Technological Protection Measures in the Courts

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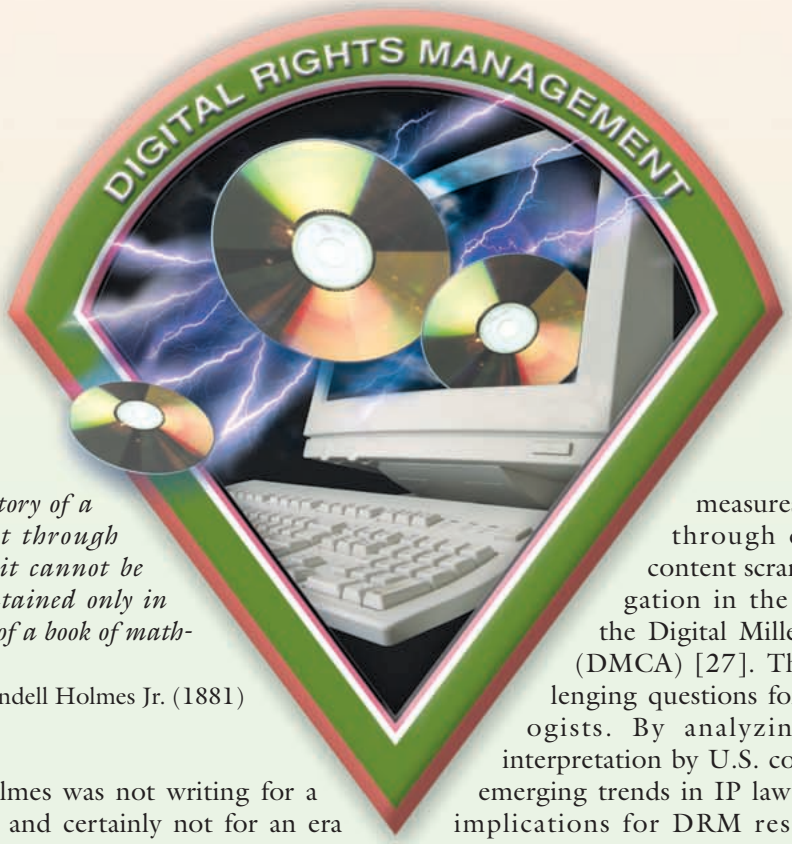
Law, engineering, and DRM lessons learned from the failure of the content scramble system.



The law embodies the story of a nation's development through many centuries, and it cannot be dealt with as if it contained only in axioms and corollaries of a book of mathematics. [9]

—Oliver Wendell Holmes Jr. (1881)

Though Holmes was not writing for a digital age and certainly not for an era of digital rights management (DRM), his remarks may hold some interesting insights for solving the DRM enigma. This article is about the similarities and differences that exist between law and engineering. It is about the nature and value of interdisciplinary research and the importance this approach will have in dealing with the problems associated with media piracy and unauthorized use of digital information. The chief aim of this article is to explore legal reasoning as it applies to technological protection measures (TPMs). We do this through consideration of the content scramble system (CSS) litigation in the United States under the Digital Millennium Copyright Act (DMCA) [27]. The DMCA poses challenging questions for lawyers and technologists. By analyzing this law and its interpretation by U.S. courts, we identify some emerging trends in IP law generally and suggest implications for DRM research. Although the DMCA is of greater application in the United States, we believe that this legislation is a response (in part) to intellectual property (IP) obligations at the international level. Similar legal movements in other jurisdictions have been initiated or are expected. Since the enforcement of intellectual property takes place at the national level, we focus on this particular jurisdiction in order to gain more understanding of DRM as it pertains to law.

Specifically, we discuss:

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▲ 1) The fact that courts and legislatures are increasing their attempts to direct the course of emerging technologies.
▲ 2) The effect that this will have on the legitimate acts of circumvention (e.g., development of new technology, fair use, and free speech) is unclear.
▲ 3) How interdisciplinary research can inform the debate on media piracy and unauthorized use of content as well as provide appropriate solutions to promote social discourse, competition, and innovation.

Overview: Challenges to TPMs

Jon Johansen and the Content Scramble System

Our study considers CSS, a well-known TPM based on encryption used for access control and copy prevention of digital versatile disks (DVDs). This DRM system was (in)famously hacked by the Norwegian teenager Jon Johansen and two other unnamed individuals in 1999. The decrypting program (DeCSS) allowed the copying of digital content on to computer hard drives as well as their playback on noncompliant machines. Johansen faced criminal charges in Norway for the use, distribution, and development of DeCSS. The court found that Johansen was not guilty. There were essentially three substantive issues in the case.

The first matter concerned whether Johansen unlawfully obtained access to data (i.e., DVD movies) or software stored or transferred by electronic or other technical means [15]. The Oslo court reasoned that decisions of unlawful access must be based solely on whether the individual in question had the authorization to gain admittance and should not be dependent on the manner in which access was obtained [3]. Thus, even though the DVD Copy Control Association (DVDCCA) intended to technologically protect a copyright work by encrypting with CSS, this fact did not legally preclude a user from circumventing the system to gain access to a lawfully purchased DVD. Johansen used DeCSS on the DVDs of "The Matrix" and "The Fifth Element," both of which were lawfully purchased; thus, his use DeCSS was not considered to be illegal.

Johansen also made DeCSS available on his personal Web site. The second substantive issue, therefore, involved whether Johansen could be found guilty of producing and publishing a tool that made it possible for others to unlawfully gain access to DVD movies. On this point the court reasoned that DeCSS could be used both lawfully (i.e., on legally acquired DVDs for private use) and unlawfully (e.g., for copyright infringement). Since it could not be proven "beyond a reasonable doubt" that Johansen developed DeCSS with the exclusive purpose of DVD copyright infringement, he was not found guilty of violating the law. The court further added that even if Johansen was aware that DeCSS could be misused, he still could not be convicted as this situation is commonly true of anyone who develops and distributes goods that may be have the potential to be used unlawfully.

The third issue debated whether reverse engineering a TPM was unlawful. The court found that breaking a TPM is not a violation if the accused has authorized access. The court noted that because the DVD player belonged to Johansen, as a matter of personal right he was entitled to reverse engineer the CSS component. At the time of this writing, the prosecutor has appealed this case, so the Johansen verdict may ultimately be overturned.

Technology and Law

CSS consists of a stream cipher and authentication protocol that employs symmetric encryption technology. Various sets of keys unique to the DVD player and DVD content are used in the system to establish access control to the content, and trust among the DVD itself, the associated player, and the host computer. CSS, in part, enforces regional viewing restrictions that ensure "first showing" in different parts of the world. CSS is proprietary, so its implementation within a system requires that manufacturers agree to the terms of a license agreement. This provides the licensing agency with a degree of control over the DVD player characteristics. For instance, the agency can insist on the inclusion of other security technologies in addition to CSS, such as digital watermarking.

The DMCA provides legal protection to CSS by making the act of circumvention and trafficking in devices that circumvent CSS unlawful. However, CSS has been described as an exemplary "break once break everywhere" weak system [2]. In spite of legislative protection for TPMs, CSS has been technologically broken through the development of DeCSS and more recent cryptanalysis studies.

Both legal and technological developments have caused considerable alarm in the legal community. For instance, although regional access restrictions are imposed by CSS, Kamarsky notes that there is nothing in copyright law that prevents a legitimate consumer of a work from using his or her lawfully acquired goods in another country [12]. The degree and extent of control that copyright owners have over the use and access of their work is at the heart of the current legal debates concerning DRM.

The Digital Millennium Copyright Act

In the United States, Eric Corley, Shawn Reimerdes, and Roman Kazan were involved in the dissemination of DeCSS via the Internet. Several motion picture industries sought an injunction under the DMCA to forbid these Web sites from directly posting the decryption software and from providing hyperlinks to other sites that made DeCSS software available. In the trial court ruling, *Universal City Studios v. Reimerdes* [30], the court granted the injunction and ruled that posting decryption software and hyperlinks violated the DMCA. As we further elaborate in this article, it was also found that the DMCA antitrafficking provisions

did not violate the U.S. Constitution. While the other defendants settled, Eric Corley appealed the *Reimerdes* judgment. In the appellate case, *Universal City Studios v. Corley* [29], the Court of Appeals maintained the earlier *Reimerdes* decision.

This judgment in the United States contrasts the more tolerant perspectives on DRM circumvention and trafficking in the Johansen case in Norway. The current disparity is an indication of the *transient* roles of law and technology in DRM, which provides an excellent environment to participate in interdisciplinary discourse. This is an ideal opportunity for engineers and technologists to appreciate the subtleties of legal interpretation as it applies to DRM in order to identify effective design parameters for next-generation TPM systems. Although the cases we consider in this article apply to the CSS, we believe that our investigation has merit to provide insight for general TPMs.

Legislative Framework for DRM

The international intellectual property regime consists of agreements between countries that allow for the mutual recognition and enforcement of IP rights globally. The enforcement of copyright is an international concern. In order to harmonize rules among countries, treaties have been entered into by members of the World Intellectual Property Organization (WIPO) to "provide adequate legal protection and effective legal remedies against the circumvention of technological measures ..." [31]. It has been argued that existing laws, prior to the DMCA, already satisfied the requirements of the WIPO treaties and, therefore, the DMCA was excessive. Furthermore, it has been criticized that the provisions of the DMCA are "unpredictable, overbroad, inconsistent and complex" [21].

The DMCA consists of three main provisions, which are subject to various exemptions. The first of these targets acts of circumvention and applies to access controls. The second and third provisions apply to trafficking in technologies that circumvent TPMs that control either access to a work or that protect the rights of a copyright holder. The DMCA targets both wrongful conduct and the facilitation of wrongful conduct with respect to the circumvention of TPMs.

The definition of trafficking is extremely broad, covering a wide range of activities. It must be shown that primary purpose of the distributed technology is to circumvent a TPM and that the technology has limited use other than to circumvent a TPM. The statute is also violated where the technology is marketed by a person having knowledge of the circumventing purpose of the technology. Thus, the court in *Reimerdes* ruled that the posting of DeCSS on a Web site amounted to "offer[ing] to the public" or "provid[ing] a circumvention tool" or "traffick[ing]" of a circumvention tool within the meaning of the DMCA [27].

In relation to access controls, a TPM is a technology that in the ordinary course of its operation effectively controls access to a work. A DMCA violation occurs when the TPM is circumvented without the authority of the copyright holder. What is apparent from a first reading of the DMCA is the high degree of control that copyright holders have over their IP in relation to the subsequent consumers.

Exemptions to the DMCA

There are exemptions to the DMCA that purport to preserve the traditional balance between copyright holders and the public. However, these exemptions are incoherent and do not reflect the full range of legitimate reasons to circumvent a TPM. In this article, we focus on the exemptions for reverse engineering, encryption research, and security testing as they are specifically referred to and used as defenses in *Reimerdes* and *Corley* and because of the importance of these exemptions to the engineering community.

With respect to reverse engineering, the court stated that the DMCA provides a defense to the act of circumventing a TPM when a person does so "solely for the purpose of enabling interoperability of an independently created computer program." [27] It was held that even if Corley had created DeCSS himself, rather than merely posting it, he would not have been in any stronger a position to make use of this exemption. In the courts' view it was not the "sole" purpose of DeCSS (as it was claimed by the defense) to achieve interoperability with Linux—DeCSS was a Windows-based file.

The encryption exception in the DMCA did not apply to Corley because the court found that he was not "performing the acts of good faith encryption research." [27] In determining whether a person qualifies for this exemption the court must consider factors such as whether the results of the encryption research were disseminated in a manner designed to advance the state of knowledge of encryption technology versus the facilitation of copyright infringement, whether the person is engaged in the legitimate study of the work of encryption, and whether the results of the research are communicated in a timely fashion to the copyright owner. As no attempt was made to obtain authorization from the copyright owners, this section did not apply.

However, it is important to consider that even prominent academics engaged in acts of good-faith encryption research have been threatened by the DMCA. Such was the case when Prof. Edward W. Felten and a team of researchers from Princeton University, Rice University, and Xerox discovered that digital watermark technology under development to protect music sold by the recording industry had significant security flaws. The Recording Industry Association of America (RIAA) and the Secure Digital Music Initiative (SDMI) Foundation threatened to file suit if Felten and his team published their research at a conference. Felten et al. were ultimately permitted to present their paper, but the fact that such threats can be made is illustrative of the lack of clarity with the

DMCA as well as the exploitation of legal mechanisms to support weak TPMs.

With respect to the security testing exemption, it was also contended that Corley's actions should be considered exempt from the DMCA under this section. Security testing is defined as "accessing a computer, computer system, or computer network, solely for the purpose of good faith testing, or correcting, a security flaw or vulnerability, with the authorization of the owner or operator of such computer, computer system, or computer network" [27]. This, too, was flatly rejected by the court.

The exemptions in the DMCA have been perceived more as something of an afterthought by many commentators in order to pacify the concerns of vociferous consumer groups and researchers than as part of an effective attempt to balance competing interests. Burk notes that, ironically, the exemptions are of limited use without having the technology required to circumvent the TPM in the first place [4]. Thus, in order to gain the benefit of the exemption, one must first unlawfully circumvent a TPM. Ginsburg addresses this issue more adroitly by stating that the exemptions "betray their origins in interest-group lobbying; no coherent vision of appropriate limits on the new access right underlies their articulation" [6].

The anticircumvention and antitrafficking provisions create new rights for copyright holders that are considered by many commentators as outside the traditional scope of copyright law. This new "para-copyright" [14] prohibits circumvention regardless of whether the underlying motivations for circumventing are harmless or harmful. Therefore, legitimate activities including copying one's own purchased media such as CDs onto portable players may contravene the DMCA, and as Perry notes, "[w]ithout the freedom to copy music from CDs to digital jukeboxes and portable players ... entire categories of products, like MP3 players and hard-disk recorders, would disappear" [17].

Copyright Law

In order to further explore why the enactment of the DMCA constitutes a shift from traditional copyright law, we discuss the principles underlying copyright law in this section. Copyright is a creature of statute granting a short-term monopoly to an author on certain uses of a given work. The primary objective of conferring a copyright as stated in the U.S. Constitution is "[t]o promote the progress of science and the useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries" [25]. The U.S. Supreme Court has held that the aim of copyright is to preserve proprietary rights in creative works while accommodating the public interest in open dialogue, deliberation, and the advance of knowledge [7]. Thus, in addition to providing remuneration for authors, copyright serves an important social and cultural function in making works available for public use.

In general, copying a work requires the authors' permission. The copyright holder has the freedom to reproduce, make derivative uses of (i.e., modify), distribute in copies, and publicly display the work. In trying to achieve a balance between providing incentives for authors to create works that contribute to social discourse, courts have developed a range of legal doctrines in order to settle disputes between opposing parties.

The DMCA alters this balance. Nimmer observes that, while copyright owners have always had the right not to publish their work, they have not previously been able to control its flow upon publication [13]. The traditional prerogatives of copyright have shifted in favor of copyright holders; they are permitted to use TPMs and prevent acts of circumventing access controls pursuant to the DMCA. Since access is a prerequisite to use, the design and implementation of technical constraints permit copyright holders to effectively supercede the rules of IP law [4].

We assert that the shift in power in favor of copyright holders encourages the engineering of nondiscriminating TPMs that do not necessarily support traditional copyright law. This is likely to result in TPMs being designed in order to take full advantage of the legal protections provided by the DMCA. Such designs will have less to do with stopping piracy and more to do with controlling the flow of innovation.

DRM in the Courts

Our consideration of the court cases concerning CSS provides insight into the way in which cases concerning other TPMs are likely to be interpreted under the DMCA. The *Reimerdes* court held that posting DeCSS constitutes a violation of the antitrafficking in tools that circumvent access control provision of the DMCA. This was because the circumvention of CSS was considered to be the only purpose of DeCSS. As we previously discussed, the defense argued that the motivation for *creating* DeCSS (an act of circumvention) was the development of a Linux DVD player, which should therefore be permitted under the reverse engineering necessary to achieve the interoperability provision of the DMCA. Although the reverse engineering exemption may have applied, in *Reimerdes* this argument was ineffectual and "immaterial" as the court reasoned that the case involved whether or not the antitrafficking provision had been violated.

In arriving at an opinion, courts frequently make remarks that do not constitute the reasons for the decision but rather are said in passing. These comments, known as *obiter dicta*, provide interesting insights into the perspective of the judiciary with respect to a given ruling. In remarking on the position of copyright holders Kaplan J. notes:

> Plaintiffs have invested huge sums over the years in producing motion pictures in reliance upon a legal framework that through the law of copy-

> right has ensured that they will have the exclusive right to copy and distribute those motion pictures for economic gain. They contend that the advent of new technology should not alter this long established structure. [30]

In assessing the merit of the defendant's counter arguments the Kaplan J. goes on to state:

> Defendants on the other hand, are adherents of a movement that believes that information should be available without charge to anyone clever enough to break into computer systems or storage media in which it is located. [30]

Thus, the judicial system has demonstrated a clear distaste of the overt promotion of circumvention activities. What is clear from this discussion is that the process invariably involves a value judgment.

However, legal protection of TPMs to support their function is one matter, but frustrating the stated copyright goal of "promoting progress of science and the useful arts" is another. Not all circumvention should be outlawed, as evidenced by the numerous exemptions in the DMCA, and these attempts to outlaw circumvention should be reasoned and coherent rather than reactionary and illogical. In commenting on this fact, the *Reimerdes* court concluded that the compromise reached by Congress with the DMCA, "depending on future technological developments, may or may not prove ideal" [30].

The reasoning in *Reimerdes* was supported on appeal. The court in *Corley* commented that the DMCA was enacted to stem the tide of media piracy. Given the ease with which digital material may be copied and distributed, it was reasoned that Congress, through the DMCA, sought to preemptively combat media piracy by affording protection to TPMs.

Academic commentators have criticized the *Reimerdes* case extensively because of the extent to which it abrogates traditional copyright principles [8]. The failure to inquire about the mixed statutory intent of the DMCA (i.e., the goal to prevent media piracy through protection of TPMs while not changing existing rights pursuant to traditional copyright law) becomes apparent when the DMCA is contrasted against the U.S. Constitution and the principle of "fair use" discussed in the next section. The deficiencies of the DMCA are highlighted.

The DMCA and the U.S. Constitution

Arguably the most controversial aspects of the DMCA are seen in relation to the U.S. Constitution. The First Amendment provides that "Congress shall make no law ... abridging the freedom of speech." [25] The importance of this value is such that there is a presumption of unconstitutionality on any system of prior restraint on the freedom of speech. Respect for freedom of speech and expression is also a feature central to international human rights law. However "speech" is a vague term and thus there is a considerable body of jurisprudence that is dedicated to the distinction between speech and conduct in relation to the First Amendment.

Legal doctrines in relation to the First Amendment have focused on whether the rule restricting the freedom of speech is content based (i.e., the message is censored), requiring that the state show that the law furthers a "compelling state interest by the least restrictive means" [20] available, or content neutral (i.e., the message is not censored, but, for example, the manner in which it is communicated may be restricted), requiring the state to show a "substantial government interest that is unrelated to the suppression of free expression and the regulation is narrowly tailored" [24] for this purpose.

The dilemma with computer code is that it may be considered both speech and nonspeech. The court in *Corley* acknowledges this fact by stating that communication does not lose constitutional protection as "speech" simply because it is expressed in the language of computer code [29]. Thus, a novel written in computer code would be allowed constitutional protection, irrespective of the fact that only a handful of highly skilled computer experts would be able to read it. However, where action is induced (e.g., the program is executed) and there is no intercession of the will or mind of the recipient involved, the computer code is not given protection.

The case of *Junger v. Daley* [11] provides a useful illustration of these concepts. This case concerned the export of encryption software. The court held that computer code should be afforded Constitutional protection despite the fact that it also has a functional capacity. It is this capacity for action (i.e., nonspeech) that was factored into the analysis of whether a government regulation of a computer code is considered constitutional.

The court in *Corley*, in upholding the lower courts' injunction against the posting of DeCSS, stated that the program had both a nonspeech and a speech component. The court stated that computer code is dissimilar to a "blueprint" or "recipe" in that a program can cause a computer to execute tasks and instantly render the associated results available throughout the world via the Internet [29]. The prohibition against posting DeCSS, therefore, was said to target the nonspeech component. The court went on to rule that the DMCA is content neutral by only targeting the functional components of speech to which it applies. As a consequence, the state only needed to show that the DMCA furthers a substantial government interest. The court was satisfied of this fact, further holding that this interest was unrelated to the suppression of free speech. We observe that functionality is seen a "proxy" for the effects of harm [30]. Thus, the courts have used functionality to justify why the distribution of computer code is not an issue of speech but is a matter of conduct, thereby making it

subject to government regulation. It is clear that this, in turn, influences the way in which computer code is both developed and disseminated.

The DMCA and Fair Use

Fair use is a defense to copyright infringement permitting a certain amount of direct copying for certain uses, without the permission of the copyright owner and notwithstanding the copyright owners' exclusive rights [26]. Thus, the fair use of copyright material does not typically require a license.

In general, copyright protects the expression of ideas. In some respects, therefore, copyright may be considered as a type of restraint on speech; an authors' property right in the work restricts others from using a particular expression [4]. Fair use is said to reconcile these conflicting provisions by allowing the use of otherwise protected material for issues that are in the public interest such as criticism, comment, and parody. Thus, fair use has therefore been conceived as a type of "safety value" regulating the competing interests of copyright holders and the requirements of the First Amendment [7]. It has also been noted that a certain amount of unregulated private noncommercial copying provides value by fuelling the creative process [1].

Typically, the would-be fair user would make an assessment as to whether the use of the copyright work was fair and would be subject to a potential lawsuit for copyright infringement if this assessment was incorrect. The evaluation of whether a given activity constitutes copyright infringement is one that takes place in the context of the legal procedures established to weigh the circumstances of the case. By directly protecting the TPMs, the DMCA removes the necessity of judicial intervention and shifts the appraisal process into the hands of the private parties who employ TPMs to protect their IP.

The courts in *Reimerdes* and *Corley* declined to rule on issue of fair use. This was because the issue of whether the antitrafficking provisions of the DMCA had been violated was said to occur independently of fair use. Attention was drawn to the fact that the plaintiff's action was for violation of the DMCA rather than copyright infringement. This leaves open the question as to whether, and in what circumstances, circumvention may be permitted in order to engage in fair use.

§ 1201 (c) DMCA states: "[n]othing in this section shall affect rights, remedies, limitations, or defenses to copyright infringement, including fair use under this title." The court interpreted this provision narrowly, reasoning that, notwithstanding, fair use does not require the work be provided for in the optimum format, nor in the identical format as the original. The court did acknowledge, however, that while precluding access to works in the public domain does not yet appear to be a problem, it may emerge as one in the future [30]. The problem that we may be ultimately faced with is the social underuse of protected content.

The concern with DRM with respect to fair use is that DRM has the potential to establish a unilateral dialogue between the copyright holder and end-user without the opportunity for the court to act as an intermediary to reconcile the strong competing interests at play.

Technology Logic Versus Legal Reasoning

The purpose of this section is to discuss the way in which courts respond to advancement in technology. We achieve this by recognizing some of the legal principles the courts employ in formulating their opinions. In relation to the CSS cases, the concept of equity plays an important role. Equity refers to the body of jurisprudence developed to mitigate the harsh effects of the common law and is limited to instances where money damages would be inadequate. Thus, where "the rules" or the legal remedy is inadequate, equity provides an interstitial gap-filling role to achieve a "just" result in a particular case. Therefore, principles of equity are grounded in notions of fairness. Over time these principles develop into maxims that contribute to the formulation of legal doctrines in contemporary case law.

Legal reasoning attempts to arrive at a solution "at law" (i.e., according to the legal rules) before engaging in an analysis of equity, which is typically value-laden and prescriptive in nature. This is because, theoretically at least, the role of the court is to interpret the law, rather than to engage in law-making.

In *Reimerdes*, an argument was made that even if the court granted the injunction it would be futile because mirror sites on servers around the world have posted the DeCSS program, making it available to anyone anywhere that has access to the Internet. The court was not persuaded by this proposition; technological improvements no matter how radical cannot fundamentally change the notions of fairness and equity. However, issues of obtaining jurisdiction over a particular defendant in cases involving the Internet continue to be a cause for concern among members of the judiciary.

In addressing these issues the court remarks:

> the strong right arm of equity may be brought to bear against [violators of the DMCA] absent a change in conduct and thus contribute to a climate of appropriate respect for intellectual property rights in a age in which the excitement of ready access to untold quantities of information has blurred in some minds the fact that taking what is not yours and not freely given is stealing. [30]

In arriving at its conclusion the court signals clearly its intent to deal with the problem of circumvention of TPMs in no uncertain terms. Thus, equity can be used to strengthen the position of the plaintiffs in actions under the DMCA in an attempt to influence the conduct of other potential defendants.

Effective TPMs

In *Reimerdes* the court affirms its commitment to providing legal protection for TPMs. This can be illustrated in the interpretation of "effective" under the DMCA. The DMCA prohibits circumvention and trafficking in technological measures that "effectively controls access" to a work. The defendants in *Reimerdes* contended that, since CSS was a "weak cipher" using only a 40-bit encryption, which did not effectively control access to the copyrighted DVD, it was not protected under the DMCA. This argument was dismissed. The court was not prepared to accept "effective" as meaning "successful" because this would essentially "gut" the statute [30].

In *Reimerdes*, the court based its understanding of the issues around the notion that circumvention was the electronic equivalent of "breaking into a locked room in order to obtain a copy of a book." This analogy has been adopted by successive courts (see, for example, [16]). However, we note that the comparison ignores important perspectives; while guarding content with access controls is not equivalent to selling a house and retaining the keys after closing, it still amounts to extending the scope of the copyright owners' enumerated rights.

An important aside we address at this juncture is the copyright doctrine of first sale. First sale is part of the Copyright Act. It is considered that the "whole point of the first sale doctrine is that once the copyright owner places a copyrighted item in the stream of commerce by selling it, he has exhausted his exclusive statutory right to control its distribution" [18]. This gives the purchaser of a book the right to resell or write over the acquired copy (although the purchaser cannot copy the book and resell the duplicate without permission).

In *Reimerdes* the defense's argument that the doctrine of first sale prevents a copyright owner from prohibiting decryption was rejected as being "pure sophistry." [30] The concept of first sale is important in the context of innovation and should not be dismissed without closer analysis.

The most recent cases concerning TPMs would tend to suggest that this *Reimerdes* view is gaining authority. In *Pearl Investments, LLC v. Standard Inc.* [16], a case involving a claim of computer fraud against a software programmer, the contention by the defendant that a TPM could not be construed as effective against the software provider who created the program was rejected as being "entirely without merit." Current interpretations of the DMCA therefore consider TPMs to be effective even against those that design them.

To claim that a DRM system is ineffective in a legal context makes for a particularly weak argument at the present time. In fact, we observe the courts' willingness to support a TPM, even if it does not protect its content well. From a technology standpoint, however, CSS *is* ineffective. Indeed it is widely acknowledged that no TPM is 100% effective [23], and the unequivocal judicial response is largely a response to this fact.

What is apparent from a first reading of the DMCA is the high degree of control that copyright holders have over their IP in relation to the subsequent consumers.

However, it is insufficient in the DRM design context to state that the technology is supported by the law. The inadequacies of both law and engineering to provide a solution to the problem of digital media piracy prompt us to engage in interdisciplinary collaborative research. Cooperative efforts can be used to direct the policy process, which will in turn lead to the creation of better laws.

DRM and the "Strong Right Arm of Equity"

In considering the way in which courts have grappled with the issues associated with providing legal protection of TPMs, we find ourselves engaging in an analysis of public policy objectives. This is nothing new to copyright law. After all, it was the development of copying technologies (i.e., the printing press) that fuelled the development of copyright law in the first place. Courts increasingly find themselves confronting the issue of whether to either extend the scope of existing law or interpret the law in a restrictive manner in the hope that Congress will enact legislation that will be dispositive on a given matter.

In the case of the DMCA, a statute was enacted in the hope that it would curb the threat of media piracy while preserving traditional copyright concepts such as fair use. The interpretation of the DMCA in *Corley* and *Reimerdes* tends to suggest that fair use does not apply to the DMCA rules.

In addition, courts have used equity to further enlarge the scope of the statute in favor of copyright holders in an attempt to send a strong signal of judicial intolerance for the acts that result in circumvention of TPMs as well as provide further incentives to ensure content owners that their digital content will be afforded full legal protection in the online environment. So while courts could have provided more guidance on the issue of fair use in relation to TPMs and the DMCA, the fact that they did not suggests, for the time being at least, that controlling access to content is of greater importance than ensuring the requisite level of fair use. This is likely to be a difficult strategy to maintain in the long term.

It is crucial to distinguish between circumvention tools that should be permitted in situations where they have the capacity to enable the free flow of ideas within society and ones that should be prohibited because

they enable piracy. The answer to this particular question is for higher courts to determine.

What is important to appreciate, however, is that courts and legislatures around the world are increasing their efforts to directly influence the development and direction of emerging technologies. This can be seen in the enactment of statutes such as the Audio Home Recording Act 1992 (as codified by [28]). This Act mandates that consumer digital audio tape machines have serial copy management system (SCMS) chips installed that permit unlimited first-generation copies, while second-generation copies will be degraded in quality. The success of such approaches will depend largely on the ability of law and policymakers to appreciate the technical as well as nontechnical dimensions of the DRM problem.

The DMCA gives greater protection to access controls than it does to the measures that control rights of the copyright holder. In *Reimerdes* the court devoted much of its analysis to the notion that CSS was designed to prevent access to the DVD. Reese argues, however, that CSS was primarily designed to prevent unauthorized copying and distribution of digital content and not to control access to the DVD [19]. While this is unlikely to have affected the outcome in *Reimerdes*, this may have important consequences for design. It may be the case that maximization of the rights of the copyright holder would be achieved by emphasizing access controls rather than copy controls in the design of DRM systems. And, as a practical matter, Samuelson points out that "[t]he main goal of DRM mandates is not, as the industry so often claim, to stop piracy, but to change consumer expectations" [22]. Thus, DRM may be become focused on granting permissions to access rather than controlling digital "rights."

Reform of the DMCA

There have been a number of legislative proposals for the reform of the DMCA, notably the Digital Choice and Freedom Act 2002 (DCFA) [5]. This Bill states that "[c]opyright laws in the digital age must prevent and punish digital pirates without treating every consumer as one." [5]

The Bill contends that the DMCA has been interpreted to prohibit all users—even lawful ones—from circumventing TPMs for any reason. This being the case, the s. 1201 of the DMCA should be amended to permit circumvention in circumstances that would enable fair use and consumer expectations. These circumstances include instances where the copyright owner has not made publicly available the necessary means to make noninfringing use without additional cost or burden to the user. The DCFA would also make nonnegotiable license terms unenforceable, to the extent they restrict the rights pursuant to the copyright statute.

Instrumentalist approaches to technological development, however, are still problematic; it is difficult to draft legislation in an area as dynamic as technology. In circumstances where forecasts prove inaccurate we find ourselves puzzled by issues of control and access rather than innovation and expression. The DCFA may potentially serve to redress the current inconsistencies, but it is likely that this Bill will be strongly opposed by the content industry.

The early enactment of legislation can lead to a number of unintended consequences. There is some merit in the view that the laws to protect TPMs are premature. Legislation in this area should appropriately include the interests of copyright holders and service providers as well as society at large. The notion of legislative latency is important in the context of technological design because of the complex interconnection of interests at stake.

Achieving this balance can take place only when DRM systems are sufficiently capable of guarding against attacks and are easy to use for the consumer, so that they may gain market acceptance. Markets, like technology, are fluid and dynamic, law typically is not. The ability of law to respond meaningfully to technological development occurs through the formulation of a sound public policy.

Law, Policy, and Interdisciplinary Research

Much of the rhetoric in the DRM debate is polemical; stakeholders voice a multitude of concerns that have the effect of polarizing the potential for a viable solution. Interdisciplinary research can serve to establish a common platform in order to meaningfully address the issues that arise in the context of media piracy and unauthorized use.

The lack of dialogue on these issues that exists between disciplines such as engineering and law serves to further frustrate the goal of achieving a workable DRM design. It has been argued that, in enacting the DMCA, Congress simply ratified the results of negotiation between the numerous interest groups [6]. This resulted in the passing of legislation riddled with internal contradictions.

The *Corley* and *Reimerdes* cases illustrate what can happen when the effects of a "weak" TPM are combined with ill-conceived legislation designed to protect it. This is likely to lead to an asymmetrical relationship between copyright holders and consumers of digital information.

The technology industry has an important role to play in informing the debate on these issues; the effectiveness of legislation is dependent on realizing, for example, that interoperability will necessarily require compromise.

Conclusion

We conclude by returning to Holmes' original claim. We find that while law cannot be contained only in "axioms and corollaries," or rather in algorithms and computer code, the DMCA, as interpreted in *Corley* and *Reimerdes,* is a step in this direction.

The DMCA provides legal protection for TPMs. These in turn create quasi copyrights having a different conceptual underpinning to that of traditional copyright law. This balance is tipped decidedly in favor of copyright holders. These rights, which center on access controls, are likely to influence the design of DRM systems.

Exceptions in the DMCA are contingent on obtaining access to the content in the first place. So while the "strong right arm of equity" will invariably bring about changes in conduct, doing so will create an asymmetrical relationship between content providers and end users. As a result, social discourse will likely take a "wrong turn." The idea that legislation can serve as a panacea for the effects of ill-bred TPMs is short-sighted and is unlikely to be conducive to social discourse, competition, and innovation. Charting a new course for digital millennium will require the effort of lawyers and technologists (and many others).

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