Patenting signals

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The catalog of wacky patents is endless. There is even a Web site for them—http://www://colitz.com/site/wacky.htm. But now the US Patent and Trademark Office (PTO) has decided to encourage inventors to file for a new kind of patent that you surely would never have dreamed possible before. The PTO proposes patents on signals.

Say you think up a new algorithm for signal compression or even a new algorithm for sorting—call it Blister Sort. It has been accepted for some time that you could get a method patent covering a method of compressing signals in accordance with your algorithm. By the same token, you could get a patent for a method of sorting data in accordance with the Blister Sort algorithm. That is, if the algorithmic procedure is novel and unobvious.

More recently, the PTO decided it should allow patents on floppy disks and other storage media or devices (ROMs, for example) encoded with computer-readable program data. Thus, you can now get a patent on a floppy disk containing computer program code for carrying out Blister Sort. The PTO says that this doesn't violate the rule against patents on algorithms as such, because a floppy disk has important structural limitations. The limitation is that the patent does not cover carrying out the algorithm's procedure using just a pencil and paper. Therefore, the patent will not *entirely* preempt the possible use of the algorithm. So, no problem.

The PTO's latest idea is to spread the idea of floppy-disk patents beyond tangible storage media and devices to "propagated signals." This would mean issuing a patent claim to "a propagated signal carrying computer-readable information representing a computer program to carry out a Blister Sort on computer-readable encoded information (data)." A transmission of the computer program over a telephone or the Internet would be the "making" of the patented article of manufacture. Thus, if unlicensed, it would be an act of patent infringement. (US patent law gives a patent owner the exclusive right to make, use, sell, and offer to sell a patented combination of components.)

The same principle would apply to the signal compression algorithm as to the sorting algorithm. Moreover, the same logic would mean allowsing a patent on the further signal resulting from the use of a program embodying the signal compression algorithm. Thus, the PTO should be willing to grant a patent on a propagated signal compressed in accordance with the new compression algorithm. (Or on a transmission of a signal embodying data sorted with the patented Bubble Sort.)

Law by mantra

You might think that there is a problem because the patent statute (35 U.S.C. § 101) authorizes the PTO to issue patents only on processes, machines, compositions of matter, and articles of manufacture. A signal? Again, no problem. The PTO has decided that a propagated signal is an article of manufacture. A signal may be ephemeral and intangible, but it involves the motion of electrons through a wire or propagation of EMF through space. Since this occurs as a result of human agency at some point, the PTO says, it is an article of manufacture. "Anything made by man under the sun," the PTO's favorite mantra goes, "is patentable."

The trouble with that mantra, though, is that it proves too much. It is clearly *not* the law that everything man makes under the sun (or elsewhere) is patentable. Jokes, puns, business schemes, and editorials in *IEEE Micro* are all unpatentable though made under the sun by man. That goes for *mafiosi* who are "made men," too. The legal principle distinguishing

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things that are in principle patentable from those in principle unpatentable is more subtle than the mantra allows.

Too broad or too stingy?

The right legal principle appears to depend on distinguishing too abstract and sweeping a characterization of a technological advance from one that is too concrete, narrow, and specific. The first approach leads to excessive patents because they are overbroad and prejudicial to the interests of the public. The second approach leads to stingy patents that fail to provide adequate incentives for inventors, resulting in lessened technological progress (which is prejudicial to public interests).

The problem is how to draw proper lines of demarcation, so that the patent system promotes technological progress and is neither overbroad or too stingy. One of the things this calls for is determining what "overbroad" means.

Morse's telegraph patent

The famous case of Morse's telegraph illustrates the difficulties. Morse invented a particular telegraphic apparatus—the so-called repeater circuit. The repeater circuit (see accompanying box) overcame the problem of noise degrading signal, which Morse's predecessors had been unable to overcome with their devices. Morse claimed that apparatus in his earlier patent claims, and in his notorious claim 8 he further claimed the use of electromotive force to send and mark a message of intelligible characters or signs at any distance. He thus claimed—and preempted although he did not enable—the teletype, fax machine, television, transmission from a space satellite to Earth of digitized astronomic images, and many other devices and processes not invented until decades or more later. (The Morse controversy occurred about 150 years ago.)

The Supreme Court upheld Morse's claims to his particular apparatus but held claim 8 invalid on two grounds. One was that claim 8's scope exceeded Morse's enabling disclosure. The other ground was that, as a matter of law, Morse did not invent or discover the use of electromagnetic force to transmit intelligible signs at any distance. That was such an abstract and intangible characterization of the subject matter in controversy that it was an unpatentable idea rather than a patentable concrete embodiment of the idea. Rather, Morse invented only a particular apparatus for electrically transmitting intelligible characters in a particular way.

In this century, the Supreme Court has looked to the *Morse* case for a usable legal standard. It wanted to distinguish unpatentable computer algorithms as such (ideas) from concrete, and thus patentable, computerized equipment using computer algorithms to perform a useful task. In one case the Supreme Court held a claim to a procedure for converting BCD signals to binary signals to be unpatentable because it was directed to the algorithm itself. In another case, the Supreme Court held a process for molding rubber in an automatic rubber mold operated in accordance with an algorithm to be patentable because it was directed to a machine system that just *used* an algorithm. Those decisions represented application of the principle of the *Morse* case to different fact patterns, where the differences led to opposite legal outcomes.

As a legal issue, then, whether the propagated signals I described earlier ought to be covered by patents involves applying the *Morse* principle to their fact pattern. Do we have a case like that of the rubber mold equipment and Morse's earlier claims? Or do we have a case more like that of Morse's claim 8? (If we have something in the middle, we are lost.)

It seems to me that the main problem with Morse's claim 8 was not one of metaphysics. That is, did he claim an idea in the abstract or a tangible embodiment of an idea into equipment? Rather, the main problem is that though Morse did not invent the fax machine, he demanded a patent that would cover it. This would both discourage anybody else from trying to develop a fax machine (less reward available) and reward Morse for something (the fax machine) that he did not give the public. From a business and engineering standpoint, Morse's claim 8 causes more trouble for society than it does good.

Applying *Morse* to claims

How does that apply to signal claims? Do they do more harm or more good? Some parts of the answer may depend on what kind of algorithm is involved. Some algorithms can be readily implemented for any environment in which one would want to use them. Other algorithms can readily be implemented for some environments, such as low-speed, room-temperature, earthbound environments. But it may be very difficult to implement them for

Repeater circuit

The repeater circuit is a cascade of relays, in which each closure of a relay contact provides the current for the coil that closes the next relay farther down the cascade. See Figure A. In effect, this is a series of nonlinear amplifiers, each providing a new 1 to the next amplifier before the existing signal 1 becomes indistinguishable from a 0 because of noise. The Supreme Court called this a "plan for combining two or more electric or galvanic circuits, with independent batteries for the purpose of overcoming the diminished force of electromagnetism in long circuits."

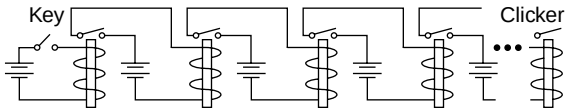

Figure A. Morse's repeater circuit.

high-speed, rigorous, space-probe environments.

Consider, for example, a pattern-recognition algorithm. It can be used for verifying signatures on checks, analyzing aerial photographs for locations of SCUD missile sites, picking up parts from an assembly line conveyor belt, or navigating a space vehicle through an asteroid belt. To implement the algorithm for a check verification application may require little disclosure on the part of the inventor.

To implement the algorithm, you use a CCD device to read the signatures. Speed and temperature is no concern; you just put the system in a room and it works. On the other hand, suppose you need to implement the same pattern-recognition algorithm for navigating a space vehicle through an asteroid belt while hostile aliens shoot phaser torpedoes at you. This is a real-time application under rugged environmental conditions, and the cost of system failure is high.

A patent application that explained only the first application (check verification) would not give the public the knowledge of how to perform the second application (navigation). The latter is to the first as the fax machine is to the telegraph. The ordinary rule of patent law is that a patent claim (particularly when it is worded, as is common for electronics patents, in terms of a list of means for performing various functions) is interpreted to cover only what the body of the patent explains and enables.

For most kinds of patents, that rule prevents a claim in a patent explaining only telegraphs from covering fax machines. That principle would apply to some extent to a floppy-disk (storage medium) kind of claim to the hypothetical pattern-recognition algorithm that I just described. A patent explaining how to carry out the algorithm with low-speed media such as a floppy disk would probably not provide enough explanation of the high-speed, rugged devices needed for phaser-resistant, fast, asteroid belt navigation use for a court to interpret the patent as covering the latter.

But in the case of a signal, that principle may break down. It may be that a signal is a signal is a signal. If you just describe how to encode the program into a signal, perhaps that is the end of the requirement. Maybe one signal fits all. I am not sure about this, but the patent system may lack its usual safeguards against overbreadth when the system is expanded to cover signals. If that is so, the public is being short-changed here.

Fault and the innocent infringer

Another problem with signal patents is how the patents would apply against infringers. The patent system is generally a no-fault system. You infringe it, you pay for it. Never mind your innocent state of mind. That is the rule for ordinary patent infringement (so-called direct infringement). A different rule applies when the defendant is sued for causing another person to commit direct infringement, for example, by selling necessary supplies or recommending infringing actions. In these cases—called contributory infringement and inducement of infringement—the defendant must be shown to have known that the challenged actions would lead to patent infringement. This is a fault rule, not a no-fault rule.

The plus side of this, from a patent owner's standpoint, is that signal patents will make it easier to go after pirates who market computer programs over the Internet. Such a pirate may well not practice the signal compression procedure or Blister Sort procedure that our hypothetical patents cover. She probably just sells the computer program by transmitting the code as a signal to a customer who downloads it.

If all a patent owner has to base a suit on is a patent on the process, it may be difficult to prove that the pirate committed a wrong recognized by patent law. Probably, the legal theory would need to be contributory infringement or inducement of infringement, where the person who actually infringes by using the patented process is the customer. Part of such a case is proving that the person claimed to have induced or contributed to the actual infringement knew about the patent.

But if the patentee has a signal patent, her case is easier. She doesn't need to show anything but the transmission of the infringing signal. That is a direct infringement. No-fault liability applies.

Do signal patents short-change the public?

That's fine if the defendant is a blatant pirate. But suppose the defendant is a telecommunications carrier or an Internet access provider. How are they to know that a customer is transmitting infringing signals? Moreover, they are deeper pocket defendants than fly-by-night pirates. Whom would you sue if you had the choice? The upshot is that a considerable amount of "accidental" infringement is likely to occur for signal patents. The defendants will have no way to prevent liability. But they will nonetheless be liable on a no-fault theory. That could present the Internet with some interesting problems.

There has been a similar problem under copyright and defamation law. The Usenet is rife with copyright infringers and slander. Courts have found copyright law and defamation law flexible enough for them to craft judicial exceptions to what otherwise might be strict liability for Internet access providers. Patent law is much less easy to twist in that manner. Probably it cannot be done except by persuading Congress to change the patent laws. Until that happens, the PTO's fondness for expanding its customer basis (and for providing greater "customer satisfaction") may give some bystanders unexpected new problems.

Coming Next Issue

Can you exclude problematic participants when you are setting a standard? Check *IEEE Micro*'s May-June Micro Law column for the answer.