevent piracy by others.

298. U.S. CONST. art. I, § 8.

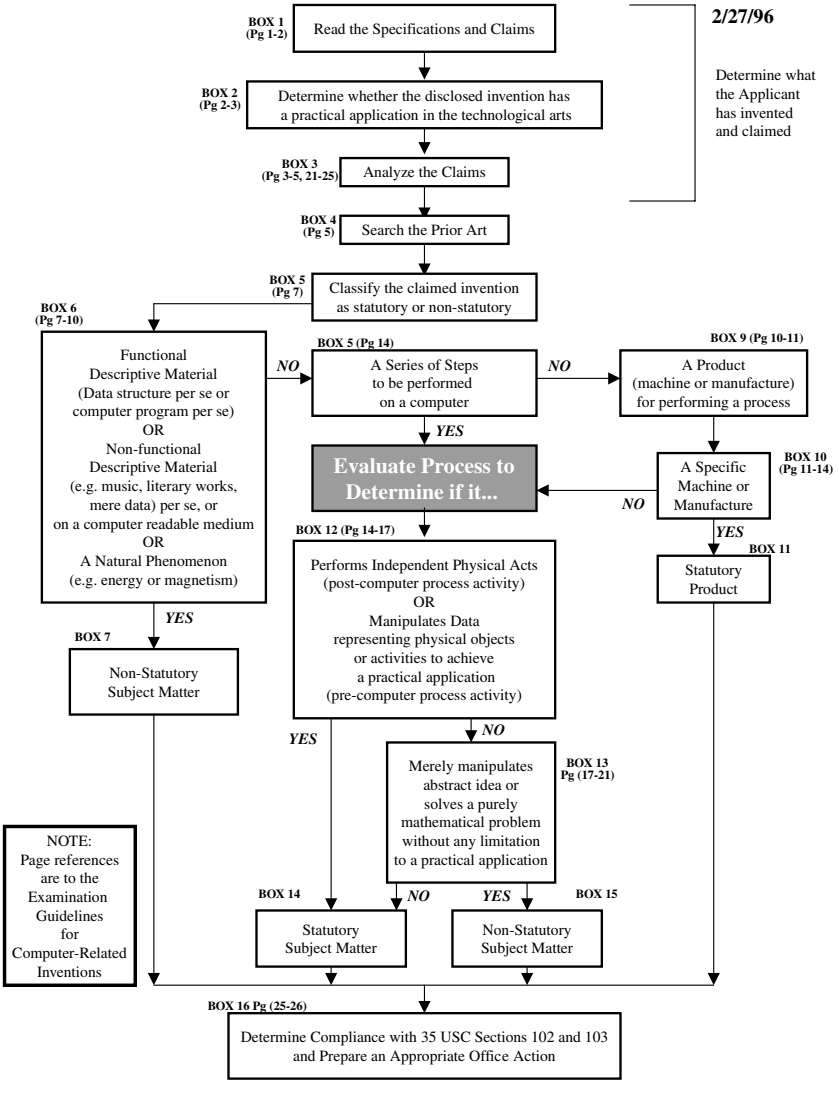
APPENDIX I

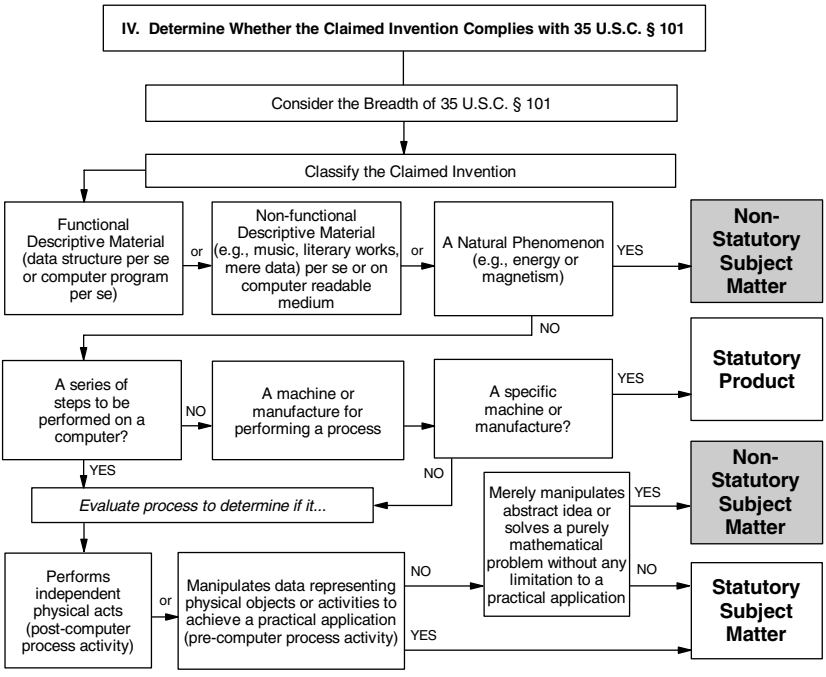
Original Patents Issued Per Fiscal Year For TC 2700



APPENDIX II

EXAMINATION PROCEDURES FOR COMPUTER-RELATED INVENTIONS




IV. Determine Whether the Claimed Invention Complies with 35 U.S.C. § 101
Consider the Breadth of 35 U.S.C. § 101
Classify the Claimed Invention
Functional Descriptive Material (data structure per se or computer program per se)
or
Non-functional Descriptive Material (e.g., music, literary works, mere data) per se or on computer readable medium
or
A Natural Phenomenon (e.g., energy or magnetism)
YES
Non-Statutory Subject Matter
NO
A series of steps to be performed on a computer?
NO
A machine or manufacture for performing a process
A specific machine or manufacture?
YES
Statutory Product
YES
NO
Evaluate process to determine if it...
Merely manipulates abstract idea or solves a purely mathematical problem without any limitation to a practical application
YES
Non-Statutory Subject Matter
Performs independent physical acts (post-computer process activity)
or
Manipulates data representing physical objects or activities to achieve a practical application (pre-computer process activity)
NO
NO
Statutory Subject Matter
YES