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# Introduction to Intellectual Property Law for Multimedia Technology And Applications

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## 1. Introduction

### 1.1. *The Setting*

The term *multimedia* out of context implies transfer of information by at least two different transmission "media," for example a lecture transmitted by sound waves accompanied by slide images transmitted by light. What people really mean by multimedia today, though, is the presentation of information by a combination of two or more of the following: images (still or moving, two or even three dimensional), sound (acoustic or electronic), and text. Common custom also implies the presence of computers as a tool or as the delivery vehicle.

This paper employs an operational definition of multimedia as follows:

> *[M]ultimedia* is (1) a combination of software and multiple forms of content, (2) in digital form, (3) that is stored and delivered via computer technology, and (4) that is used in an interactive and nonlinear manner.[1]

Multimedia products have two basic components: content and vehicle. By vehicle we mean not so much the hardware, which can be CD's, the Internet, a computer, video, or other devices, some as yet uninvented. Instead, in the current context vehicle connotes primarily the software that is used to create the product and the software that is used to transmit and deliver it. Since this is a technical conference, this paper will emphasize the vehicle, but intelligent discussion requires at least an introduction to the protection of content. Moreover, copyright, which is the mainstay of content protection, plays a crucial role in software.

### 1.2. *The Basic Concepts*

The technology of multimedia advances with sometimes bewildering speed. Law, on the other hand, often moves glacially. It is also very much tied to past forms, and the bodies of law applicable to multimedia have developed mostly from centuries-old concepts. Law is also a blunt instrument, a human institution subject to great imprecision, mistakes, and seemingly arbitrary distinctions. One might characterize the application of law to multimedia technology as involving an impedance mismatch.

Nevertheless, creators of the law applicable to modern technology have been in general agreement, also for several centuries, that originators should be entitled to the fruits of their

[1] The current discussion draws heavily on a number of sources, but perhaps the most concise is Thomas J. Smedinghoff, *Multimedia Legal Handbook*, (Aspen Law & Business, 1998) [hereinafter cited as "Smedinghoff"]. The definition is found at page 1-5 of Smedinghoff.

new ideas and the beneficial results of their endeavors. However, the rights and needs of others and in particular the rights and needs of society as a whole must be balanced against the rights of creative and entrepreneurial individuals. Defining appropriate limits by balancing these often disparate interests is a difficult and never ending experimental process.

Four core doctrines form the foundation of modern intellectual property law. Trademark, trade secret, copyright, and patent law create generally complementary rights. In the Anglo-American legal tradition, trademark law grew out of common law doctrines of unfair competition (which to some extent grew out of craft guild practice): it is improper for someone else to pass off his product as yours. Trademark law thus concerns itself almost exclusively with the means of identifying one originator of goods and services and differentiating that originator from another. In this discussion we will dispense with discussion of trademark law.

Trade secret law also grew out of the venerable doctrine of unfair competition: it is fundamentally unfair to steal the valuable commercial secrets of another. In the United States, trade secret law is almost, but not quite, exclusively a state matter, and the vast majority of states have adopted the Uniform Trade Secrets Act, which attempts to codify and unify concepts developed over several centuries in the common law. Since multimedia content almost by definition is to be published, this paper deals with trade secrets in the discussion of vehicles.

Copyright in one form or another has existed in various places for many centuries, the earliest recorded copying dispute having occurred in the 6th century AD. This dispute arose out of unauthorized copying of an abbot's psalter by the Irish monk Columba, who (much later) became Saint Columba. Generally however, disputes over copying arose simultaneously with the printing press in the 15th century. Modern day English and American law has evolved largely out of the Statute of Anne, enacted in 1710, through periodic deletion of unworkable provisions and addition of new approaches.

Patent law grew out of the governmental practice of creating incentives for the development of new commercial arts and the importation of new goods. This practice involved the grant of a monopoly by publication of an "open letter," otherwise known as "letters patent." There is fragmentary evidence that such a practice originated in third century BC Greece. In modern times, the United States Constitution gave Congress the power to promote science and the useful arts, and both the first patent act and the first copyright act became law in 1790. Patents were authorized for invention or discovery of useful arts, manufacture, and devices not previously known. Patents give the holder a monopoly, limited in subject matter and time, on the practice of the invention. Precisely what the patent law grants is the right to exclude others from the practice of the invented matter. Patent protection will be covered in the vehicle, or software, segment of this paper.

## 2. Protection of Content

### 2.1. *Outline of the Law*

In multimedia products, content typically comprises a combination of images with text and sometimes sound. The only legal protection for such material (aside from trademark law, which covers only identification of origin) arises from copyright law. This paper outlines principally United States copyright law.

Formerly, United States federal copyright law covered only published works; authors had to fall back on state law for protection of unpublished works. In 1976, copyright legislation imposed the current system, in which federal law preempts state law for all works, published or unpublished. (A public speech not written down and not recorded is an example of a work of authorship still not covered by federal copyright law.)

The Berne Convention for the Protection of Literary and Artistic Works originally became effective for signatory countries in 1887. Not until more than 100 years later, however, did the United States adhere to the Convention and enact implementing legislation, which became law January 1, 1989. Congress' approach to conformity with Berne requirements was at best grudging, but gave enough ground to allow ratification. The implementing legislation did make some important changes to U.S. copyright law which brought it much closer to that of other industrial nations. For example, the implementing legislation abolished the mandatory copyright notice requirement for published works and exempted originators from other Berne countries from the requirement of U.S. registration before infringement suit can be brought. Later legislation, such as the Visual Artists Rights Act of 1990, which enacted a limited form of "moral rights" in works, brought U.S. copyright law closer to that of other Berne countries. However, in the legislative history of the enabling act the Congressional committees took the position that remaining conflicting requirements of the Berne Convention do not override U.S. law.

Statutory copyright protection has two basic elements: originality and fixation, 17 U.S.C. §102(a):

> Copyright protection subsists . . . in original works of authorship fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device.

The statute enumerates eight types of works of authorship, but the list is illustrative and not complete.

Subsection (b) goes on to delimit further the scope of copyright protection:

> In no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work.

In other words, copyright applies to original modes of expression only and really only prohibits copying. The ideas do not have to be original and in fact can be appropriated by others. In particular, scientific (and mathematical) discoveries are not protected by copyright. Indeed, even the mode of expression is not protected if a second person can prove origination without copying. *Waldman Publishing Corp. V. Landoll, Inc.*, 43 F.3d 775 (2d Cir. 1994).

The originality threshold is modest. Some European countries require an "aesthetic step" roughly equivalent to the "inventive step" requirement of patent law; the U.S. does not, although some minimum degree of creativity is necessary. For example, blank business forms with minimal text are not copyrightable. *E.g., Sheplers Catalog Sales, Inc. v. Old West Dry Goods Corp.*, 830 F. Supp. 566 (D. Kan. 1993). Fragmentary words and phrases, including titles, are not subject to copyright. *E.g., Arthur Retlaw & Associates, Inc. v. Travenol Laboratories, Inc.*, 582 F. Supp. 1010 (N.D. Ill. 1984). Neither rises to the level of originality necessary to sustain a copyright.

The law gives the copyright owner six bundles of exclusive rights to exploitation of a copyrighted work, 17 U.S.C. §§106, 106A:

(1) reproducing the work
(2) preparing derivative works
(3) distributing the work
(4) publicly performing the work
(5) publicly displaying the work
(6) with respect to works of visual art, assuring proper attribution, maintaining integrity of the work, and preventing destruction.

(A work of visual art is a painting, drawing, print, or sculpture, or a photographic image produced for exhibition only, either single copy or a signed and consecutively numbered limited edition of 200 or fewer.) For works created from January 1, 1978, copyright endures for the life of the last surviving author plus fifty years, except in the case of an anonymous, pseudonymous work, or work for hire, in which cases the copyright endures for 100 years from the creation or 75 years from publication, whichever expires first.

In the first instance copyright ownership resides in the authors of the work. In the case of a work made for hire—a work made by an employee within the scope of employment or a work specially ordered or commissioned when so designated in writing—the employer is considered the author for copyright purposes. Copyright or any subset of rights under the copyright may be licensed or sold and copyright ownership passes by inheritance.

Copyright registration is permissive, not mandatory. However, in all cases involving origin of the work in the United States, registration is necessary before suit for infringement can be brought, and a certificate of registration is prima facie evidence of validity of copyright. Also, the copyright owner may not recover statutory damages (up to $20,000) for the period when the work was unregistered unless it is registered within three months of publication. Registration requires deposit of copies, payment of fees, and submission of an application but is normally perfunctory. Marking of a work with copyright notice is also permissive, not mandatory, but if marking is done the notice must conform to certain statutory requirements.

Enforcement of copyright is by lawsuit in federal court. The court may order an infringer to cease use, may impound copies or order them destroyed, and may award either actual damages (lost profits and the like) or statutory damages.

The concept of infringement of copyright has a number of important wrinkles. Some works, especially older works, are in the public domain. The Copyright Act provides for "fair use" without infringement of small portions of works for noncommercial purposes, with some other refinements (see below). Finally, there are some traps in the protections provided. For example, the "first sale" doctrine provides that the copyright owner of, say, a music CD or a book cannot prevent the buyer from selling it to someone else. However, the exclusive right of public performance enables the copyright owner to prevent the subsequent legitimate owner of the CD, for example, from playing it for a large number of people, especially for commercial purposes. In particular, transmission of certain works over the Internet will be held to be infringement notwithstanding that the transmitter legitimately owns a copy of the work.

The Copyright Act is not absolute in that it imposes some limitations on the monopoly granted by copyright. The most important and most often invoked of these is the doctrine of fair use. This doctrine is of relatively ancient origin but is now codified in 17 U.S.C. §107, which provides, in pertinent part:

> [T]he fair use of a copyrighted work ... for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research, is not an infringement of copyright. In determining whether the use made of a work in any particular case is a fair use the factors to be considered shall include –
>
> (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;
> (2) the nature of the copyrighted work;
> (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
> (4) the effect of the use upon the potential market for or value of the copyrighted work.

Generally copying for multimedia products will not be considered fair use. However, this doctrine is important in the analysis of certain software issues (see below).

### 2.2. *Application To Multimedia Works*

In many instances some or all components of a multimedia work will be excerpted or derived from the previous work of others. In such instances, permissions or licenses must be obtained from copyright holders of all preexisting segments of a multimedia product. The segments often come from different industries—motion pictures, books, music, for example—and each industry may have different routines and practices for granting licenses. Also, sometimes there are overlapping copyrights. A multimedia product which incorporates 1,000 such segments, far from an unknown situation, presents a daunting licensing problem.

The multimedia product itself, even if assembled out of previously copyrighted segments of material, is inherently copyrightable as either a "compilation" or a "collective work" under the Copyright Act if the assemblage rises to the modest level of originality necessary to support copyright. To assure that the multimedia producer retains the copyright, the producer needs to take care either that the persons who create or assemble the multimedia product are true employees or that they have signed written documents agreeing that the work is a work for hire.

As previously noted, a number of infringement traps can ensnare the unwary. For example, transmission of a multimedia product over the Internet, which can be characterized as public performance, can give rise to infringement if the requisite scope of licensing has not been obtained. Moreover, a digital embodiment of a substantial portion of a visual or musical work is a copy for copyright purposes.

## 3. Protection of Non-Content Software

The principal "vehicle" of interest for multimedia applications is software. Protectable software may be that used to create, develop, or edit content. It may also be the software needed to access the work, search a database, or play back a work involving moving pictures or sound. Finally, relevant software may be that used to compress or transmit content. In practice, digital signal processing techniques are treated as indistinguishable from computer programs. Trade secret law, copyright law, and patent law give different kinds of protection to software.

### 3.1. *Trade Secret Law*

In the United States trade secret law is for the most part a matter of state, not federal law. However, the vast majority of states have brought substantial uniformity to trade secret law by the enactment of the Uniform Trade Secrets Act. Even in the handful of jurisdictions which do not have the Uniform Act, differences are generally insubstantial.

The Uniform Act defines a "trade secret" as:

> information, including a formula, pattern, compilation, program, device, method, technique, or process that:
>
> (1) Derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use; and
>
> (2) Is the subject of efforts that are reasonable under the circumstances to maintain its secrecy.

There is little doubt that computer programs can be trade secrets. *E.g.*, *Avtec Systems, Inc. v. Pfeiffer*, 21 F.3d 568, 575 (4th Cir. 1994). Misappropriation means acquiring the information by improper means or receiving and using it after someone else has obtained

it by improper means. Remedies for misappropriation under the Uniform Act include both damages and injunctions.

Actual secrecy, specifically that the information not be known to competitors, and economic value to the holder are necessary to trade secret protection, as are substantial efforts by the holder to keep the information secret from competitors. Sometimes courts look for at least a modicum of novelty in technical secrets to determine whether a trade secret really exists—novelty in this case is a surrogate for not being known by competitors—but novelty never has to rise to the level necessary for patent protection. Even if a computer program incorporates some known algorithms and data, typically a specific program can be a trade secret because of the very specific logic and coherence in a particular implementation. "Trade secret novelty (or secrecy) requires only that the particular architecture of a program is valuable and that it is neither a matter of common knowledge nor readily duplicated."[2]

The trade secret holder must make diligent efforts to preserve the secrecy of the information. Employees are bound by common law duties not to disclose the employer's trade secrets or use them for the employee's own gain. Disclosure of trade secrets to another party requires the owner to extract a confidentiality commitment from the recipient. Written confidentiality agreements are commonplace among businesses evaluating one another's ideas. Similarly, licensing of proprietary software will typically involve a requirement to maintain it as a confidential trade secret. When a product is for sale on the open market, maintenance of trade secret protection can be difficult, perhaps even impossible.

Multimedia products themselves, of course, are placed in commerce and therefore disclosed generally. They are then not trade secrets. On the other hand, a great deal of the software which gives the user access to the product or makes it "work" is valuable, is frequently a secret, and is therefore inherently capable of being a trade secret.

The difficulty with maintaining trade secret status for software embedded in multimedia products is that "reverse engineering" is a time honored and legal route around trade secrets. It is perfectly legal for a competitor to purchase your equipment which performs uniquely because of the incorporation of a trade secret, disassemble it, and figure out how it works, for the purpose of developing a competing product. If software is embedded, say, in a CD ROM sold to the public, the buyer can reverse engineer the software without violating trade secret protection.[3] On the other hand, a search engine provided by an Internet provider or by an online database could very well remain a trade secret indefinitely. Detailed facts will determine whether trade secret protection would hold up in specific situations.

### 3.2. *Copyright Protection for Software*

For copyright purposes, a computer program is a "literary work" with respect to which the owner has the rights granted by 17 U.S.C. §106. *E.g.*, *M. Kramer Mfg. Co. v. Andrews*, 783 F. 2d 421 (4th Cir. 1986). However, the Register of Copyrights and the courts take the position that only those portions of a work which are properly copyrightable may obtain protection. In the case of computer programs, this position has led to some rather confusing analysis by the courts regarding what elements of software are worthy of copyright protection.

Section 117 of the Copyright Act establishes an important limitation of the rights of the copyright holder in a computer program:

> [I]t is not an infringement for the owner of a copy of a computer program to make . . . another copy or adaptation of that computer program provided:
>
> (1) that such a new copy or adaptation is created as an essential step in the utilization of the computer program in conjunction with a machine and that it is used in no other manner, or

[2] Smedinghoff at 9-7 to 9-8.

[3] But see the discussion of reverse engineering with respect to copyright which follows.

> (2) that such new copy or adaptation is for archival purposes only and that all archival copies are destroyed in the event that continued possession of the computer program should cease to be rightful.
>
> . . .

On the other hand, unauthorized copying of the literal line by line source or object code of an entire program infringes its copyright. But what is at issue in most cases is unauthorized appropriation of important components or structures of programs. In particular,

> Two particular issues have been the focus of attention recently: (1) protection for the nonliteral elements of a program, sometimes known as the program's "structure, sequence, and organization," and (2) protection for interfaces—*e.g.*, those parts of the program that the user sees or that communicate internally between different parts of the computer or between the hardware and a computer program. [4]

The Copyright Act in particular grants the holder the exclusive rights to make derivative works, 17 U.S.C. §106(2), where the Act defines as a work, 17 U.S.C. §101:

> based on one or more preexisting works, such as a translation, musical arrangement, dramatization, fictionalization, motion picture version, sound recording, art reproduction, abridgment, condensation, or any other form in which a work may be recast, transformed, or adapted.

So more than the exact literal code listing must be protected.

One must also keep in mind the idea-expression dichotomy inherent in copyright law. The method which inheres in a set of computer instructions is protectable, if at all, by patent law. Copyright cases give no discernible general guidance as to how the unprotected idea content of a copyrighted work is to be sorted out, however.

In *Whelan Associates v. Jaslow Dental Labs*, 797 F.2d 1222 (3rd Cir. 1986), *cert. denied*, 479 U.S. 1031 (1987), a computer program for the management of dental laboratories was at issue. Defendant did not copy the program; rather, it was rewritten in a different language for a different type of computer. It was not a mere translation from one computer language to another—Fortran to C++, for example – because the program required substantial revision to run on the defendant's computer. The court found that the defendant had copied the flow of the program, its structure, sequence, and organization. It further found those elements of the program protected under copyright, but used a flawed analysis—analogy to a theatrical play—to determine that structure, sequence, and organization were not part of the uncopyrightable "idea" behind the program.

On the other hand, the court in *Computer Associates International, Inc. v. Altai, Inc.*, 775 F. Supp. 544 (E.D. N.Y. 1991), *aff'd*, 982 F.2d 693 (2d Cir. 1992) created an "abstraction-filtration comparison test." In this approach, courts hearing computer copyright infringement cases are supposed to break down the allegedly infringed program into its structural parts, then examine each part for "ideas" and expression necessarily incidental to those ideas, and elements taken from the public domain. The court then filters out ideas and public domain material as unprotectable, thereby finding the kernel or kernels of creative expression. The court then compares the "kernels" to the accused program to ascertain substantial similarity. How a court would apply this form of analysis in a particular situation is anyone's guess. In fact, this analysis suffers in part from the same flaw as *Whelan* and in addition probably requires the court to hire an independent software expert to apply it. Other courts have taken the approaches of *Whelan* and *Computer Associates* to even more bewildering extremes. An interpretation that would focus on the entire program, in particular the programmer's choice

[4] William F. Patry, "Copyright Law and Practice" (Bureau of National Affairs, Inc. Washington, DC 1994) at 215 [hereinafter cited as "Patry"].

and ordering of elements, the selection and arrangement of such elements, may offer a way out of the analytical wilderness so far created by the courts. [5]

Another question that arises with respect to computer programs is whether "decompilation" or reverse engineering is infringing use. Decompilation or dissassembly necessarily results in the making of a "copy" of a program not authorized by 17 U.S.C. §117, which is therefore prima facie infringement. If the purpose of the decompilation is to develop a product which will potentially displace the copyrighted program in the market, a court would likely find that decompilation was not fair use under §107. On the other hand, such use to develop a competing product is not always infringement. For example, in *Sega Enterprises, Ltd. v. Accolade, Inc.*, 977 F.2d. 1510, 1527-28 (9th Cir. 1992), the court held that disassembly to enable the defendant to make competing game cartridges compatible with plaintiff's game console was fair use:

> [W]here disassembly is the only way to gain access to the ideas and functional elements embodied in a copyrighted computer program and where there is a legitimate reason [*e.g.*, interoperability] for seeking such access, disassembly is a fair use of the copyrighted work, as a matter of law.

It is not clear that this analysis will stand the test of time, but fair use for interoperability of software is likely to survive in some format. In particular, the European Union *Directive on the Legal Protection of Computer Programs*, 91/250/EEC, O.J. (L 122)(May 14, 1991), provides in Article 6 explicit authorization for decompilation to achieve interoperability with independently created software.

Copyright law is an imperfect shield against unfair copying of a software developer's independent and original work. As we have seen, it explicitly declines to protect a computer program's ideas, concepts, and methods. These are often the most valuable parts of a new program. Moreover, not all of the specific expression in a computer program even rises to the level of originality necessary for copyright protection, and the tests the courts have developed to determine what is protected are murky at best. Moreover, trade secret law only protects what is kept secret. Obviously an additional mode of protection is necessary.

## 4. Patent Protection of Software

Patent law, which in the United States at least has developed extensively over the last couple of decades, provides a partial remedy to the deficiencies of these doctrines.[6] A patent is a grant of a legal monopoly for a fixed period of time for the making, use, and sale of new and useful articles and methods. In reality, a patent gives the right to exclude others from using whatever is encompassed by the patent but not, as will become clear, necessarily the right to use what is in the patent. In the United States (and probably in most other federal nations as well) federal law enables and regulates patents exclusive of state law.

An invention, to be patentable, must meet five requirements: the subject matter must be patentable, the invention must be novel, it must not be obvious to one "skilled in the art" (a kind of abstract, idealized, middle-of-the-bell-curve practitioner of the subject matter), the invention must work (or at least not obviously not work) [7], and the inventor must be, in the United States, the first person to develop or discover the invention, or, in most other countries, the first person to file a patent application on the invention. In other countries, novelty is also a requirement, and the United States concept of "non-obviousness" is generally incorporated by requiring an "inventive step."

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[5] Patry, Vol. I, at 226.

[6] A reliable and helpful guide to software patenting is Gregory A. Stobbs, "Software Patents" (John Wiley & Sons, Inc., New York 1995)

[7] The Patent Office seems only to apply this requirement rigorously in chemical applications, where evidence that an invention actually works is frequently required. Otherwise, only obviously inoperable inventions, for example, perpetual motion machines, will be rejected.

In the United States, we now are the beneficiaries of almost two hundred years of experience in interpreting and refining these requirements with respect to devices and machines, chemicals, and industrial processes. The resulting application of the law is complex, but at least patent attorneys understand the requirements reasonably well. Only in recent decades, however, has software become even arguably patentable, and the details and underlying rationales are still being worked out.

The most pertinent provisions of United States patent law appear in Title 35 of the United States Code from about §100 to about §120. Section 102 spells out the details of the first tier limitations, novelty and inventorship.

The actual details of §102's limitations are somewhat intricate, but generally an invention must be truly novel, that is, the invention must not have been known or used in the United States or patented or published anywhere by others before the current invention; the current inventor must actually have invented the claimed matter, must be the first inventor of it in the United States[8], and must not have abandoned it; and the current inventor must not have patented, published, or permitted public use or sale of the invention more than a year before application in the United States. In European practice and in most other countries, the "first invention" requirement does not exist; rather the first inventor to file a patent application gets priority. In addition, in most other countries there is no grace period of a year between publication or public use or sale and filing a patent application: publication at any time before patent filing destroys patentability. The threshold in the United States for determining that something is published or in public use is very low.[9] There is, however, generally a grace period of twelve months between filing a patent application in one country and filing in another by virtue of the 1883 Paris Convention for the Protection of Industrial Property (revised in the late 1960's).

Section 103 further limits the grant of a patent to developments which would not have been obvious as a whole to a person of "ordinary skill in the art to which [the] subject matter pertains." The requirement of an "inventive step" or its equivalent found in other countries' patent law is approximately equivalent.

A lengthy and expensive process of application and examination precedes the grant of a patent. The Patent Office examines an application for compliance with the law. A Patent Examiner, of which there are very approximately 2,000 in the United States Patent Office, conducts this process.

A patent application must include at a minimum a specification, which must describe the invention, and claims, which delimit for legal purposes the essence of the invention.[10] Generally, but not universally, drawings are required as well. Section 112 of 35 U.S.C. states the requirements for both specification and claims. The specification must describe the invention so that a person skilled in the art could use the invention. Drafting and amending claims to meet the requirements of §112—claims must particularly point out and distinctly claim the subject matter the inventor regards as the invention— is a large part of the process of having a patent allowed. The claims must also find substantive, and usually textual support, in the specification.

The other major part of patent prosecution is establishing that others have not previously invented essentially the same thing or rendered the new invention obvious. (A Patent Examiner typically finds obviousness when a combination of two references, along with discernible

[8]The North American Free Trade Agreement and the Uruguay Round of the General Agreement on Tariff and Trade extended first inventorship to invention in participating countries.

[9]Tours of closed laboratories in which classified research was being conducted have given rise to findings of public use.

[10]The United States now permits provisional applications without claims. These must be turned into a regular application within a year of filing, else they lapse. However, provisional applications do establish a filing priority date.

motivation to do so, would yield the invention.) Overcoming Patent Examiners' rejections based on an assertion that others have previously invented the same thing or that others have rendered the present invention obvious can be an arduous process. With respect to digital signal processing inventions, this process can be excruciatingly difficult because the Patent Examiner's education, training, and experience may not enable even a superficial understanding of an application's contents.

Until about twenty years ago, the insuperable bar to software patents was that computer programs represented abstract mathematics, inherently unpatentable subject matter. Although the courts and the Patent Office have receded from this draconian position over the last two decades, the change has been halting and sometimes confusing. An outline of the history of this change aids understanding of the current interpretation of the law.

Section 101 of 35 U.S.C. defines the patentable subject matter in United States practice:

> 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 therefore, subject to the conditions and requirements of [the remainder of the patent statute].

Difficulty for software patenting originated in this section, because United States courts have long held that pure scientific discoveries and abstract ideas, and especially mathematics, do not fall within the definition of new and useful machine or process. (Other countries incorporate similar or related distinctions.) In past decades software was routinely refused patent protection in the Patent Office and in the courts because it was characterized as made up of algorithms indistinguishable from mathematics or other abstract ideas.

The first important court decision addressing software directly was the U.S. Supreme Court case *Gottschalk v. Benson*, 409 U.S. 63 (1972). This case involved an application for a patent on a method to convert decimal numbers, or really binary coded decimal numbers, to true binary. The Court found this application to attempt to capture an idea, the conversion algorithm, and characterized the method as a principle not a patentable process. Although this opinion can be understood as limited to manipulation of pure numbers, it chilled the filing of applications for software patents for about a decade. A few years later, in *Parker v. Flook*, 437 U.S. 584 (1978), the same Court further stated that "post solution activity"[11] in the physical world could not transform an unpatentable principle into a patentable process. The general idea was that one cannot apply a verbal band-aid to a claim attempting to capture a pure algorithm and hope to succeed.

The tide began to turn in *Diamond v. Diehr*, 450 U.S. 175 (1981). This case involved the process of curing synthetic rubber in a mold by heat. The invention used temperature sensors inside the mold, a digital computer programmed to process these measurements according to an equation which was known to predict cure time, and a computed signal of when to open the mold. The Supreme Court held this process to be patentable subject matter. Justice Rehnquist, who wrote the majority opinion, characterized the difference between a patentable process and a principle:

> Transformation 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 particular machines.

[11] In this case the Supreme Court rejected the claim at issue because the final step of the claimed process involved updating an alarm limit, which the Court characterized as "a number," *id.* at 585, for catalytic chemical conversion of hydrocarbons: "A competent draftsman could attach some form of post-solution activity to almost any mathematical formula; the Pythagorean theorem would not have been patentable . . . because a patent application contained a final step indicating that the formula, when solved, could be usefully applied to existing surveying techniques." *Id.* at 590.

*Id.* at 184. The lack of a "particular machine" covers most situations involving general purpose computers. In 1983, the Congress created a new court, the United States Court of Appeals for the Federal Circuit, which now hears all appeals of patent matters. Notwithstanding *Diamond*, the Patent Office showed reluctance to entertain software patent applications. A number of cases came before the Federal Circuit with mixed results. A representative example is *Arrhythmia Research Technology, Inc. v. Corazonix Corp.*, 958 F.2d 1053 (Fed. Cir. 1992), in which the court found a computer method for analyzing electrocardiograph signals to be patentable subject matter. The input signals were not abstractions, the court said, and neither was the output, since it "is a signal related to the patient's heart activity." *Id.* at 1059. "The view that 'there is nothing necessarily physical about "signals" ' is incorrect." *Id.*

It remains "non-obvious" how the Federal Circuit in *Arrhythmia* got around the Supreme Court's alarm limit holding in *Parker v. Flook, supra*. But this and later decisions emphasize the application of the process in the real world. Perhaps if the claims in *Parker* had merely added the step that the updated alarm unit is then used either to shut down the chemical process or to adjust its flow the Supreme Court might have held otherwise, as it did in *Diamond v. Diehr, supra*.

Finally, in *In re Allapat*, 33 F.3d 1526 (Fed. Cir. 1994) the court (in an *en banc decision*, which makes it binding precedent throughout the United States unless the Supreme Court overrules it in a later case) took the approach that a claim involving software must be evaluated as a whole. In particular, the court emphasized the fact that the claimed process culminated in data being converted into illumination data for display on a screen. With respect to programs to be run on general purpose computers, the court stated:

> We have held that such programming creates a new machine, because a general purpose computer in effect becomes a special purpose computer once it is programmed to perform particular functions pursuant to instructions from program software.

*Id.* at 1545. It further stated:

> [T]he dispositive issue is not whether the claim recites on its face something more physical than abstract mathematics . . . The dispositive issue is whether the invention or discovery for which an award of patent is sought is more than just a discovery in abstract mathematics.

*Id.* at 1557 (emphasis in original). Subsequently, in *In re Lowrey*, 32 F.3d 1579 (Fed. Cir. 1994), the court held a claim to data structures to cover patentable subject matter because the claims recited the computer memory in which the data structure is embedded, the computer memory being an article of manufacture.

If the foregoing seems to be grounded excessively in metaphysics, later Federal Circuit cases have done little to create a bright line distinction between patentable and unpatentable subject matter. The only clarifying document issued recently is the Patent and Trademark Office's guidelines, "Examination Guidelines for Computer Related Inventions," 61 Fed. Reg. 7478 (Feb. 28, 1996). The purpose of this document was to give Patent Examiners guidance in examination of software inventions.[12]

Briefly, software claims directed to very specific machines, that is, machines adapted to and only to the purpose of the program will be treated as articles of manufacture and therefore inherently patentable if the machine has a practical application to the technological arts. *Id.* at 7483. If software claims encompass more or less any machine embodiment, it is treated as a process, and

> To be statutory, a claimed computer-related process must either: (1) Result in a physical transformation outside the computer for which a practical application in the technological arts is either disclosed in the specification or would have

[12] Federal agency "guidelines" are not legally binding but Examiners will certainly rely on this document.

> been known to a skilled artisan . . . or (2) be limited by the language in the claim to practical application within the technological arts . . .

*Id.* With respect to (1),

> A process is statutory if it requires physical acts to be performed outside the computer independent of and following the steps to be performed by a programmed computer, where those acts involve the manipulative [sic] of tangible physical objects and result in the object having a different physical attribute or structure. Thus if a process claim includes one or more post-computer process steps that result in a physical transformation outside the computer (beyond merely conveying the direct result of the computer operation . . . ), the claim is clearly statutory.

*Id.* In addition,

> Another statutory process is one that requires the measurement of physical objects or activities to be transformed outside of the computer into computer data, where the data comprises signals corresponding to physical objects or activities external to the computer system, and where the process causes a physical transformation of the signals which are intangible representations of the physical objects or activities.

*Id.* at 7484. With respect to (2) above,

> There is always some form of physical transformation within a computer because a computer acts on signals and transforms them during its operation and changes the state of its components during the execution of a process. Even though such a physical transformation occurs within a computer, such activity is not determinative of whether the process is statutory because such transformation alone does not distinguish a statutory computer process from a non-statutory process. What is determinative is not how the computer performs the process, but what the computer does to achieve a practical application.
>
> . . . [A] computer process that simply calculates a mathematical algorithm that models noise is non-statutory. However, a claimed process for digitally filtering noise employing the mathematical algorithm is statutory.

*Id.* at 7484.

The Patent Office still uses a form of the *Parker v. Flook* post-solution activity basis for rejection:

> In some instances, certain kinds of post-solution "acts" will not further limit a process claim beyond the performance of the preceding mathematical operation step even if the acts are recited in the body of a claim. If, however, the claimed acts represent some "significant use" of the solution, those acts will invariably impose an independent limitation on the claim. A "significant use" is any activity which is more than merely outputting the direct result of the mathematical operation.

*Id.* at 7485. For example, merely displaying the result as a shade of gray rather than as a number or transmitting electrical signals will not make the claim statutory.

If one gets the sense that governmental authorities are still groping for workable definitions of what software should be patentable, his perception is correct. The Patent and Trademark Office guidelines, however imperfect, are a big improvement on the recent past both in the Office itself and in the courts. It seems likely that the Patent Office and the Federal Circuit, as they gain even more experience with software patents, will continue the trend toward clearer and more workable rules.

G. H. Hardy, an eminent mathematician of the early part of this century, wrote:

> I have never done anything "useful." No discovery of mine has made or is likely to make, directly or indirectly, for good or ill, the least difference to the amenity of the world.

Hardy probably would have been horrified if one of his discoveries had resulted in a patentable invention. He was wrong about the usefulness of his discoveries, however, because at least one asymptotic formula from number theory that he and Ramanujan worked out has found significant use in nuclear reaction theory.

Hardy did prefigure the distinction which patent law is now trying to work out with respect to algorithms. Perhaps a person of his brilliance and accomplishment could give us better guidance with respect to what computer algorithms are useful and affect things in the real world and therefore should be patentable. Until then, we shall have to labor mightily in the trenches and make do with the thoughts ordinary lawyers, judges, and legislators.

## 5. Conclusion

The protection of software is the most difficult but perhaps the most fruitful aspect of applying intellectual property law to multimedia technology and applications. Copyright protection is usually necessary but often not sufficient. To protect the novel idea content of a new program or signal processing technique, a patent is necessary. Because governments do not want to give individuals monopoly power over mathematical methods, scientific discoveries, and laws of nature, it is necessary to sort out which programs are truly practical applications of algorithms and which are not. Doing so can require abstruse distinctions the consistency of which is not readily apparent. Dabbling in metaphysics may be unfamiliar to mathematicians, scientists, and engineers, and it certainly is to lawyers, but it appears to be a necessary concomitant of applying patent law to software.