BRIEFING PAPER:
AT & T CORP. V. EXCEL COMMUNICATIONS INC.

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In *AT & T Corp. v. Excel Communications Inc.*,[1] the Federal Circuit addressed whether the method claims asserted by AT & T against Excel go to statutory subject matter, given that the claims described a mathematical algorithm. When the Federal Circuit upheld the claims, it extended an ongoing trend away from strictly limiting mathematical subject matter in patent claims. This briefing paper looks at the rise and fall of the "mathematical algorithm exception" leading up to the Federal Circuit's decision in *Excel*.

PATENTABLE SUBJECT MATTER AND ALGORITHMS

Section 101 of the Patent Act establishes the scope of patentable subject matter:

> Whoever 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 this title.[2]

This statute has traditionally been read very broadly. The Supreme Court has noted that "Congress intended statutory subject matter to include 'anything under the sun that is made by man.' "[3] However, the Supreme Court has carved out a small number of unpatentable categories: laws of nature, natural phenomena, and abstract ideas.[4]

With the rise of the digital computer, courts have repeatedly confronted claims involving mathematical algorithms, defined as "procedure[s] for solving a given type of mathematical

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1. 50 U.S.P.Q. 2d 1451 (Fed. Cir. 1999).
2. 35 U.S.C. § 101.
3. *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980), quoting S. Rep. No. 1979, 82d Cong., 2d Sess., 5 (1952); H.R. Rep. No. 1923, 82d Cong., 2d Sess., 6 (1952).

problem"[5] While a mathematical algorithm is, on its face, an abstract idea, it can be used as part of a process that achieves a useful result. Section 101 suggests that such a process ought to be patentable. Thus, the courts have been struggling for years to determine whether and when claims directed to mathematical subject matter meet the Section 101 requirement for patentability.

THE ALGORITHM EXCEPTION

A. Gottschalk v. Benson

The Supreme Court first addressed the patentability of a digital computer algorithm in 1972, when two inventors sought patent protection for a method of converting decimal (base ten) numbers into the binary numbers used by digital computers.[6] In *Gottschalk v. Benson*,[7] the Supreme Court ruled that the claims were invalid.

The Court offered several possible rationales for its holding, leaving its reasoning somewhat ambiguous.[8] In one place in its opinion, the Court suggested that the method was unpatentable because "[t]he conversion of [binary coded numbers] to pure binary numerals can be done mentally…."[9] In another place, the Court proposed that "[t]ransformation and reduction of an article to a different state or thing is the clue to the patentability of a process claim that does not include

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4. *Diamond v. Diehr*, 450 U.S. 175, 185 (1981).
5. *Gottschalk v. Benson*, 409 U.S. 63 (1972).
6. The method involved first converting the decimal numbers into "binary coded decimal numbers," a technique that was well-known in the art. The invention lay in the algorithm for converting the binary-coded numbers to binary. The problem and the solution of Benson and Tabbot are described in DONALD CHISUM, CHISUM ON PATENTS, §1.03[6][C].
7. 409 U.S. 63 (1972).
8. Chisum analyzes this decision extensively, pointing out the flaws in some of the Court's rationales.
9. 409 U.S. at 67. The Court relies on *LeRoy v. Tatham*, 55 U.S. (14 How.) 156 (1852), for the proposition that mental processes are not patentable.

particular machines."[10] And in yet another place, the Court asserted that if the patent were upheld, it "would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself."[11]

Between 1972 and 1978, the Court of Customs and Patent Appeals attempted to follow *Benson* in a number of cases involving patent claims that included calculational steps for gathering, analyzing, and displaying data of various kinds.[12] In the most significant of these cases, *In re Freeman*,[13] the court devised a two-step analysis for claims involving algorithms:

> 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.[14]

Applying this test in *Freeman*, the court found that no algorithm was recited in claims for a typesetting system that used a computer-based control. It reasoned that if *Benson* were not limited to mathematical algorithms, the result would be "the absurd view that the Court was reading the word 'process' out of the statute."[15] Since the method in this case did not depend on the mathematical meaning of the manipulated symbols, it could not be considered a mathematical algorithm.

B. Parker v. Flook

In 1978, the Supreme Court again confronted the mathematical algorithm question. In *Parker v. Flook*,[16] a patent applicant sought to protect an algorithm used to calculate new alarm

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10. 409 U.S. at 71. The Court claims to derive this rule from previous cases.
11. 409 U.S. at 72.
12. Chisum briefly describes a number of these cases, in § 1.03[6][d].
13. 573 F.2d 1237 (C.C.P.A. 1978).
14. *Id.* {need page cite}
15. *Id.* {need page cite}
16. 437 U.S. 584 (1978).

limits in certain chemical reactions. The claims included "post-solution activity" in the form of actually updating the limits. The Court of Claims and Patent Appeals had upheld the claims, on the grounds that *Benson* applied only if the claim pre-empted all use of the algorithm; in this case, Flook's claim did not pre-empt the algorithm because of the post-solution activity.[17] The Supreme Court reversed, stating that

> [t]he notion that post-solution activity, no matter how conventional or obvious in itself, can transform an unpatentable principle into a patentable process exalts form over substance. A competent draftsman could attach some form of post-solution activity to almost any mathematical formula.[18]

The Court also offered the following approach to analyzing patent claims involving algorithms:

> The process itself, not merely the mathematical algorithm, must be new and useful. Indeed, the novelty of the mathematical algorithm is not a determining factor at all. Whether the algorithm was in fact known or unknown at the time of the claimed invention, … it is treated as though it were a familiar part of the prior art.[19]

Applying this rule to the facts, the Court ruled that the claimed process was "unpatentable under Section 101 not because it contains a mathematical algorithm as one component, but because once that algorithm is assumed to be within the prior art, the application, considered as a whole, contains no patentable invention."[20]

In subsequent cases, the Court of Claims and Patent Appeals emphasized that *Benson* and *Flook* held that "a process is not unpatentable simply because it contains a law of nature or a mathematical algorithm" and that the Court had "refused to hold computer programs nonstatutory subject matter per se."[21] The court continued to apply the *Freeman* test, looking at the sub-

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17. See *In re Flook*, 559 F.2d 21 (C.C.P.A. 1977).
18. 437 U.S. at 590.
19. *Id.* {need page cite}
20. *Id.* at 594.
21. *In re Johnson*, 589 F.2d 1070, 1072 (C.C.P.A. 1978).

ject matter of the claim as a whole and allowing claims that either did not recite a mathematical algorithm or were not, as a whole, directed to mathematical formulas.[22] In *In re Walter*,[23] the court elaborated the second part of the *Freeman* test, holding that claims should be allowed under Section 101 "[i]f 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 and limit claim steps (in process claims)." Claims should not be allowed if "the mathematical algorithm is merely presented and solved by the claimed invention, as was the case in *Benson* and *Flook*, and is not applied in any manner to physical elements or process steps," regardless of post-solution activity or the presence of "a preamble merely reciting a field of use of the mathematical algorithm."[24]

C. Diamond v. Diehr

In 1981, when the Supreme Court confronted the issue of algorithm patents again, it seemed to endorse the *Freeman-Walter* line of reasoning. *Diamond v. Diehr*[25] involved a claim for an improved method for curing molded rubber articles. The method included steps of monitoring the temperature of the mold, using a well-known equation to calculate a new cooling time based on the current temperature, and opening the mold automatically at the end of the calculated time.

In a 5-4 decision, the Court upheld the validity of the claims. The majority opinion explained that *Benson* and *Flook* "stand for no more than [the] long established principles that exclude patent protection for laws of nature, physical phenomena, and abstract ideas."[26] Unlike

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22. Chisum briefly describes a number of these cases, in § 1.03[6][f].
23. 618 F.2d 758 (C.C.P.A. 1980).
24. *Id.* {page cite needed}.
25. 450 U.S. 175 (1981).
26. *Id.* at 187.

Diehr, the applicants in the earlier cases had tried to patent a formula in the abstract.[27] The Court emphasized that process claims involving a mathematical formula must be evaluated as a whole:

> [A] new combination of steps in a process may be patentable even though all the constituents of the combination were well known in common use before the combination was made. The 'novelty' of any element or steps in a process, or even of the process itself, is of no relevance in determining whether the subject matter of a claim falls within the Section 101 categories of possibly patentable subject matter.[28]

The Court held that "respondents' claims involve the transformation of an article, in this case raw uncured synthetic rubber, into a different state or thing" and that "[i]ndustrial processes such as this are the type which have historically been eligible to receive the protection of our patent laws."[29] However, the Court concluded on a cautionary note, reiterating that merely "attempting to limit the use of [a] formula to a particular technological environment" or "insignificant post-solution activity" are not enough to overcome the rule that a formula in the abstract cannot be patented.[30]

After *Diehr*, the Court of Customs and Patent Appeals continued to use the *Freeman-Walter* test. Thus, in *In re Abele*,[31] the Court of Claims and Patent Appeals took *Diehr* into account in holding that an application of an algorithm was patentable, "provided that its application is circumscribed by more than a field of use limitation or non-essential post-solution activity."[32]

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27. *Id.*
28. *Id.* at 188.
29. *Id.* at 184.
30. *Id.* at 192, note 14. According to the Court, these factors distinguished *Benson* and *Flook* from *Diehr*. The language sounds very similar to that of *Walter*.
31. 684 F.2d 902 (C.C.P.A. 1982).
32. *Id.* at 915.

D. The Federal Circuit Era

The Federal Circuit opened the door wider to algorithm-related patents in *In re Grams*,[33] holding that, "though satisfaction of the *Walter* test necessarily depicts statutory subject matter, failure to meet that test does not necessarily doom the claim."[34] The true test is "What did applicants invent?"[35] and the answer is determined by inquiring whether "the claim in essence covers only the algorithm."[36]

Later cases continued to cite the *Freeman-Walter-Abele* test, while gradually relaxing standards for the patentability of mathematical algorithms. For instance, in *Arrhythmia Research Technology, Inc. v. Corazonix Corp.*,[37] the Federal Circuit held that whether "the product [of a claim] is numerical is not a criterion of whether the claim is directed to statutory subject matter."[38] In this case, "the number obtained is not a mathematical abstraction; it is a measure in microvolts of a specific heart activity."[39] The court upheld method and apparatus claims directed to producing this number from an electrocardiograph signal.

However, the Federal Circuit remained willing to reject at least some algorithm-based claims. For instance, in *In re Schrader*,[40] the court upheld the PTO's rejection of a claim for a method of conducting auctions that involved collecting bids for various items being sold and computing a "completion" that would result in each item being sold once (and only once) while maximizing the total price of the items. The court held that "[t]he claimed process involves only

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33. 888 F.2d 835 (Fed. Cir. 1989).
34. *Id.* at 839.
35. *Id.*
36. *Id.* at 837. Despite this somewhat relaxed standard, the Federal Circuit upheld the § 101 rejection of applicants' claims.
37. 958 F.2d 1053 (Fed. Cir. 1992).
38. *Id*. at 1060.
39. *Id*.

information exchange and data processing and does not involve a process of transforming or reducing an article to a different state or thing."[41] The court held that the claim was directed to an algorithm, and that the data-gathering step (*i.e.*, collecting the bids) was "insufficient to impart patentability to a claim involving the solving of a mathematical algorithm."[42] The court further held that "the step of entering data into a 'record' is implicit in any application of a mathematical algorithm" and that reciting a data-entry step in a claim "merely makes implicit what had been implicit."[43] Finally, the court reiterated that in cases where it had upheld algorithm patents, the claims "involved the transformation or conversion of subject matter representative of or constituting physical activity or objects."[44]

The same year, in *In re Alappat*,[45] the Federal Circuit began to step away from transformation requirements or other specific tests. The court held that in *Benson*, *Flook*, and *Diehr*, the Supreme Court had not designated mathematical algorithms as a distinct category of unpatentable subject matter. Instead, the Supreme Court had simply tried to explain that "certain types of mathematical subject matter, standing alone, represent nothing more than abstract ideas until reduced to some type of practical application, and thus that subject matter is not, in and of itself, entitled to patent protection."[46] Thus, the "proper inquiry" regarding mathematical subject matter is "whether the claimed subject matter as a whole is a disembodied mathematical concept, …

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40. 22 F.3d 290 (Fed. Cir. 1994).
41. *Id*. at 292.
42. *Id.* at 293.
43. *Id*. at 293-94.
44. *Id.* at 294.
45. 33 F.3d 1526 (Fed. Cir. 1994).
46. *Id.* at 1543.

which in essence represents nothing more than a 'law of nature,' 'natural phenomenon,' or 'abstract idea."[47] If so, then the subject matter is unpatentable under *Diehr*.[48]

E. Summary

The courts have consistently held that some claims directed to mathematical algorithms are abstract ideas and thus not patentable. They have been less consistent in setting rules for distinguishing unpatentable abstract algorithms from patentable applications of those algorithms. At best, the decisions indicate that certain properties are (or are not) enough to establish patentability. For instance, it seems clear that data-entry steps, "insignificant post-solution activity," and recitation of a field of applicability are by themselves insufficient to make an algorithm claim patentable. Transformation of an article into a different state or thing appears to be a sufficient condition for patentability, but it is less clear from these decisions whether it is a necessary one.

DEMISE OF THE EXCEPTION

In *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*,[49] the Federal Circuit again confronted the mathematical algorithm exception. Citing *Alappat*, the court held that "[u]npatentable mathematical algorithms are identifiable by showing they are merely abstract ideas … . From a practical standpoint, this means that to be patentable, an algorithm must be applied in a 'useful' way."[50] Citing *Alappat* and *Arrhythmia*, the court concluded that an application of an algorithm is patentable if it produces a "useful, concrete, and tangible result."[51] It then held that the data processing system for managing investment accounts claimed by State

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47. *Id.* at 1544.
48. *Id*.
49. 149 F.3d 1368 (Fed. Cir. 1998).
50. *Id*. at 1373.

Street Bank did produce such a result: "a final share price momentarily fixed for recording and reporting purposes."[52] The court rejected the *Freeman-Walker-Abele* test as having "little, if any applicability to determining the presence of statutory subject matter" in light of *Diehr* and *Chakrabarty*.[53]

AT & T Corp. v. Excel Communications, Inc.[54] followed and extended *State Street Bank*, going, in the words of one commentator, "as far as imaginable in removing the subject-matter obstacle to patenting" inventions involving algorithms, notably software inventions.[55]

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51. *Id.*
52. *Id.*
53. *Id.* at 1374.
54. 50 U.S.P.Q. 2d 1447 (Fed. Cir. 1999).
55. E. Robert Yoches, "Patent Protection for Electronic Commerce and Other Internet Applications," 563 PLI/Pat 321, 331 (June 1999).