Software and Patents: A Status Report

by Elmer W. Galbi
Special Consultant
International
Business Machines
Corporation
Armonk, NY 10504

There are two current developments concerning the legal protection of computer programming. First, a number of important cases are presently pending in the Court of Customs and Patent Appeals. These cases raise important issues concerning the patentability of algorithms. The first section of this discussion will concern the effect on the protection of programming of the recently decided cases and the presently pending cases. Possible future developments are also discussed.

The second area where there are current developments concerning the protection of proprietary rights in programming is the legislative area. In the second section we will discuss some of the proposals which have been made for new legislation in this area.

As most people in data processing know, the Court of Customs and Patent Appeals has rendered a series of decisions which have been interpreted as holding that computer programs constitute patentable subject matter. This does not mean that all computer programs are patentable. It does mean that a programmer can obtain a patent covering a computer operating in accordance with a particular program if the program is new, useful, and unobvious. Furthermore, the recent decisions make it possible to obtain a patent with claims covering a method or algorithm for solving certain problems irrespective of what apparatus is used to solve the problem.

In order to give some appreciation of the present fluid state of the law, a chronologically arranged summary of the vacillation in court and administrative rulings in this area is given below. This chronologically arranged summary is followed by a discussion of possible future development.

Background

In the early days of computer technology, programming was generally viewed as intellectual activity which was not subject to ownership. As the amount of investment in programming increased, lawyers began to look for ways to protect this investment. In 1964, the United States Copyright Office began to grant copyright registration for computer programs. However, copyright protection is subject to certain limitations, and in order to obtain what they felt was broader protection,[1] some lawyers began to urge the proposition that the United States Patent Office should grant patents covering computer programs. In 1966, the U.S. Patent Office issued "proposed guidelines to the examination of Programs" [A]. The only effect of these guidelines was that they succeeded in riling both the proponents and the opponents to patenting computer programs. Among those who felt that the proposed guidelines were inadequate and who submitted alternative proposals were Bell Telephone Laboratories [B], which felt the proposed guidelines were too restrictive, and IBM [C], which felt the proposed guidelines were too broad. Since no one supported the guidelines which were proposed in 1966, the Patent Office never issued them.

In 1968, the Patent Office did issue a set of guidelines [D] which bore practically no resemblance to the 1966 guidelines. The guidelines that were issued in 1968 stated:

"A computer programming process which produces no more than a nu-

[1] It is noted that the question of whether copyright protection is narrower or broader than patent protection is subject to some degree of disagreement. Although most people contend that copyright protection is, in fact, narrower than patent protection, the most that can clearly and absolutely be said is that the nature of protection granted by a patent is fundamentally different from the type of protection granted by a copyright. For example, a copyright only prohibits "copying" or performing, while a patent prohibits anyone, including someone who developed the idea independently, from "making, using, and selling" the patented article. Another difference is that copyright infringement is a civil and criminal offense, whereas patent infringement is only a civil offense. It should be noted that the result of copyright protection can be very broad at times. For example, the courts have given protection to characters in books, plays, comic strips, etc.

merical, statistical or other informational result is not directed to patentable subject matter.

Following these guidelines, the Patent Office refused to issue patents specifically directed toward computer programming. The Patent Office argued that computer programs were mathematical in nature and constituted a series of mental steps and that as such they were not patentable subject matter.

In 1968 and 1969, the *Prater and Wei* case [E] involving special apparatus and a computer program used to analyze data from a mass spectrograph was decided by the Court of Customs and Patent Appeals. The initial opinion in this case overruled the Patent Office and said that the invention was, in fact, patentable. The decision apparently reversed some of the long-standing rules concerning the patentability of mental steps, or at least the Patent Office interpretation of these rules. Substantial drama was introduced into the situation because of the fact that the judge who wrote the decision died after completing the decision but prior to the time that the decision was issued. The Court subsequently granted a rehearing on this same case, and again issued a lengthy opinion indicating support for the former judge's opinion but rejecting all of the process claims based on a somewhat technical admission made by the applicant. Probably one of the most significant parts of the opinion was relegated to a footnote stating:

"No reason is now apparent to us why, based on the Constitution, statute or case law, apparatus and process claims broad enough to encompass the operation of a programmed general purpose digital computer are necessarily unpatentable. In one sense, a general purpose digital computer may be regarded as a storeroom of parts and/or electrical components. But once a program has been introduced, the general purpose digital computer becomes a special purpose digital computer (i.e. a specific electrical circuit with or without electromechanical components) which along with the process by which it operates, may be patented, subject, of course, to the requirements of novelty, utility and nonobviousness. Based on the present law, we see no other reasonable conclusion."

Bernhart and Felter: Following the *Prater and Wei* decision the next case in this area which faced the Court was *Bernhart and Felter* [F] which involved a computer connected to a plotter and a set of equations which allowed the system to plot various views of a three-dimensional object. The views could be from any selected plane and from any point in space. The applicant did not disclose the program in his patent application. He merely gave the equation. The claim which the Court said should be allowed was:

$$V_i = \frac{k(x_o^2 + y_o^2 + z_o^2)\ (-y_o x_i + x_o y_i)}{\sqrt{(x_o^2 + y_o^2)}\ [(x_o^2 + y_o^2 + z_o^2) - (x_o x_i + y_o y_i + z_o z_i)]}$$

$$W_i = \frac{k\sqrt{(x_o^2 + y_o^2 + z_o^2)}\ [-x_o z_o x_i - y_o z_o y_i + z_i\ (x_o^2 + y_o^2)]}{\sqrt{(x_o^2 + y_o^2)}\ [(x_o^2 + y_o^2 + z_o^2) - (x_o x_i + y_o y_i + z_o z_i)]}$$

Fig. 1

"A system for providing a drawing of an object comprising in combination: electronic digital computer means programmed to respond to applied signals (x_0, y_0, z_0) and a series of groups of signals (x_1, y_1, z_1) to provide a corresponding series of pairs of output signals (v_1, w_1) with the relationship between signals (x_1, y_1, z_1) and (x_0, y_0, z_0) to the signals (v_1, w_1) being defined as follows: [see Figure 1] where K is a selectable variable; signal means coupled with said computer means and providing said signals (x_1, y_1, z_1) and (x_0, y_0, z_0) thereto with said signals (x_1, y_1, z_1) representing the three-dimensional coordinance of selected points on the object and with said signals (x_0, y_0, z_0) representing the three-dimensional coordinates of the location of the observation point from which the object is seen; and planar plotting means coupled with said computer means and responsive to said signals (v_1, w_1) to make a drawing of the object."

In deciding the case, the Court explained its reason for allowing the above claim with the following language:

"A member of the public would have to do much more than use the equations to infringe any of these claims. He would have to use them in the physical equipment recited in the claim. Moreover, all machines function according to laws of physics which can be mathematically set forth if known. We cannot deny patents on machines merely because their novelty may be explained in terms of such laws if we are to obey the mandate of Congress that a machine is subject matter for a patent. We should not penalize the inventor who makes his invention by discovering new and unobvious mathematical relationships which he then utilizes in a machine, as against the inventor who makes the *same machine* by trial and error and does not disclose the laws by which it operates."

In re Mahony [G] was the next case to come before the court. The purported invention in this case related to a method for synchronizing a receiver which was receiving a stream of bits from a transmitter. According to the patent application, prior to this invention receivers were synchronized to transmitters by including certain synchronizing bits in the data string. Synchronization was obtained by interrogating all bits to determine which bits were synchronizing bits. The application in this case reversed the process and obtained synchronization by determining which bits were the data bits,

thereby establishing that the remaining bits were the synchronizing bits. One of the claims under consideration was as follows:

"19. The method of establishing which bits in a bit stream are data bits and which are framing bits, where the framing bits appear in predetermined positions and have a predetermined sequence of values, comprising the steps of:
(1) comparing to one another the values of bits in respective bit positions in successive equal length groups of bits,
(2) registering which respective positions in said groups of bits have a sequence of bit values inconsistent with said predetermined framing sequence as ascertained by repetitions of the comparing step, and
(3) counting the number of successive bit positions in the bit stream wherein the sequence of bit values has been ascertained as inconsistent with the predetermined framing sequence, whereby the framing bit positions are established when the number of successive bit positions counted is equal to the total number between the framing bit positions."

The Court's rationale for allowing the claim included the following language:

"The words bit and bit stream as used in the claim . . . render mental performance of the claimed process impossible . . . In computers bits appear in the physical form of pulses . . . If the bits are in a bit stream, as required by the claims here and understood in the data transmission art, the bits must have the form of electrical pulses . . . It would be absurd to say that the claims reasonably read on a mentally implemented process. We are aware of no way in which the human mind can operate on such signals."

Within the Technological Arts: The last case concerning computer programs which was decided by the Court of Customs and Patent Appeals was *Musgrave* [H] which was decided on October 8, 1970.[2] This case involved special purpose apparatus and a method for analyzing seismic data. The Patent Office had refused to allow the patent on the basis that the invention was mathematical in nature and therefore not subject to a patent monopoly. The Court reversed the Patent Office on the basis that the inventor had developed a process which was in fact useful in "the technological arts."

"All that is necessary . . . to make a sequence of operational steps a statutory process . . . is that it be in the technological art."

The concurring opinion in this case quoted the above language and then stated that:

"No limitations are placed upon this holding. In effect it is apparent that what the majority has done will only substitute for one set of problems, another possibly more complex set. Because the problems will be new they will add confusion to the law. We are only now beginning to make some sense out of this area of the law. To change at this time, I submit, is nonsense."

Pending case: Another chapter in this drama is presently pending before the Court. The Court is now considering the Benson case [I] which involves a computer program for converting binary coded decimal to binary. The applicant has stated that the method which he seeks to protect by patent can be carried out by hand, by programming a general purpose computer, or by special purpose apparatus. The method described in this patent application involves repeatedly adding the binary number "101"[3] (appropriately shifted) to the binary coded "units" digit of the decimal number, once for each "1" in the "tens" digit. The example given in Figure 2, which is the one in the patent application, shows how the number 53 is converted from binary coded decimal into binary.

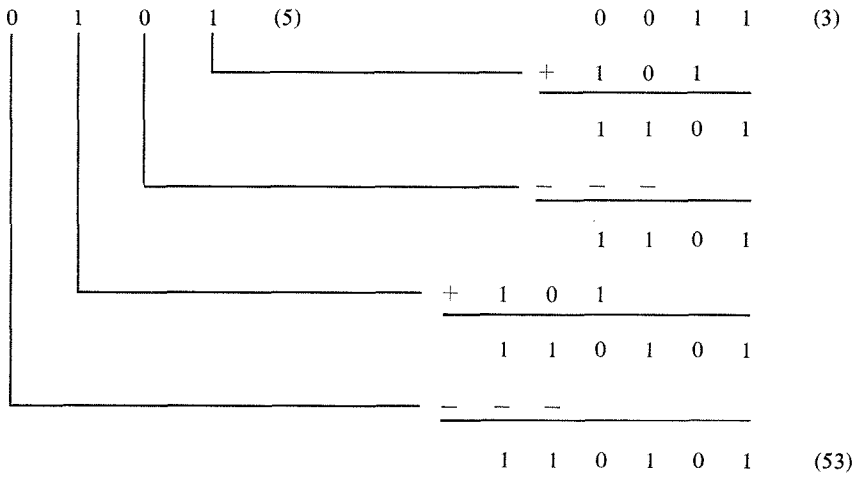

Fig. 2

[2] After this paper was prepared another case, In re Foster, was decided by the Court on March 18, 1971. This case did not enunciate any new principles.

[3] Obviously this is really $1010_2 = 10_{10}$, the final zero bit being implicit.

The program shown in the patent application is as follows:

Program Store Address	Instruction		
108	STC	4	set counter
109	CGT	ADRxDR	clear and gate auxiliary register to date register
110	SHR	3	shift right 3 places
111	2BT	114	test second bit data register
112	SHR	1	shift right 1 place
113	TRA	119	transfer
114	SSB	0	set second bit of data register to 0
115	ADI	DR	add "1" to data register
116	SHL	2	shift lift
117	ADI	DR	increment data register
118	SHR	3	shift right
119	TIX	111	transfer and index
120	SHR	1	shift right

For multiple digit numbers, conversion takes place successively starting with the two most significant digits, in the usual manner

A claim being considered by the court is:

"13. A data processing method for converting binary coded decimal number representations into binary number representations comprising the steps of:
(1) testing each binary digit position i, beginning with the least significant binary digit position, of the most significant decimal digit representation for a binary "0" or a binary "1";
(2) if a binary "0" is detected, repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;
(3) if a binary "1" is detected, adding a binary "1" at the (i + 1)th and (i + 3)th least significant binary digit positions of the next lesser significant decimal digit representation, and repeating step (1) for the next least significant binary digit position of said most significant decimal digit representation;
(4) upon exhausting the binary digit positions of said most significant decimal digit representation, repeating steps (1) through (3) for the next lesser significant decimal digit representation as modified by the previous execution of steps (1) through (3); and
(5) repeating steps (1) through (4) until the second least significant decimal digit representation has been so processed."

This case has been argued before the Court of Customs and Patent Appeals, but the Court has not as yet rendered a decision. If the Court follows its earlier lines of reasoning, concerning the patentability of mental steps, it probably will require the Patent Office to grant this patent.

Enforceability

An interesting and important aspect of this problem is the fact that, although it now appears possible for people to obtain patents covering computer programs, no one can be certain whether or not these patents are, in fact, enforceable, and if they are enforceable, what scope they will be accorded. The reason for this is that in order to enforce a patent, the patent owner must bring an infringement suit in a United States District Court. The U.S. District Courts are not bound to follow decisions of the Court of Customs and Patent Appeals which rendered the above-discussed decisions.[4] Thus it is entirely possible that when patents concerning computer programs reach the District Courts these District Courts will take a position on this subject which is opposed to the position taken by the Court of Customs and Patent Appeals. History indicates that in many situations the other federal courts have taken positions which differ from the Court of Customs and Patent Appeals and from each other. Such conflicts can only be resolved by the U.S. Supreme Court. Unfortunately, it may take 10 to 15 years for infringement cases to develop and be decided by the District Courts and by the Federal Appellate Courts. In the meantime, the industry has to operate in an environment where people can obtain patents but where no one can be certain whether or not these patents are, in fact, enforceable.

The period of doubt could be shortened if the Government took the initiative to seek a final resolution of the question. The Government can ask the U.S. Supreme Court to directly review decisions rendered by the Court of Customs and Patent Appeals. [J] Although the U.S. Patent Office has lost five or six cases in this area, the Government has not as yet seen fit to appeal any of these decisions to the Supreme Court.

At least three reasons can be given to support the proposition that the Supreme Court should be asked to review one of the decisions in this area: first, and from the businessman's point of view the most important reason is the uncertainty created by the dispute as to whether computer programs are patentable, and whether money should be spent to obtain patents that may ultimately prove worthless; second, the many implications of opening a vast new field of patentability, such as the tremendous new burden which this places on an already overworked Patent Office; and third, the effect of the recent Court of Customs and Patent Appeals decisions on large bodies of existing case law, including the "mental steps" doctrine, the "mathematical formulae" rule, and the definition of "process." If the Government decides not to bring a case in this area to the Supreme Court, infringement litigation will, no doubt, begin within the next several years. This litigation will probably take several years to work its way through the District Courts and the Circuit Courts of Appeal.

Proposed New Legislation

There have been numerous proposals for new legislation in this area. Several committees organized by bar associations and industry groups are considering the need for new legislation. Among the most active and

[4] Neither is one District Court bound to follow the decisions of any other District Court, nor of any Circuit Court outside its own circuit.

widely-based committees is one which was organized at the suggestion of the Commissioner of Patents under the auspices of the National Council of Patent Law Associations. This committee is composed of members of the patent bar, law professors, software houses, manufacturers, the Patent Office, the Copyright Office, the Justice Department, and others. It is headed by Harry Mayers, of Blair, St. Onge and Mayers, who was formerly patent counsel for the General Electric Company. This committee is geared to a long-range effort, and only an interim report is planned for October.

The interest in this subject is not confined to the United States. The World Intellectual Property Organization (WIPO) has scheduled a meeting of representatives of the member governments for Geneva in March 1971.

One of the earliest proposals was made in 1968 by W. W. Burns [K], who is with the U.S. Patent Office. His proposal was directed toward easing the burden faced by the Patent Office in examining patent applications directed toward computer programs. He proposed a change in the patent law whereby patent applications directed toward computer programs would be treated in a different manner from normal patent applications. In accordance with his system, patent applications directed to computer programs would be submitted in two parts. The first part would consist of a complete documentation and all materials, including magnetic tapes, necessary to practice the invention. The second part of the application would be a description of the invention in general terms, such as block diagrams, and an explanation of the materials submitted in the first part of the application. Initially, the Patent Office would only inspect the application to see that it was complete from a format point of view, and it would immediately publish the second part of each application.

Within a fixed period after the publication of the application, anyone would have the right to file a paper with the Patent Office registering opposition to the granting of the patent. After this fixed period was terminated, the examiner would examine the application. His examination would consider all items which are normally considered by the Patent Office, including a search of the available prior art. Where opposition papers had been filed, the examiner would also take into account all matters raised by such papers.

After the examination, if the examiner concluded that there was an invention, he would issue a patent, and the first part of each application would be published.

Another well thought out proposal was made in 1968 by Robert W. Wild [L]. This suggestion was aimed at eliminating the necessity to search prior art to see if the program disclosed in the patent application was unobvious or inventive in light

Patents and Programs: The ACM's Position

In 1966, the U.S. Patent Office proposed a set of guidelines for the examination of computer programs with a view to possibly issuing patents thereon if the applications satisfied the traditional requirements of novelty, utility, and unobviousness. Concurrent with a public hearing on these proposed guidelines, a Presidential Commission on the Patent System also held hearings as to whether programs should be made patentable or nonpatentable. At about the same time, up on Capitol Hill, the Congress was preparing a proposed copyright revision statute which would have had an enormous impact upon the computing profession if it had been passed in its somewhat naive original form.

Almost everyone connected with data processing was appalled by the tremendous information gap between the lawgivers and enforcers and the industry's techniques and economics. To overcome this gap, the then-President of the ACM, Dr. A. G. Oettinger, set up an ad hoc committee, since renamed the Committee on Copyrights, Patents, and Trademarks, under the chairmanship of Dr. Norman Zachary, Director of the Harvard Computing Center, to furnish the information needed by the Congress and other Government bodies regarding the computing industry.

The ACM early recognized that its members and their parent organizations would have differing views concerning the propriety or desirability of various legal proposals, in general and in particular. To use one example, Bell Laboratories has consistently fought to extend the traditional patent protection to software, whereas IBM has consistently opposed patented protection for computer software per se while supporting the notion that some form of legal protection was necessary. Hence, it was decided that the ACM as a body would not take explicit positions on legislative and administrative proposals, but instead would make available those of its members who are knowledgeable in the relevant areas. This policy has been followed by the pres-

of what had previously been done. A patent type of system was proposed where the application was examined to determine if the program was new but where no examination was made to determine if it was inventive or unobvious, as is done for a normal patent.

In Wild's proposal, the Patent Office would act as program clearinghouse for potential users. He suggested that each program be accompanied by proof of operability or the program would be tested at the Patent Office. He also suggested that copyright protection for programs be abolished, thus avoiding confusion and contradiction between the two laws and duplication of effort by the two offices. It was felt that most programs are obsolete within five years, and hence they do not require seventeen or more years of protection, and that shortening the time may lead to more pressure on patentees to grant licenses.

In 1968 the Commissioner of Patents publicly asked for suggestions for new legislation [M], and IBM submitted a proposal [N] to him that was designed to meet the following goals:

(a) The system should advance the general public interest by stimulating the development and use of computer programs.

(b) The system should provide an attractive and practical way of protecting investment in programs, compatible with the business needs of both the creators and the users of computer programs.

(c) The possibility of incurring inadvertent liability should be minimized.

(d) The system should facilitate and encourage the timely dissemination of new concepts in order to foster a continuing advance in the state of the art.

(e) The protection should be inexpensive to obtain; one should be able to obtain this protection in a timely fashion; and the system should be easy to administer.

The system proposed by IBM was based upon the premise that the investment necessary to produce a workable program can be divided into three general categories:

- the development of concepts,
- the preparation of documentation and flowcharts,
- the actual writing, testing, and debugging of the program.

It is also based on the additional premise that, since most programs do not have unobvious or inventive concepts, business considerations point toward a registration type of system which provides protection for the noninventive or nonpatentable innovation which results from the investment involved in creating a workable program. According to the proposed system, the concept, the detailed description, and the actual sequence of instructions would be treated in different ways.

At the time of registration, a copy of the program listing and a description of the concepts used in the pro-

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by:
Michael A. Duggan
Chairman, ACM Committee on
Copyrights, Patents, and Trademarks
University of Texas at Austin

ent chairman, who succeeded Dr. Zachary as head of the committee. Other committees have adopted this policy, and have made members of the Association available both for public Congressional and FTC Hearings (e.g. "the correspondence and trade school" proposed trade regulation rule), and for ex parte tutorial sessions, as those held for the FCC in connection with the Computer Utility Inquiry.

In the past, the ACM Patent Committee itself, in view of its ad hoc nature, has made no attempt to formalize membership rolls, schedule regular meetings, institute newsletters, and so forth. Instead, it has served at the pleasure of the ACM President, seeking to furnish information both to computing and to the lawgivers. Among its more recent projects has been the joint National Bureau of Standards/American Patent Law Association/ACM committee to investigate the feasibility of classifying computer software, liaison with other ad hoc groups and Congressional staffs, besides providing state-of-the-art reports on current legal developments (see *Communications,* October 1969, p. 589).

The ACM Executive Committee has now given this Patent Committee a specific assignment to:

(1) review the types of programs on which patents have been issued and to develop critical commentary upon specific patents;

(2) review specific legislative and administrative proposals, including possible guidelines for the examination of software and hardware from a programming point of view;

(3) make recommendations to the Executive Committee and ACM Council concerning specific policies ACM should pursue in this area, and ways in which these policies might be implemented.

A formal but nonexpository meeting of those interested in this subject will be held both at SJCC '71 and at ACM '71.

gram would be deposited with a registrar. At the option of the party registering a program, a detailed description of the program (e.g. detailed flowcharts) could also be deposited if he wanted to gain protection for this material. The registrar would maintain the program per se and the detailed description in secrecy until the end of the period of protection, but he would make public the description of the concepts. The person who registered a program could attempt to keep the registered program secret, or he could divulge the program to any extent that he desired. The only examination required at the time of registration would be a determination that the format of the description of the concepts was in proper form.

Unauthorized copy, translation, use or transfer of physical possession of a registered program or of the registered detailed description would subject one to liability. No liability would be incurred under this system by one who used the published conceptual description to independently create a new program. It should be emphasized that under the present patent system a person who *independently* creates a program would infringe even if he did not have access to a conceptual description. IBM's proposal did not suggest any change in the patent system.

Answers Needed

As indicated by the above examples, there have been some proposals for new legislation in this area. Unfortunately, there is relatively little hard factual background data upon which to make broad public policy judgments which are needed to evaluate the proposals. Questions such as the following need to be addressed, among many others:

- Would the development of "new concepts" or "scientific innovations" be stimulated by providing patent protection for those who make innovations in the programming area? Is there any reasonably scientific way to make the above determination?
- Is there anything special about programming technology and the way that it is developed which indicates that it should or should not be treated as a special case with respect to property rights? Can we gather any statistics to show how programming technology is developed and how this compares with the development of other technologies
- What, if anything, is holding back the faster development of programming technology? What changes in the proprietary rights field would advance or retard the development of the technology?
- Is it in the public interest to stimulate free interchange of information about programming innovations? If so, how can we stimulate this? How is information about programming developments transmitted within the programming community? How will the development of various kinds of proprietary rights affect this?

The broad public policy questions such as the above need more attention.

There is a substantial amount of current activity in this area. One possibility for a relatively quick final resolution of some of the issues could occur if the Government asked the Supreme Court to review one or more of the decision by the Court of Customs and Patent Appeals. The other alternatives, such as the development of infringement cases or the passage of new legislation, will probably require much more time before a final conclusion is reached.

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