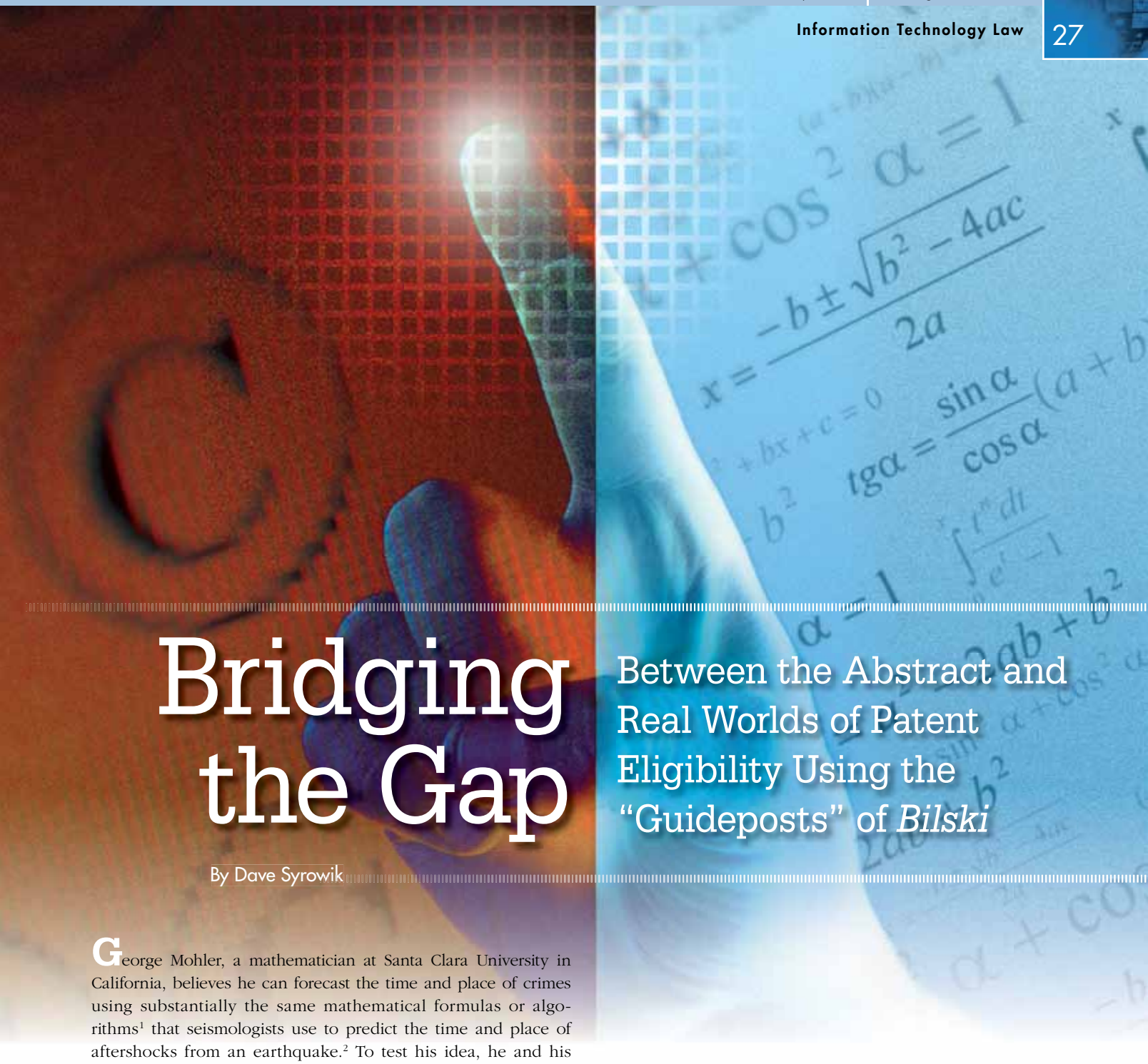

Bridging the Gap

Between the Abstract and Real Worlds of Patent Eligibility Using the "Guideposts" of *Bilski*

By Dave Syrowik

George Mohler, a mathematician at Santa Clara University in California, believes he can forecast the time and place of crimes using substantially the same mathematical formulas or algorithms[1] that seismologists use to predict the time and place of aftershocks from an earthquake.[2] To test his idea, he and his team of researchers rewrote a computer program used by seismologists to calculate the likelihood of aftershocks. They seeded the rewritten program with Los Angeles Police Department (LAPD) 2004 burglary data representing thousands of residential burglaries that occurred in a region of the San Fernando Valley, one of the city's largest districts.

Programmed with the algorithm, a computer calculated which city blocks were most likely to experience the highest number of burglaries the next day. Specifically, the computer predicted which 5 percent of homes within that area were at particular risk of being burglarized. In one test, the program accurately identified a high-risk portion of the city in which, had it been adequately patrolled, police may have been able to prevent a quarter of the burglaries that took place in the area that day.

Fast Facts:

Processes are patentable; algorithms are not. As technology and information processing have evolved, the courts have grappled with developing clear tests to decide what is patentable and what is not.

The United States Supreme Court's recent *Bilski* decision helped define the distinction between unpatentable abstract ideas and patentable processes, but left many issues unresolved.

If Mr. Mohler wishes to patent his idea by filing a patent application, he and his patent attorney or agent must have a clear understanding of how to travel between the world of unpatentable, abstract ideas and the real world of patent eligibility of such ideas. This patent issue was the subject matter of last year's United States Supreme Court case *Bilski v Kappos*.[3] The Court stated that process-patent claims[4] directed to a method of managing the consumption-risk costs of a commodity sold by a commodity provider rather than at a local price was an attempt to patent an unpatentable abstract idea rather than a patentable application of that idea under the Patent Act.[5] The Court left intact the appellate court's use of the "machine-or-transformation" test[6] to help evaluate the patentability of such procedures or methods. But the Court faulted the appellate court for transforming the test into a rigid rule that limits the inquiry regarding whether a claimed "process" is patent-eligible under the Patent Act.[7] Rather, the Court suggested that the appellate court determine a set of factors that could be applied flexibly, keeping in mind its prior precedents[8] including the *Benson*,[9] *Flook*,[10] and *Diehr*[11] cases, as well as section 101(b) of the Patent Act, which contains a definition of the word "process."[12]

The first part of this article looks at the patent system in general and *Bilski* in particular. The second part examines the *Benson-Flook-Diehr* trilogy of Supreme Court cases on which the *Bilski* Court largely based its decision. Finally, a review of the lessons learned from the trilogy of cases helps clarify the boundary between unpatentable abstract ideas and patentable applications of such ideas using Mr. Mohler's predictive criminal algorithm as an example.

The Patent System and *Bilski*

The United States Constitution empowered Congress to establish a national patent system through the patent clause, which states that Congress shall have the power "to promote the Progress of Science and useful Arts, by securing for limited times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."[13] Passed pursuant to this patent clause, section 101 of the Patent Act of 1952 sets forth the subject matter eligible for patent protection:

> 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.[14]

Consequently, an invention may be patented only if it fits within one of these four statutory classes of subject matter.[15] The general purpose of these four statutory classes of subject matter is to limit patent protection to the field of applied technology, which the United States Constitution calls "useful Arts."[16]

While limiting in this sense, the *Bilski* Court underscored the expansiveness of section 101 by quoting, "'In choosing such expansive terms…modified by the comprehensive 'any,' Congress plainly contemplated that the patent laws would be given wide scope.'"[17] Congress took this approach to patent eligibility to ensure that "'ingenuity should receive a liberal encouragement.'"[18]

In *Bilski,* the Court explained that despite such "wide scope," there are exceptions on this scope of patent eligibility: "laws of nature, physical phenomena, and abstract ideas"[19] and the concepts covered by these exceptions are "part of the storehouse of knowledge of all men…free to all men and reserved exclusively to none."[20]

The Court referred back to the Patent Act in determining whether the appellate court was correct in stating that a claimed process is only patent-eligible under section 101 if "(1) it is tied to a particular machine or apparatus, or (2) it transforms a particular article into a different state or thing [for example, "machine-or-transformation" test]."[21] Section 100(b) of the Patent Act provides a somewhat circular definition of process as "process, art, or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material."[22]

The Court stated that "adopting the machine-or-transformation test as the sole test for what constitutes a 'process' (as opposed to just an important and useful clue)" violates the statutory interpretation principle that words of a statute are to be interpreted as taking their "ordinary, contemporary, common meaning."[23] The Court was unaware of any ordinary, contemporary, common meaning of the definitional terms "process, art or method" that would require these terms to be tied to a machine or to transform an article.[24] Consequently, the Court stated that the machine-or-transformation test was not the sole test to be applied in the case before it.[25]

Finally, the *Bilski* Court reemphasized the importance of section 100(b) after explaining its prior trilogy of cases to find the concept of hedging in the case before it to be an unpatentable abstract idea, just like the algorithms at issue in *Benson* and *Flook*: "The Court, therefore, need not define further what constitutes a patentable 'process,' beyond pointing to the definition of that term provided in §100(b) and looking to the guideposts in *Benson, Flook,* and *Diehr*."[26]

The *Benson-Flook-Diehr* Trilogy

The *Bilski* Court drew upon the body of law it created in the *Benson-Flook-Diehr* trilogy of cases and characterized the trilogy as being "guideposts" worthy of study in helping determine what is a patentable process under 35 USC 101.

The Court noted that the algorithm at the heart of the process claim can be executed by existing digital computers long in use…and, in fact, it could be performed mentally by a human without a digital computer.

Gottschalk v Benson

In *Benson,* the Court considered whether an algorithm to convert binary-coded decimal (BCD) numerals into pure binary code was a patentable process under section 101.[27] Initially the Court noted that transformation and reduction of subject matter such as an article "to a different state or thing" is "the clue" to the patentability of a process claim that does not include a particular machine.[28]

Exemplary process claim 8 of *Benson* recites steps of "storing… signals in a reentrant shift register," "shifting the signals," "masking out [a bit]…of said register," and "adding [a bit]…of said register."[29] Consequently, the claimed algorithm required an operative device in the form of a "reentrant shift register" wherein the algorithm included steps for manipulating data in the register.

The *Benson* Court held that process claim 8 was directed to an unpatentable abstract idea. The Court reasoned that permitting the process claim "would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself."[30] The Court noted that the algorithm at the heart of the process claim can be executed by existing digital computers long in use without requiring any new machinery, and, in fact, it could be performed mentally by a human without a digital computer.[31] The Court stated that such a digital computer solved problems by doing arithmetic as a person would by "head and hand."[32]

Despite the fact that process claim 8 required a reentrant shift register, the Court found that the claim was not limited to any particular technology, apparatus, machinery, art, or end use; in short, the Court held that mathematical formulas or algorithms that have no practical application except in connection with an existing digital computer (which includes such a reentrant shift register) are not patentable processes under section 101 of the Patent Act.[33]

The Court provided additional guidelines for types of subject matter that are either unpatentable or potentially patentable. In the realm of unpatentable subject matter, it included phenomena of nature (even though just discovered), mental processes, and abstract intellectual concepts, all three of which the Court identified as basic tools of scientific and technological work.[34]

In the realm of potentially patentable subject matter, the Court took pains to clarify that its decision should not be understood to preclude a patent for a computer program servicing a digital computer. Whether the "patent laws should be extended to cover these [computer] programs [for an algorithm is] a policy matter to which we are not competent to speak."[35]

Parker v Flook[36]

The patent claims at issue in *Flook* alleged a process or method for updating an alarm limit in a catalytic chemical conversion of hydrocarbons. The method involved measuring the present value of process variables such as temperature and pressure, calculating an updated alarm-limit value according to a specific equation, and finally adjusting the actual alarm-limit value to the updated value.[37] The claim expressly recited an equation, which provided a new and presumably better method of calculating alarm-limit values.[38]

The Court initially noted that the calculation could have been performed using a pencil and paper; significantly, the alarm-limit feature in the claim was simply a number that does not alter or control a physical property or transform or reduce subject matter to a different state or thing.[39] Moreover, the Court noted that the *Flook* patent specification did not contain any disclosure relating to the means or apparatus for setting an alarm or adjusting an alarm system.[40] In particular, the subject matter of the process claim did not include physical, tangible elements.[41]

Consequently, the Court held the process claim to be unpatentable under section 101. The Court held the claimed process, considered as a whole, contains no patentable invention. The Court stated, "[A] claim for an improved method of calculation, even when tied to a specific end use, is unpatentable subject matter under §101."[42]

The *Flook* Court provided additional guidance with respect to types of subject matter that are either unpatentable or potentially patentable. For unpatentable subject matter, the Court stated that adding "insignificant" post-solution activity to an otherwise unpatentable process cannot transform the unpatentable process into a patentable process.[43] *Flook* also noted that limiting an abstract idea to one field of use (for example, the petrochemical industry) does not make an abstract idea patentable.

Meanwhile, with regard to potentially patentable subject matter, *Flook* 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."[44]

"While 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."

Diamond v Diehr[45]

In *Diamond v Diehr,* the United States Supreme Court clarified its precedent on the patent eligibility of process claims under section 101 and held that the process under review was patent eligible. The *Diehr* patent application claimed a method for molding raw, uncured, synthetic rubber into cured precision products using a mathematical algorithm or formula to complete some of its several steps by way of a computer.[46] The method in *Diehr* was directed at steps for operating a molding press, including constantly determining internal mold temperature, continuously calculating cure time by means of a digital computer and the well-known Arrhenius equation, and signaling by the computer to open the mold press automatically.[47]

The *Diehr* Court initially reiterated some of the principles for determining which types of subject matter are potentially patentable and stated that processes involving transformation of an article into a different state or thing are patentable under section 101 (for example, transforming uncured synthetic rubber into cured products).[48]

Furthermore, the Court stated that claims drawn to otherwise statutory subject matter do not become nonstatutory because they use a mathematical formula, computer program, or digital computer to complete some of their several steps. The Court emphasized the need to consider the claimed invention as a whole: "an *application* of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection."[49]

Lessons Learned and Their Application to Abstract Ideas Such as Predictive Algorithms

While difficult to draw in many cases, the line between unpatentable abstract ideas or algorithms and their patentable applications can be drawn if one has a "real world" focus. If the results of such algorithms are applied to obtain a practical use or to solve a problem in the real, physical world, such applications should be patentable.

In *Benson,* only an abstract algorithm for solving the mathematical problem of converting BCD into binary was presented. The resulting binary number representation was neither output nor conveyed into the real world to solve a real-world problem.

In *Flook,* only a process or formula for computing an updated alarm limit was presented. But an alarm limit is only a number. Missing from the claimed abstract process was something that exists in the physical, real world for setting off an alarm or adjusting an alarm system.

In *Diehr,* unlike the abstract ideas of *Benson* and *Flook,* the claimed invention was a process for molding raw, uncured, synthetic rubber into cured products. While the Arrhenius equation operating as a computer program in a digital computer was claimed, the claimed process also required signaling by the computer to open a press or molding machine to thereby produce the tangible, real-world result or effect of allowing the resulting cured-rubber product to be removed from the press.[50]

Returning to George Mohler's modified seismological algorithm used to predict criminal activity, it is clear that his algorithm, if claimed in the abstract in a patent application, would not be patentable since the algorithm does not provide any real-world benefit or result as such. The entire process is patentable only when the results of running a computer program that implements his algorithm are communicated from the abstract world to the real world in a form useful to those who can use such predictions.

For example, if automated, detailed crime forecasts tailored to each of the LAPD's area stations were streamed on a daily basis to police commanders, such actions would take the results of the algorithm from the inner workings of a programmed computer into the real world. The commanders could use such forecasts to make decisions about where and when to deploy officers on the streets of Los Angeles.

Other types of signals, such as alert and reminder signals, could be transmitted to patrol car computers or hand-held devices programmed with mapping software that could display the real-time probability of various crimes occurring in the vicinity of the police officers.

In summary, a claimed invention as a whole must be useful and accomplish a practical application in the real world to be patentable. The purpose of this requirement is to limit patent protection to inventions that possess a certain level of real-world value, as opposed to subject matter that represents nothing more than an abstract idea or concept or is simply a starting point for future investigation or research.[51] ■

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FOOTNOTES

1. In mathematics and computer science, an algorithm is a precisely stated method for solving a problem. *Webster's New World Dictionary, College Edition* (1966).
2. Rubin, *Stopping Crime Before it Starts,* Los Angeles Times, August 21, 2010; *The Aftershocks of Crime: An idea Borrowed from Seismology May Help to Predict Criminal Activity,* The Economist, October 22, 2010.
3. *Bilski v Kappos,* ___ US ___; 130 S Ct 3218; 177 L Ed 2d 792 (2010).
4. An application for a patent must include one or more claims that set forth the parameters of the invention. See *id.* at 3225 citing the Patent Act, 35 USC 112. A claim defines the boundaries of an invention much like the description of property in a deed defines the boundaries of real estate.
5. See *id.* at 3231–3232.
6. *In re Bilski,* 545 F3d 943, 959–960 (Fed Cir, 2008).
7. *Bilski,* n 3 *supra* at 3226–3227.
8. *Id.* at 3229.
9. *Gottschalk v Benson,* 409 US 63; 93 S Ct 253; 34 L Ed 2d 273 (1972).
10. *Parker v Flook,* 437 US 584; 98 S Ct 2522; 57 L Ed 2d 451 (1978).
11. *Diamond v Diehr,* 450 US 175; 101 S Ct 1048; 67 L Ed 2d 155 (1981).
12. 35 USC 100(b).
13. US Const, art I, §8, cl 8. 35 USC 100(a) defines "invention" to mean "invention or discovery." In *Graham v Deere,* 383 US 1, 5; 86 S Ct 684; 15 L Ed 2d 545 (1966), the Supreme Court discussed the origins and effect of the patent clause: "The clause is both a grant of power and a limitation. This qualified authority, unlike the power often exercised in the sixteenth and seventeenth centuries by the English Crown, is limited to the promotion of advances in the 'useful arts.'"
14. 35 USC 101.
15. See *Kewanee Oil v Bicron Corp,* 416 US 470, 483; 94 S Ct 1879; 40 L Ed 2d 315 (1974) ("no patent is available for a discovery, however useful, novel, and nonobvious, unless it falls within one of the express categories of patentable subject matter of 35 USC § 101 . . . .").
16. *Diamond v Chakrabarty,* 447 US 303; 315; 100 S Ct 2204; 65 L Ed 2d 144 (1980). Likewise, the U.S. Court of Customs and Patent Appeals has pointed out that "the constitutionally-stated purpose of granting patent rights to inventors for their discoveries is the promotion of progress in the 'useful Arts,' rather than in science" and that "the present day equivalent of the term 'useful arts' employed by the Founding Fathers is 'technological arts.'" *In re Bergy,* 596 F2d 952, 958–959 (CCPA, 1979) (citations omitted).
17. *Bilski, supra* n 3 at 3225, quoting *Chakrabarty,* n 16 *supra* at 308.
18. *Chakrabarty* at 308–309, quoting 5 Writings of Thomas Jefferson 75–76 (H Washington ed 1871).
19. *Id.* at 309.
20. *Funk Bros Seed Co v Kalo Inoculant Co,* 333 US 127, 130; 68 S Ct 440; 92 L Ed 588 (1948).
21. *Bilski* at 3225–3226.
22. 35 USC 100(b).
23. *Bilski* at 3226, quoting *Diehr,* n 11 *supra* at 182.
24. *Id.*
25. *Id.*
26. *Id.* at 3231.
27. Gottschalk, n 9 *supra.*
28. *Id.* at 70.
29. *Id.* at 73.
30. *Id.* at 72.
31. *Id.* at 67. While much faster and more reliable, digital computers that currently exist do not perform any analysis or computation that a person or group of people cannot perform, at least in principle.
32. *Id.* at 65.
33. *Id.* at 67–68.
34. *Id.* at 67.
35. *Id.* at 72–73.
36. *Parker,* n 10 *supra.*
37. *Id.* at 586.
38. *Id.*
39. *Id.*
40. *Id.*
41. See *id.*
42. *Id.* at 595 n 18.
43. *Id.* at 590.
44. *Id.* at 591.
45. *Diehr,* n 11 *supra.*
46. *Id.* at 177.
47. See *id.* at 178–179.
48. *Id.* at 184.
49. *Id.* at 187.
50. Such "signaling" by a computer comprises a signal that, while transient, is an electric or electromagnetic transmission used to convey data or information from one place to another. Typically, such data is superimposed on a carrier current or wave by a modulation process. While a signal is not a physical object, a signal modulated with data exists in the real world and is physical and real in that it is perceptible and has tangible causes and effects.
51. See generally *Brenner v Manson,* 383 US 519, 528–536; 86 S Ct 1033; 16 L Ed 2d 69 (1966).