

6th European Conference on Electrotechnics



Computers in Communication and Control

26–28 September 1984

Sponsors

The Convention of National Societies of Electrical Engineers of Western Europe (EUREL)
The Institute of Electrical and Electronics Engineers (IEEE) Region 8

Venue

The Brighton Centre, Kings Road, Brighton, UK

EUROCON 84 Committees

Steering Committee

Dr J Brown CBE, UK (Chairman)
Dr G H Byford, UK
Professor P Dietrich, Federal Republic of Germany
Dr J G Herry, France
E Lauger, Denmark

H H W Losty, UK
B W Osborne, UK
Dr W E Proebster, Federal Republic of Germany
C R Russell, UK

Technical Programme Committee

Dr J Brown CBE, UK (Chairman)
Professor D P Atherton, UK
K E Clarke, UK
Dr D E Cuzner, UK
Professor P G Farrell, UK

P Lucas, France
Professor J Moltoft, Denmark
Professor Dr H G Musmann, Federal Republic of Germany
Professor M H Rogers, UK
Professor Dr F L H M Stumpers, The Netherlands

Corresponding Members

Professor Dr G Almássy, Hungary
L Arosenius, Sweden
Professor Y Bar-Shalom, USA
C Bouille, France
Professor F Carassa, Italy
Professor J Furlan, Yugoslavia
I Lønberg, Denmark
Professor E Luque, Spain

Professor Dr J A Peperstraete, Belgium
Professor Dr K-L Plank, Federal Republic of Germany
R Rosenthal, USA
Dr E Rothauser, Switzerland
Professor A Smolinski, Poland
L Urshev, Bulgaria
Dr J Ziv, Israel

Educational Workshop Committee

Professor P G Farrell, UK (Chairman)
Professor C W Turner, UK

Professor A S Vander Vorst, Belgium

Published by Peter Peregrinus Ltd, London, UK ISBN 0 86341 029 4.

PPL Conference Publication number 22.

This publication is copyright under the Berne Convention and the International Copyright Convention. All rights reserved. Apart from any copying under the U.K. Copyright Act, 1956, part 1, section 7, whereby a single copy of an article may be supplied, under certain conditions, for the purposes of research or private study, by a library of a class prescribed by the U.K. Board of Trade Regulations (Statutory Instruments, 1957 No 868), no part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, without the prior permission of the copyright owners. Permission is, however, not required to copy abstracts of papers or articles on condition that a full reference to the source is shown.

Multiple copying of the contents of the publication without permission is always illegal.

© 1984 IEEE and EUREL.

Printed in Great Britain by Short Run Press Ltd., Exeter, Devon.

SOFTWARE PROTECTION IN THE US - FACTS, FANTASIES, METHODS AND RESULTS

P L Michaelson and M B Einschlag

Michaelson & Einschlag, USA

Software theft and piracy in the US have reached epidemic proportions. For every legitimate copy of a commercially successful program at least four, and according to some estimates ten or more, pirated copies exist. As the success of a program increases, so does the number of illicit copies. Large and small organizations alike copy; sometimes secretly and sometimes openly. The revenues lost by this copying are significant.

People use a number of different schemes for protecting software in the US; however none offers complete protection. Several schemes seek protection under the US patent, copyright and trade secret laws.

This paper addresses the availability of protection for software under current US patent, copyright and trade secret laws, the extent and limitations of that protection, and the schemes generally adopted by the American computer industry utilizing these laws.

1. Is Software Patentable? Answer: By itself -
-NO;
In combination with hardware -
-probably
Is Patent Protection Worthwhile? Answer: It
Depends

Patents provide the strongest protection for intellectual property in the US. As provided

by federal statute, whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter or any new and useful improvement therefor may obtain a patent for it. During the 17 year life of any patent, its owner has the right to exclude others from making, using or selling the invention claimed in the patent anywhere in the US.

The essence of any program lies in its underlying algorithm -- a sequence of steps which when followed perform a useful and intended result. Although such an algorithm is designed to be implemented on high-speed processors, humans, in theory and given enough time, can perform the algorithm to yield the same result. In view of this, US courts have frequently held algorithms to be nothing more than a sequence of mental steps which comprise non-patentable subject matter. Hence, the argument is often made that software, by itself and devoid of any relationship to the hardware that it controls, is non-patentable. Recently, the United States Supreme Court had occasion to consider this issue in the case of Diamond v. Diehr 450 U.S. 175 (1981) but side-stepped it. Here, the Court ruled that since patent protection was sought for a process for curing rubber, which has always been viewed as patentable subject matter, the inclusion in the claims of a programmed digital computer to control the process did not render the process non-patentable.

Consequently, claims to a system which employs a software-based algorithm can not be directed to algorithm alone. However, patent protection can encompass a structure which utilizes a software-based algorithm as one of its elements to achieve a function.

Furthermore, most programs generally have a rather short product life -- often a year or two at most. Since US patent protection only begins on the date a patent issues from the US patent office, and often that date is at least two years after the underlying patent

application is filed in the US patent office, most of the useful product life of the program has ended before patent protection has begun.

Even if meaningful patent protection is obtained, full-scale patent litigation is extremely complex and often stretches to many years (5 to 7 is not uncommon in the US). This delay greatly postpones any effective relief from infringement. Although patent infringement remedies -- when finally awarded by a court of law -- often involve substantial financial recovery (such as damages, court costs; and if willful infringement is found, treble damages and attorneys fees can also be awarded) these remedies may be of little consolation if the infringing activity is substantial but short-lived and the infringer goes out of existence shortly after the infringing activity has concluded. Hence, in view of the lengthy delays involved as well as the complexity of the proceedings and the uncertainty of any result, the vast majority of patent cases are settled well before any such case reaches a final judicial determination. Unfortunately, as a result, most settlements are often far less than the original relief sought and usually insufficient to completely compensate the patent owner for all the damage caused by the infringing activities.

Hence, the uncertainty surrounding the patentability of software, the short product life of most programs, and the protracted period of time required to obtain both patent protection and effective relief from infringement militate against the use of US patent protection for software in all situations.

2. Is Software Copyrightable? Answer: Yes
Is Copyright Protection Worthwhile?
Answer: Definitely

Copyrights, by contrast, provide immediate protection. This protection begins as soon as an original work of authorship (such as a program) is affixed in any tangible medium of expression (such as printed on paper, programmed into a ROM chip, or stored in magnetic media). Copyrights, by federal statute, provide the copyright owner with the right, subject to certain exemptions, to

control unauthorized copying of his copyrighted work. However, unlike patents, copyright protection is limited to the form ("expression") in which an original work of authorship (e.g. the program) is conveyed (via "a tangible medium of expression") regardless of whether that form is human and/or machine readable. Copyright protection does not in any way extend to cover any idea, procedure, process, system, method, operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated or embodied. Copyrights can protect more than just programs; artwork, wiring diagrams, schematics, flowcharts and all other pictorial design information can be and should be protected through copyrights.

A number of years ago, various US courts began to consider whether software was copyrightable subject matter. A major issue addressed by these courts was whether the software under consideration was purely "functional." Early on, US courts have held that items that are purely functional (utilitarian) in nature, i.e. designed to perform a given function rather than being artistic or expressive in nature, were not copyrightable; and if protection is to be for these items, that protection must come from a US patent. At first, various US courts perceived software to be purely functional in nature, i.e. controlling the operation of a computer to produce a desired result, and have thus held software to be non-copyrightable. Over the past few years, a number of influential US courts, in well-reasoned opinions, have realized that since

software contains significant amounts of original authorship, fixed in a tangible medium of expression and independent of the function performed by the program (i.e. the program can be written in many different ways to perform the same function), software is copyrightable subject matter. Although the matter has yet to be considered by the US Supreme Court, US law is such that software, source code and even object code fixed (stored) in ROM, is now copyrightable subject matter.

Although the rights provided by US copyrights are far narrower than under patents, most software mis-appropriation in practice involves slavish copying. This occurs because few would-be infringers have either the time and/or financial resources to extract the underlying algorithm from a copyrighted program and, using this algorithm, re-write the infringing program such that it does not appear to be "substantially similar" to the copyrighted program. Such copying is generally the rule where short-lived consumer goods (particularly video games and home/personal computers) are involved and a competitor is seeking to play "catch-up" by minimizing his product development time. Copyright infringement actions are generally far simpler than patent infringement actions and also provide an extremely fast and effective remedy against slavish copying. Unfortunately, copyright actions provide no relief against one who discovers the underlying algorithm and appropriately re-writes the program such that the "infringing" program is not substantially similar in appearance to the original copyrighted program.

Moreover, in order to sue for copyright infringement under the present US copyright act and take advantage of all the remedies provided by that act (such as attorneys fees and statutory damages which, if willful infringement is proved, can reach US \$50,000 per infringing act), a complete copy of the program (or a specified portion thereof) to be copyrighted must be deposited in the US Copyright Office (which forms part of the Library of Congress). Presently, all copyright deposits (with some minor exceptions -- such as secure tests -- not relevant here) are publically accessible. Although proposed rules are now being considered by the Copyright Office to eliminate public access to software deposits, these rules have not yet been adopted. Hence, anyone who now deposits a program in the Copyright Office runs an increased, though still minimal, risk that a third party will examine the deposited program, discern its underlying algorithm and produce a non-infringing version of that program.

Nonetheless, US copyright protection, although limited in scope, has proven to be an extremely effective weapon against software mis-appropriation.

3. Is Software Protectible as Trade Secrets?

Answer: Definitely

Is Trade Secret Protection Worthwhile?

Answer: It depends.

Trade secrets, in contrast to patents and copyrights, cover a broad range of subject matter. Generally speaking, any item of intellectual property can be the subject matter of a trade secret as long as that item is not generally known by others, conveys a competitive advantage to one who does not possess it and adequate steps are taken by the owner of that item to protect its secrecy. For example, unpatented chemical formulae, patterns, business information (such as customer lists and financial information), plans, designs, and processes as well as software can all qualify as trade secrets. Unlike US patents and copyrights, trade secret protection is not granted by the US government, but rather this protection, which varies from state-to-state within the US, comes into being through a confidential relationship, whether contractual or not, existing between the owner of the trade secret and another party. Unlike patents and copyrights, trade secrets do not possess a fixed life. Trade secrets can last indefinitely -- as long as the subject matter of the trade secret remains secret and adequate steps are taken to insure its continued secrecy.

While US patent or copyright protection will protect its owner against any third party infringers, trade secret protection does not. Anyone who successfully discovers a trade secret, through legal means such as "reverse engineering", can, from that point on, use it free of any interference from the original trade secret owner. Since the essence of trade secret protection is based on a confidential relationship, anyone, who has actual knowledge of or should of known of the trade secret information and then breaches such a relationship (whether existing in fact or implied by law), can be quickly restrained from using the trade secret to the detriment of its owner.

Like patents and copyrights, trade secrets can be licensed. Such licenses are often referred to as "know-how" licenses and can include one or more of the following restraints: limitation of the number of CPU's on which the program can be run; limitation on non-archival copying; personnel and customer disclosure limitations; requirement of rapid notification to the licensor of unauthorized use and/or disclosure by the licensee, its personnel and/or its customers and restriction on processing of third party data.

The vast majority of software in the US is protected through trade secret protection. However, since trade secrets provide no protection against third party reverse-engineering, this protection is wholly inadequate to protect a program destined for commercial public distribution. Hence, trade secret protection should only be relied on in those instances where total access to the program can be tightly controlled. Thus, for example, if a program is to be sold to the public, the object code --which is supplied to the public and is likely to fall into the hands of third party infringers -- should be copyrighted and the source code -- which, if ever, should only leave the manufacturer under tightly controlled circumstances (e.g. a software escrow) -- should be primarily protected, as a trade secret, through a confidentiality agreement and secondarily protected through a copyright. Since the source code is not likely to be copied, it need not be deposited in the Copyright Office. However, inasmuch as the object code bears the risk of infringement, it should be deposited in order to obtain a registered copyright. Nonetheless, both the object and the source code should bear prominent copyright notices, preferably in the comment sections at the beginning, middle and ends of the respective programs.

In recognition of the inability of trade secret protection to protect against reverse-engineering, a number of technical methods have been devised to thwart reverse-engineering and detect unauthorized copying. These methods include: program and data encryption, multi-media program dissemination and execution, hardware and software serialization, non-standard program and data storage formats, software dissemination in object code alone, incorporation of self-destruct mechanisms, and the incorporation of unique identifiers (e.g. un-executable code or proprietary rights notices).

Table 1 below summarizes the salient features of and differences between US patent, copyright and trade secret protection.

Recent Developments

Over the past few years, American computer manufacturers have become increasingly

litigious and have taken advantage of American intellectual property laws to counter -- at least temporarily -- the increasing onslaught of mis-appropriation.

For example, in a recent case, In the Matter of Certain Personal Computers and Components Thereof US International Trade Commission (ITC) 337-TA-140 (1984), Apple Computer obtained an exclusion order from the ITC which barred the importation into the US of personal computers and various sub-

assemblies used therein, which were manufactured primarily by establishments based in Hong Kong and Taiwan and which infringed various US patents and copyrights that Apple held on its personal computer hardware and software, respectively.

Also, in other recent cases, e.g. Apple Computer Inc. v. Franklin Computer Corp. 714 F.2d 1240 (3rd Cir. 1983) and Apple Computer Corp. v. Formula International 562 F. Supp. 775 (C. D. Calif. 1983) (both cases involved copying of Apple's ROM based "Autostart" and "Applesoft" programs, among others); and Midway Manu. Co. v. Roger Strohon et al 564 F. Supp. 741 (N. D. Ill. 1983) (which involved copying of the ROM code for the video game "Pac-man"), US courts have upheld the copyrightability of programs, particularly those stored as object code in ROM chips, and have generally granted relief against unauthorized duplication of the ROM code.

Furthermore, in a recent widely publicized criminal sting operation led by the US FBI, IBM successfully thwarted mis-appropriation, of its trade secreted "Adirondack" workbook applicable to its 3081 machines, by agents of various Japanese firms. IBM and one of those firms recently settled a companion civil suit which arose out of this mis-appropriation for a significant amount, believed to be several hundreds of millions of US dollars, being paid to IBM.

Also, in 1982, a new US Court of Appeals, i.e. the so-called Court of Appeals for the Federal Circuit, having exclusive nation-wide jurisdiction to hear appeals in patent cases, was created. Since its inception, this court has been extremely active in judicially educating lower court (US District Court) judges to the proper legal interpretation and factual analyses required by US patent law. This effort has dramatically increased the value of an issued US patent and has markedly strengthened the US patent system.

Also, the US Administration, through the Antitrust Division of the Department of Justice, has further strengthened the patent system by repudiating its opposition to a number of patent licensing activities, which it previously considered to be unduly restrictive. The basis for this action was the recognition that the financial rewards secured by patents motivates increased private research and development expenditures which, in turn, bolster domestic and international competitiveness of American concerns.

Moreover, much debate is occurring in Congress concerning the inadequacy of the protection accorded by American intellectual property laws, particularly copyrights, to both computer hardware, notably chips, and software. In view of the substantial on-going mis-appropriation of computer technology, remedial Federal legislation, of some form, is likely to be passed in the near future.

Conclusion

Thus, while US patents, copyrights and trade secret laws now provide significant protection for computer technology, even stronger protection is expected in the near future as the American legal system continues to grapple with increasing mis-appropriation of technology.

TABLE 1 - U.S. PATENT, COPYRIGHT & TRADE SECRET CHARACTERISTICS

FORM OF PROTECTION	SUBJECT MATTER REQUIREMENTS	SUBJECT MATTER COVERED	EXTENT OF EXAMINATION	BEGINNING OF PROTECTION	DURATION OF PROTECTION	DEGREE OF EXCLUSIVITY OBTAINED	ENFORCEMENT AGAINST THIRD PARTIES	PRESUMPTIONS ACCORDED	REMEDIES AVAILABLE
PATENTS (UTILITY)	-Patentable subject matter -Novel & useful -Non-obvious (35 USC §§101, 102, 103)	-Process, Machine, Manufacture, Composition of matter or Improvement (35 USC §101)	Detailed	-Upon issuance of patent-- now running 2+ years after filing of application -"Pat. Pending" or the like can be affixed to article or used in advertising in connection with article (35 USC §287)	-17 Years from date utility patent issues (35 USC §§154, 155)	-The right to exclude others from making, using or selling the claimed invention anywhere in U.S. during term of patent (35 USC §173)	Yes (35 USC §§271, 281)	Patents are presumed valid (35 USC §282)	-Injunctions -Actual damages -Pre-judgment interest -Court costs -Exclusion orders to bar infringing imports from entry into U.S. --If infringement found willful: Treble damages & Attorneys' fees can also be ordered. (35 USC §§281, 283, 284, 285)
COPYRIGHTS (registered)	-Original works of authorship fixed in any tangible medium of expression now known or later developed from which these works can be perceived, reproduced or otherwise communicated either directly or with the aid of a machine (17 USC §102(a))	-Expression -No protection for any idea, process, system, method of operation, concept, principle or discovery regardless of the form in which it is described, explained, illustrated or embodied (17 USC §102(b))	Cursory	Immediately upon creation of original work of authorship fixed in a tangible medium of expression (17 USC §405(a)) -Registration is not a pre-requisite to obtaining copyright protection, but it is a pre-requisite for an infringement suit and certain remedies (17 USC §§408, 411, 412)	-Life of author and 50 years. -If "work made for hire": 75 years after date of first publication or 100 years from date of its creation, whichever expires first (17 USC §302)	-Right to control copying and distribution of copyrighted work -Right to control preparation of "derivative" works based upon copyrighted works, and (for certain works) right to control public display and performance of copyrighted work. (17 USC §106) --Limited copying permitted for "Fair Use" and software archiving (17 USC §§107, 117)	Yes (17 USC §501)	If certify- icate of copyright registration dated within five years after first publication of copy- righted work, certificate provides presumption of validity of copyright (17 USC §401(c))	-Injunctions, -Actual damages and infringer's profits attributable to infringement -Statutory damages -Pre-judgment Interest -Court costs -Seizure and forfeiture of infringing articles -Exclusion orders barring importation of infringing articles from entry into U.S. (17 USC §§502, 503, 504) -Criminal penalties (17 USC §506) If infringement found willful: Attorneys' fees (17 USC §505)
TRADE SECRETS	Any information that is not widely known and would convey a competitive advantage to one not possessing it. (extent of protection and/or remedies vary state-to-state in U.S.)	None	None	Immediately upon creation of a "confidential relationship" (explicitly by agreement or implicitly through facts of situation)	Unlimited-- provided information remains secret and adequate steps are taken to protect its secrecy	Can only prevent those who breach a "confidential relationship" (explicit in fact or implied by law) from using trade secret information	No	None	Typically: -Injunctions -Damages -Court Costs

--All references are to appropriate sections of the United States Code (USC).--