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NOTES & COMMENTS

COMMENT

PATENTS COME TO THE RESCUE OF SPECIAL EFFECTS: WHY PATENTS ARE AN ESSENTIAL ELEMENT IN THE PROTECTION OF COMPUTER-GENERATED SPECIAL EFFECTS

I. INTRODUCTION

The widespread success of movies like *Jurassic Park*[1] and *Jumanji*[2] indicates that the exciting field of computer-generated imaging is primed to make its presence well known in the film industry. More telling is the success of the three-dimensional ("3-D") animated movie *Toy Story*,[3] which was made entirely through computer-generated imaging.[4] Special effects, especially those involving computer animation, are now so important to the movie industry that the Academy of Motion Pictures Arts and Sciences[5] granted branch status to its visual effects members in February of 1995.[6]

It is no secret that Hollywood has been courting Silicon Valley firms ever since the release of *Jurassic Park*. More than four years later, the marriage of the computer and film industries has been consummated. Today, few movies are made without the aid of computer graphics and computer-generated imagery.[7] Even in a movie such as *Sense and*

1. JURASSIC PARK (Universal Studios 1993).

2. JUMANJI (Tri Star 1995).

3. TOY STORY (Walt Disney Pictures 1995).

4. *Toy Story* made history as the first all-digital full-length movie "created entirely by artists using 3-D computer graphics tools." Barbara Robertson, *Toy Story: A Triumph of Animation*, COMPUTER GRAPHICS WORLD, Aug. 1995, at 28, 38.

5. Academy of Motion Pictures Arts and Sciences [hereinafter the "Academy"].

6. It has been forty-two years since the Academy granted new branch status. P.J. Huffstutter, *FX Oscar Seeking Academy Recognition*, L.A. DAILY NEWS, Feb. 10, 1997, at 6.

7. Bob Swain, *Animation Moves into Computer Generation*, TIMES UNION (Albany), Dec. 28, 1995, at 19.

Sensibility,[8] ostensibly devoid of computer assistance, computer-enhanced special effects were used to turn sunny days into cloudy ones and vice versa.[9] Intermingling of technology and art has led to conflicts regarding the intellectual property rights of movie studios and special effects creators. Conflicts have arisen regarding issues such as intellectual property ownership of emerging processes, machines, and software used in creating computer images for movies.[10]

Today's sophisticated audiences demand increasing quality in terms of photorealism and special effects, and these demands can only be met by further advancing special effects methods using computer hardware and software. An increasing number of special effects companies, movie makers, inventors, and software programmers are working on improving digitally enhanced special effects. Currently these improvements overlap, causing inevitable tension over intellectual property rights. For example, an inventor sued Paramount Pictures and LucasFilm in 1995 for patent[11] infringement over a process of altering facial and lip movements using computer-generated imaging techniques in the movie *Forrest Gump*.[12]

Traditionally, patents have been a key method of protecting inventions related to special effects in movies. However, only recently have computers been vital in the propagation of special effects in movies, and the speed in which computer technology is advancing brings with it a renewed importance for patent protection. Due to the proliferation of technology, issues regarding the ownership of the processes, machines, and software used in special effects are pressing matters. Therefore, the need for patent protection is significant.

An astounding amount of effort, creativity, and innovation is necessary to make those unique scenes and characters come to life on the big screen.[13] Filmmakers should, therefore, be rewarded for their creativity, not only through box office sales, but also through the ownership of intellectual property rights in these new developments. Traditional copyright protection of films is not enough for filmmakers

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8. SENSE AND SENSIBILITY (Columbia Pictures 1995).

9. Tony Kontzer, *Many of the Best Effects in the Movies Go Unnoticed*, BUS. J., Aug. 5, 1996, at 7B.

10. Michael Martinez, *Inventor Says Something's Wrong with 'Gump' Picture*, CHI. TRIB., Mar. 23, 1995, at 1.

11. Patents protect new and useful processes, machines, manufactures, or compositions of matter. *See infra* note 57. Copyrights, on the other hand, protect original works of authorship including literary works, musical works, and architectural works. 17 U.S.C. § 102(a) (1994).

12. FORREST GUMP (Paramount Pictures 1994). *See Inventor Sues Over 'Gump' Lip Syncs*, CHI. SUN-TIMES, Mar. 23, 1995, § 2 (Features), at 36.

13. *See infra* Part II.B.

because copyrights merely protect the end product or movie from being copied,[14] and are insufficient to protect the new machines, processes, and software developed by movie makers in their pursuit of special effects.[15]

This Comment argues that copyright law does not provide sufficient protection for computer-generated imaging and that patents are instead the necessary vehicle to satisfactory protection for these artists. Part II explains how computer-animated images are developed, including a description of the computer software and hardware utilized in the process of creating these images. Part III discusses existing patent law and the patentability of hardware and software, including digital technology, used in special effects. The analysis of the patentability of animation software focuses mainly on the patent guidelines for software patents promulgated by the Patent and Trademark Office ("PTO") in 1996.[16] Part IV reviews the development of copyright law as it applies to computer programs. This section discusses the strengths and weaknesses of copyright law with respect to the protection of animation software and distinguishes between the types of animation software that can be sufficiently protected by copyrights and those requiring patents for adequate protection. Finally, this Comment concludes that copyright law does not adequately protect and reward movie makers for their contribution to the art and science of movie making, and that they should instead look to patent law.

II. THE BASICS OF COMPUTER-GENERATED IMAGING

To appreciate the necessity of legal protection for computer enhanced special effects, it is vital to understand the technology, beginning with the basics in computing, to correctly match various areas of intellectual property law with the particular components of computer enhanced special effects.

A. A Review of Computer Technology Concepts

A computer program is a "set of statements or instructions to be used directly in a computer in order to bring about a certain result."[17] It is written by software engineers in the form of a source code, which is the human-readable format of a computer program.[18] The computer converts

14. 17 U.S.C. § 102(a).

15. *Id.*

16. Examination Guidelines for Computer-Related Inventions, 61 Fed. Reg. 7478 (1996).

17. 17 U.S.C. § 101 (1994).

18. DANIEL REMER, LEGAL CARE FOR YOUR SOFTWARE, A STEP-BY-STEP GUIDE FOR COMPUTER SOFTWARE WRITERS 9 (1984).

the source code into a binary form of ones (1) and zeroes (0) called the "object code." The object code is comprehensible only to the computer.[19] Thus, the only way for a human to understand the object code is to translate it into a source code.

Software essentially tells the mechanical components of a computer, often called hardware, what to do. Without software the user cannot tell the computer that he/she wants the letter "T" typed on the screen merely by hitting the "T" key on the keypad. The computer program responds to external forces caused by the computer operator, and based on those forces causes a physical change in the hardware of the system.[20] For instance, Microsoft Word is a word processing program that instructs the hardware to create documents based on keystrokes and other physical forces caused by the user.

B. Creating Images Using the Computer

Computer-generated imaging is accomplished by computer programs, whereas traditional cel animation is created by hand. The animation can be achieved in two-dimensional ("2-D") or three-dimensional ("3-D") format, depending on the quality of the work desired.[21] There are two methods of animating: (1) key frame, which involves drawing the principal frames on a computer and letting the computer fill in the missing frames between the principal frames; and (2) performance, which utilizes puppets and live actors covered in sensor-equipped data suits and data gloves.[22]

The images that result from computer-generated imaging can be highly polished, very fluid, and much more realistic than their exclusively hand-drawn counterparts. For example, the overall effect of the movie *Toy Story* is "[d]ifferent from other feature animations because of the use of 3-D tools, and it's different from other 3-D animations because of its depth and breadth."[23] John Lasseter, director of *Toy Story*, said of the 3-D world depicted in the movie, "The audience knows it doesn't exist, but [with 3-D] there is a sense of reality that's greater than with cel [animation]."[24]

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19. *Id.*

20. An example of a physical change in the hardware is when letters are depicted on the screen in response to the application of a physical force on the keypad.

21. Kenneth J. Lopez, *Using a Basic Knowledge of Computer Animation to Save Money on Your Next Project*, INTELL. PROP. TODAY, Sept. 1996, at 38.

22. Barbara Robertson, *Cyber Acting*, DIGITAL MAGIC, Apr. 1, 1996, at S2.

23. Robertson, *supra* note 4, at 28.

24. *Id.* at 30.

Therefore, computer animation can greatly improve the quality of films that require photorealistic stunts and characters.

1. Key Frame Animation

Key frame animation "is a five step process that involves designing, modeling, animation, rendering and the presentation of the final product."[25] The designing process usually includes a storyboard, which is a series of hand or computer drawn still images such as that found in comic books.[26] The storyboard is an entirely creative and artistic endeavor that dictates the parameters of the project. Although the least expensive part of the project, a mistake or an absence of detail in the storyboard can lead to increased expenses in later stages.[27]

Modeling requires each animated object in the movie to be sketched on the computer.[28] Modeling creates the framework of the still objects, such as the cow that spins in the funnel cloud in the movie *Twister*.[29] Computer animators use both commercial and proprietary software to accomplish the task of modeling.[30]

The next step in the key frame process is animation, which involves manipulating the computer models to recreate an event.[31] Animation requires artistic skill and a separate computer program to make the manipulations possible. Once a certain frame is sketched in the modeling process, it can be altered in an infinite number of ways to create a slightly

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25. Lopez, *supra* note 21, at 38.

26. *Id.* ("[Storyboarding] is the most important but least expensive aspect of creating computer animation."); *see also* Robertson, *supra* note 4, at 30 (quoting John Lasseter, "I think people don't understand the importance of storyboarding").

27. Lopez, *supra* note 21, at 38.

28. *Id.*

29. TWISTER (Warner Bros. 1996).

30. Microsoft's SoftImage was the software used to create the animal images in *Jumanji*. Peter Caranicas et al., *High-Tech Future of Graphics and Effects Paraded at SIGGRAPH*, SHOOT, Aug. 18, 1995, at 1. Alias' Wavefront was used to model the 366-plus objects in *Toy Story*. Robertson, *supra* note 4, at 30. Industrial Light and Magic, which is the design house that created the computer-generated imaging in *Dragonheart*, used CARI, a piece of proprietary software used to develop the lip sync and over 100 shapes of Draco's face. Lynn Haber, *Animation: PC's Final Frontier*, COMPUTER RESELLER NEWS, July 31, 1995, at 59 ("One of the biggest trends in the animation software market is open software architectures, which encourage third-party vendors to write programs to supplement popular packages."); *see also* Nancy A. Hitchcock, *Commercial Appeal*, COMPUTER GRAPHICS WORLD, Apr. 1996, at S16, S17 (quoting Robert Greenberg, CEO of R/GA Digital Studios, "We have continued to support an in-house proprietary software system so we can harness customized capabilities to job-specific purposes and combine our own technology with off-the-shelf software packages.").

31. Lopez, *supra* note 21, at 38.

different frame. Thus, an animator can make *Dragonheart's*[32] Draco smile by slightly lifting the sides of his mouth frame by frame. Looking at the frames in rapid succession, Draco's expression changes from a blank look to a smile. There are two advantages in key frame animation: (1) rather than sketching a whole new frame, the animator only needs to make slight alterations to the preceding frame; and (2) larger gaps between frames in computer animation are later filled in by the computer program. These advantages over traditional cel animation greatly reduce animation time.

After the models have been drawn and animated, the rendering process begins. Rendering is the step whereby the computer determines the final appearance of each frame of the animation as it will appear in the movie, commercial, or other multimedia presentation.[33] The computer completes each frame to meet the instructions given during the modeling and animating processes, including filling in the sketches with color.

In *Toy Story*, the computer-generated wizardry was accomplished using various computer graphics software running on Silicon Graphics workstations.[34] These machines are necessary because the 3-D graphics programs and the 3-D images created by animators require an immense memory capability.[35]

2. Performance Animation

Although key frame animation seems to be cutting edge technology, it is relatively old compared to performance animation. Performance animation is the digitizing of real-time human or puppet movements.[36] Performance animation requires computer models, performance animation software, a computer, and special input devices, such as body suits laced with sensors.[37]

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32. DRAGONHEART (Universal Studios 1995).

33. Lopez, *supra* note 21, at 38.

34. A Silicon Graphics workstation is computer hardware geared for computer animation and graphics. It has enormous memory capabilities and can run complicated and long rendering programs rapidly. Kontzer, *supra* note 9, at 15B. Silicon Graphics workstations comprise 90% of the animation hardware market. These machines are extremely powerful and capable of storing huge amounts of data and running programs requiring minimal hard disk space in the gigabytes and RAM in the area of 64 megabytes. Daniel B. Levine & Lori Grunin, *A Geek with an Artist's Soul*, WINDOWS SOURCES, July 1, 1996, at 80.

35. *See* Emma Woollacott & Joanne Wallen, *Toy Story: Pixar's Computer Animation "Leaves Artists More Time to be Creative,"* COMPUTERGRAM INT'L, Jan. 1996, at 1 (explaining that each of the 144,000 frames created by the animators at Pixar to make the 77-minute movie, required 300 megabytes of memory).

36. Robertson, *supra* note 22, at S2.

37. *Id.*

Performance animation utilizes a brand new technique called motion-capture technology. This technology allows animators to model the figure on the computer or scan a picture of the figure into the computer. Animation of individual frames is not necessary. Performance animation "uses actors and puppeteers clad in sensor-equipped 'data suits' and 'data gloves' to collect motion and position data that is applied in real time to a 3-D computer-generated character."[38] For example, the human wearing the motion sensors walks, turns around, and waves while the computer-generated character simultaneously does the same. The movement is recorded and saved on hard drives. Hence, no painstaking and time-consuming animation of individual frames is necessary.

The main advantages of performance animation over key frame animation are lower costs and faster results.[39] However, key frame manipulations are still necessary for the subtle scene changes and motions that are very difficult to simulate with puppets and humans.[40]

C. Computer Manipulation of Existing Film Footage

The increasing sophistication of today's movies has led to elevated audience expectations. Computer animation is crucial to ensure that high quality productions continue to emerge on the big screen. Computer animation and special effects are essential to create photorealistic characters and creatures, such as dinosaurs, dragons, stampeding jungle animals, and "living" toys. Computer animation and special effects techniques using computers are also crucial to create scenes that would otherwise be unrealistic or impossible to shoot. The technology makes post-production editing easier and more efficient and results in better quality footage and scenery.

Now that film can be transformed from analog to digital using digitizing machines, special effects can be added to film during post-production rather than during production.[41] There is no longer a need for

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38. Adele Hars, *Masters of Motion Capture*, COMPUTER GRAPHICS WORLD, Oct. 1996, at 26.

39. *Id.* ("While keyframe techniques can easily take hours to produce a single frame, PA can produce 20 minutes of animation in a single day for as little as $500/minute, depending on the complexity of the animation. That's 10 to 20 times less than what you'd expect to pay for the same thing done in keyframe.").

40. *Id.* at 32 ("While standard walking, standing, turning, gesturing, and running motions pose no problem for PA, for example, a scene depicting Donkey Kong swinging on a vine would best be handled with keyframe.").

41. *See* U.S. Patent number 4,258,385 to George A. Greenberg, *Interactive Video Production System and Method* (Mar. 24, 1981) (on file with the *Loyola of Los Angeles Entertainment Law Journal*) (disclosing one of the first digitizing machines wherein the

reviewing numerous reels of film footage to determine whether further filming is necessary.

These post-production editing techniques include the use of image processors, which are capable of receiving video frames in analog format and converting them to digital format, where they can be stored in computer memory in a binary code of ones and zeroes.[42] The ones and zeroes correspond with particular points, or pixels,[43] on the video screen. The color of each pixel can be altered, enabling the manipulation of frames by changing the colors of individual pixels.[44] In essence, the computer animator erases and draws over the previous image.[45] The process is done one frame at a time creating fluid motions and transformations when the frames are run at rapid speed.

The digital version of the film frame then can be viewed on a computer screen and manipulated in countless ways using animation and graphics programs. For example, in the movie *Space Jam*,[46] an image of Michael Jordan was scanned into the computer for storage in digital format. Subsequently, the image was "stretched, squashed and even wadded up like a basketball."[47] The increased possibilities of film manipulation, coupled with increased convenience and ease, amount to important advances in film editing.

Another example of manipulating existing footage is the alteration of lip movements to correspond more realistically with the soundtrack.[48] Mouth movements can be altered by digitizing the film and altering the arrangement of the lips and mouth to synchronize visual movements with the audio soundtrack. This effect can be done by "identifying the position of the mouth on each frame, identifying what to do with the mouth and

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digitized images could be altered).

42. *Id.*

43. THE NEW IEEE STANDARD DICTIONARY OF ELECTRICAL AND ELECTRONIC TERMS 958 (5th ed. 1993) ("The smallest element of a display surface that can be assigned independent characteristics. *Note:* This term is derived from the term 'picture element.'").

44. This pixel-altering technology was discovered in 1981 with U.S. Patent number 4,258,385. *Combined Logic Files Patent Lawsuit in Federal Court*, U.S. NEWSWIRE, Mar. 11, 1996, *available in* 1996 WL 5620042.

45. Simon Vail, *Movie Magic Apes Real Life*, TIMES (London) Jan. 24, 1996, at 1 ("'[The computer animator] can get rid of objects that have wandered' into a frame, or take out safety wires [that are attached to actors or objects in movies].").

46. SPACE JAM (Warner Bros. 1996).

47. Amy Longsdorf, *Special Effects Advance by Light Years in 'Space Jam,'* MORNING CALL (Allentown), Nov. 10, 1996, at F1.

48. *See* U.S. Patent number 4,600,281 to Richard Bloomstein, *Altering Facial Displays in Cinematic Works* (July 15, 1986) (on file with the *Loyola of Los Angeles Entertainment Law Journal*).

then exacting the change with digital technology."[49] This "lip-sync" technology was used in the movie *Forrest Gump* to make American presidents utter words they never spoke in real life. President Kennedy was digitized and "repainted with the proper phonetic mouth movements to match the scripted dialogue and with highlights on his face to simulate the corresponding jaw and muscle changes."[50] The effect has stirred up litigation over patent rights for the process used to create the altered mouth and facial movements.[51]

Digitizing film revolutionized editing techniques. After digitizing, the steps involved in editing include viewing, cutting, combining and assembling clips, adding transitions and special effects, such as overlays, squeezes, rotations, and animation.[52] Editors no longer have to physically manipulate and cut numerous reels of film. Computer hardware and software technology enables editors to composite and layer scenes,[53] incorporate animation,[54] remove characters and objects from scenes, as well as alter shading and lighting.[55] This technology increases the realm of possible effects, allowing filmmakers to utilize a wider range of their imagination.

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49. Martinez, *supra* note 10, at 5.

50. Stephen Prince, *True Lies: Perceptual Realism, Digital Images, and Film Theory*, FILM Q., Spring 1996, at 27.

51. Martinez, *supra* note 10, at 1.

52. Jeff Ubois, *Video-Editing Systems Ready for Prime Time*, MACWEEK, June 3, 1996, at 20, 21.

53. Compositing and layering is the art of incorporating multiple frames or shots into one frame. Traditionally, film editing required juxtaposition of frames to composite and layer, but now shots can be incorporated digitally in the computer. For example, in the movie *Alaska*, "[t]he town the characters lived in was on the Canadian coast, but the mountains on view in the background were shot in Valdez, Alaska, and electronically laid into the image." David Ansen & Ray Sawhill, *The New Jump Cut: Digital Editing is Revolutionizing the Way Films are Made and Look. It's Also Creating Havoc*, NEWSWEEK, Sept. 2, 1996, at 64.

54. An interesting example of incorporating animation into a scene was accomplished in the movie *The Babe*, where a baseball stadium was digitally filled with 50,000 fans dressed in 1920's clothing. By filming about 50 people in 1920's costumes and duplicating the image many times, the stadium appeared to be filled with screaming fans. Kontzer, *supra* note 9, at 7B.

55. Ubois, *supra* note 52, at 20; *see also* Ansen & Sawhill, *supra* note 53, at 64 (explaining that entire films can be edited on digital systems such as Avid computers).

III. PATENT PROTECTION

A. Patenting Computer Animation Hardware

Patent protection is widely available for computer hardware under the Patent Act of 1952.[56] Section 101 of the Patent Act discloses the scope of patentable subject matter[57] by stating, "Whoever invents or discovers any new and useful *process*, *machine*, *manufacture*, *or composition of matter*, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of [Title 35 of the United States Code]."[58] "New" means that the exact invention has not already been invented.[59] Additionally, the invention must be nonobvious over the prior art.[60] "Nonobvious" means that a person skilled in the field of the particular invention, and basing his decision on existing technology, would not think it obvious to make the invention.[61] Thus, the requirements to obtaining a patent are: (1) the invention must be patentable subject matter; and (2) the invention must be new, useful, and nonobvious.

Digitally enhanced special effects technology is comprised of hardware that runs various animation or editing software. Clearly, a computer or other hardware is a machine, making it patentable subject

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56. Act of July 19, 1952, ch. 950, 66 Stat. 792 (codified as amended at 35 U.S.C. §§ 1–376 (1982)).

57. Patentable subject matter means all things that can be patented under the current patent laws. 35 U.S.C. § 101 (1994). Patentable subject matter is limited to processes, machines, articles of manufacture, and compositions of matter. *Id.*

58. *Id.* (emphasis added). Process has been defined as a "[t]ransformation and reduction of an article 'to a different state or thing.'" Gottschalk v. Benson, 409 U.S. 63, 70 (1972) (quoting Cochrane v. Deener, 94 U.S. 780, 787–88 (1877)). A machine is defined as, "a structure consisting of a framework and various fixed and moving parts, for doing some kind of work; mechanism." WEBSTER'S UNABRIDGED DICTIONARY 1080 (2d ed. 1983). Composition of matter refers to chemicals and pharmaceuticals. 35 U.S.C. § 101 (1994). Finally, "manufacture" means "the production of articles for use from raw or prepared materials by giving to these materials new forms, qualities, properties, or combinations, whether by hand-labor or by machinery." Diamond v. Chakrabarty, 447 U.S. 303, 308 (1980) (quoting American Fruit Growers, Inc. v. Brogdex Co., 283 U.S. 1, 11 (1931)).

59. The term "new" is often referred to as "novel," and these two words will be used interchangeably throughout this Comment.

60. "A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. § 103 (1994). Prior art can take the form of a prior patent or a reference made in a printed publication. *Id.* § 102.

61. *Id.* § 103.

matter.[62] Therefore, if the hardware is useful, new, and nonobvious, then it is patentable.

Patenting is the only sufficient form of intellectual property protection for computer animation hardware, such as data suits and gloves used in performance animation. Data suits and gloves and other machines developed for computer animation cannot be protected by copyrights because copyright law is not designed for the protection of inventions.[63] The only other possible form of protection for such innovative apparati is to keep them a secret from the world.[64] However, trade secret protection is also inadequate because it does not protect the inventor from reverse engineering or independent development by someone else.[65] Therefore, patents are the most reliable protective measure for filmmakers and animation studios developing new and useful animation tools. Hence, animation hardware can and should be patented either as machine patents or as process patents.

B. Patenting Special Effects Methods That Use Digital Technology

Process or method patents adequately protect special effects techniques utilizing digital or computer technology to edit existing film footage. Since processes are statutory subject matter under patent law,[66] an invention that is a process of creating some sort of cinematic effect is patentable if it is new, useful, and nonobvious.

For example, a process for masking over unwanted portions of a scene using animation programs and/or computer hardware is patentable subject matter.[67] A patent can protect the entire process, but as various hardware and software components are included in the claims of the patent, the scope of the patent becomes increasingly limited.[68] Therefore,

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62. *In re* Alappat, 33 F.3d 1526, 1545 (Fed. Cir. 1994) ("Consequently, a computer operating pursuant to software *may* represent patentable subject matter.... [A] computer, like a rasterizer, is apparatus not mathematics.").

63. 17 U.S.C. § 102(a) (1994).

64. Trade secrets are one form of intellectual property protection, but trade secret law does not protect inventors from reverse engineering. Bonito Boats v. Thunder Craft Boats, 489 U.S. 141 (1989). Thus, to sufficiently protect trade secrets when inventions can be reverse engineered with relative ease, inventors should not sell their inventions to the public.

65. *Id.*

66. *See supra* note 58 and accompanying text for a definition of "process."

67. *See supra* note 53 and accompanying text. Such a process is often used in the making of movies like *Braveheart*. In *Braveheart*, actors were digitally removed from a scene during the editing process when it was decided that they had entered the scene a few seconds too soon. Steve Daly, *Don't Believe Your Eyes; This Summer's Most Spectacular Effects Could be the Ones You Don't Even Notice*, ENT. WKLY., June 16, 1995, at 38.

68. Claims are the part of a patent application that describe and define the limitations of the

it is beneficial to include minimal hardware and software components in the claims. This strategy affords greater protection because another inventor who invents a way to do the same thing using different hardware or software would still infringe.

An example of a patented computer enhanced special effect is the process of altering the mouth and facial expressions of actors to match a given soundtrack.[69] In fact, this procedure currently enjoys a patent[70] owned by Richard W. Bloomstein, who sued the makers of *Forrest Gump*, Paramount Pictures and LucasFilm, for infringement of that patent.[71] Claim 1 of the patent, which is representative of all the claims, reads:

> [T]he method of the invention comprises altering a cinematic work by substituting a second animated facial display for a first animated facial display and in which the displays have lip movements corresponding to the languages used and wherein the languages of the two displays are sufficiently different to result in different lip movements for each display, and including the steps of: generating data in digital form representing the configuration of the second facial display over a plurality of cinematic frames, generating data in digital form representing the configuration of the first facial display over a plurality of cinematic frames of said work, and altering under the control of both sets of said data and a programmed digital computer the configuration of said first facial display to produce substantially the configuration of the second facial display.[72]

The specification of this patent refers to foreign languages. The word "language" is used by the patentee in the sense that different countries speak different languages, as opposed to "language" meaning spoken words and phrases in general.[73] Thus, the claim is drawn to a process of

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invention. The claims tell the world exactly what the patented invention involves. Bell Communications Research, Inc. v. Vitalink Communications Corp., 55 F.3d 615, 619 (Fed. Cir. 1995).

If one claims a process of computer enhanced special effects using hardware *x* and *y* and software *a* and *b*, he/she limits his/her patented process to one that uses *x*, *y*, *a*, and *b*. This claim is limited by the elements of *x*, *y*, *a*, and *b*, and only processes that utilize all four of those elements infringe upon the patented process. For example, if an accused infringer's process does not utilize hardware *x*, but does utilize hardware *y* and software *a* and *b*, the accused is not infringing because one of the elements of the claim is not present in the accused process.

69. Martinez, *supra* note 10, at 5.

70. U.S. Patent number 4,600,281, *supra* note 48, at claim 1.

71. *See Inventor Sues Over 'Gump' Lip Syncs*, CHI. SUN-TIMES, Mar. 23, 1995, § 2 (Features), at 36.

72. *See* U.S. Patent number 4,600,281, *supra* note 48, at claim 1.

73. The specification of the patent is a part of the patent separate from the claims of the patent. The specification describes and explains the invention using drawings and detailed

altering lip movements to correspond to a soundtrack that communicates in a different language than the original soundtrack. In *Forrest Gump*, the lip movements of the presidents were altered to correspond to different words of the same language. Thus, it can be argued that the process utilized in *Forrest Gump* does not literally infringe U.S. Patent No. 4,600,281 because it lacks one of the elements of the patented process;[74] this case is an excellent illustration of the scope of a process patent dealing with computer animation. Bloomstein's patent would be stronger—that is, it would cover a wider range of lip synching animation—if it was not limited to changing facial expressions to fit the words of a different language.

The advantage of process patents is that if the inventor draws the claims in the patent broadly, processes that use other kinds of machines, or subsequent technology, may still infringe the patent. For example, Bloomstein might have drafted a claim that read: "a method of altering facial displays utilizing electronic technology." Such a claim, although unrealistically broad, illustrates the potential magnitude of protection that process patents can provide.

Processes, such as Bloomstein's and others, that deal with character manipulation or creation, should be patented. Process patents are the best form of protection in a field such as computer-generated imaging because there are so many different components to computer-generated imaging that fit together to create the final images. A process patent can cover the method of tying together the entire conglomeration of components. For example, if one claims a process for stretching characters to make them look taller and includes some limitations describing how the stretching is done by computer, one can potentially be protected from a subsequent developer of a computer program that does the same thing. Process patents are also useful when the individual components of the process are

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descriptions of the drawings that include the various embodiments of the invention. *See* U.S. Patent number 4,600,281, *supra* note 48, at claim 1.

74. The element referred to is the altering of facial displays wherein the languages of the two displays are different. However, a complication exists in this example in that the limitation of the above process claim is found in the preamble of the claim. The preamble does not limit the scope of the claim when it merely states a purpose or intended use. *In re* Paulsen, 30 F.3d 1475, 1479 (Fed. Cir. 1994). However, the terms in the preamble do limit the scope of the claim when they give meaning to the claim and properly define the invention. Bell Communications Research, Inc. v. Vitalink Communications Corp., 55 F.3d 615, 620 (Fed. Cir. 1995). The preamble of Bloomstein's claim 1 probably does more than state a mere purpose or intended use, but that is for a judge to decide. Markman v. Westview Instruments, 116 S. Ct. 1384 (1996).

Furthermore, Bloomstein's claim 1 may still be infringed under the "doctrine of equivalents" if the process used in *Forrest Gump* has substantially the same function and operates in substantially the same way with substantially the same result as the patented process. Graver Tank & Mfg. Co. v. Linde Air Prods. Co., 339 U.S. 605, 608 (1950).

not individually patentable, but the process of using them together and in a certain order is patentable. Finally, an innovative method of animating may be more valuable than the machines used to implement that method. In that case, a method patent is clearly more valuable than a machine patent.

The downside to a process patent is that it does not individually protect the components that comprise the patent. For example, a process that uses particular hardware and software together to stretch characters does not individually protect the hardware or software developed for the stretching process.

C. Patenting Computer Software

Historically, the patentability of a computer program, either as an application program or an operating system, has been an unsettled area of the law. Even though the legislative history of the 1952 Patent Act[75] contains a statement that statutory subject matter "'include[s] anything under the sun that is made by man,' Congress did not so mandate."[76] Until recently, it was not clear whether and how computer programs would evolve into patentable subject matter as defined by 35 U.S.C. § 101.[77]

The patentability of software is an area of the law that has undergone a bewildering metamorphosis. At one time software was not patentable, but currently, the state of the law seems to be that software is patentable depending on how it is claimed.[78] The Supreme Court and the Court of Appeals for the Federal Circuit, considered the "Supreme Court of Patents,"[79] have in the past thirty years been inconsistent in their treatment of software patents.[80] However, the modern trend, as suggested by the new PTO guidelines, suggests that patents will be an effective and important form of intellectual property protection for computer software.

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75. 35 U.S.C. §§ 1–376 (1994).

76. *In re* Warmerdam, 33 F.3d 1354, 1358 (Fed. Cir. 1994) (citations omitted).

77. The cases on software patents were confusing, but the treatment of software has been clarified by the new Examination Guidelines for Computer-Related Inventions, 61 Fed. Reg. 7478 (1996).

78. Diamond v. Diehr, 450 U.S. 175, 195 (1981) (Stevens, J., dissenting) ("Prior to 1968, well-established principles of patent law probably would have prevented the issuance of a valid patent on almost any conceivable computer program.").

79. Robert C. Laurenson, *Computer Software 'Article of Manufacture' Patents*, COMPUTER LAW., June 1995, at 18.

80. The U.S. Supreme Court was opposed to the expansion of patent laws to encompass computer programs in *Gottschalk v. Benson*, 409 U.S. 63 (1972) (overturning the decision of the C.C.P.A. in *In re* Benson, 441 F.2d 682 (C.C.P.A. 1971) that allowed the patenting of computer programs).

For the sake of brevity, and also because this Comment is not a discussion on software patent law, only the PTO guidelines will be discussed to describe the form that software patents must take if they are to be patentable.

1. The New PTO Guidelines on Software Patents

The new PTO guidelines on software patents have aided in clarifying the confusing case law on software patents by stressing that computer programs be treated the same as other technology.[81] These guidelines were created to assist patent examiners in reviewing patent applications dealing with computer-related inventions.[82] They were drafted based on the substantive case law from the Supreme Court and the Federal Circuit; however, "[they] do not constitute substantive rulemaking and hence do not have the force and effect of law."[83] The guidelines allow utilitarian software features to be patented while the expressive or aesthetic aspects of software must be copyrighted for protection.[84]

a. Patentable Subject Matter under the PTO Guidelines

The PTO guidelines mandate that software patents be classified into three categories of patentable subject matter: process, machine, and article of manufacture.[85] However, certain aspects of software also may be patented as design patents.[86] The PTO Guidelines state:

> Software patents may be written to claim what software does—that is, its process—such as a method for presenting help information on a display screen. Machine patents, usually referred to as patents claiming an apparatus, are written to claim the implementation of a software program in a computer, such as a [sic] carrying out of directions for pinning a menu onto a screen. Manufacture patents claim an article of manufacture, such as a disk embedded with a novel, non-obvious software program for displaying graphical information on a display.[87]

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81. Examination Guidelines for Computer-Related Inventions, 61 Fed. Reg. 7478 (1996).

82. *Id.* at 7479.

83. *Id.*

84. *Id.* at 7478; *see also* Willis Higgins et al., *A Bill of Rights for Software is Issued*, NAT'L L.J., May 20, 1996, at C37.

85. Higgins et al., *supra* note 84, at C37.

86. *Id.*

87. *Id.*

Claims drafted as a process, apparatus, or an article of manufacture are likely to be held valid and able to withstand litigation.[88]

Patenting software as a process was one of the first methods to introduce software as patentable subject matter.[89] However, the PTO guidelines make clear that software is patentable when claimed as a process.[90] To meet subject matter statutory requirements, a process claim must include post-computer process activity, manipulation of data representing physical objects or activities, or be limited to a practical application within the technological arts.[91]

As previously stated, computer programs may be patented if claimed as part of a machine or apparatus.[92] An apparatus claim is statutory if it defines a specific machine. The claim must define the physical structure of the machine "in terms of its hardware or hardware and 'specific software.'"[93]

Finally, the PTO guidelines adopt the view that a computer-readable medium encoded with a computer program is patentable as an article of manufacture.[94] There are two necessary elements to an article of manufacture:

> (1) a computer-readable storage medium, such as a memory device, a compact disc or a floppy disk, and (2) the specific physical configuration of the substrate of the computer-readable storage medium that represents data (e.g., a computer program, [often called 'data structures']), where the storage medium so configured causes a computer to operate in a specific and predefined manner.[95]

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88. *Id.* at C38 ("[S]oftware claimed as operational in a computer or stored on a computer-readable medium is very likely to be upheld by the courts.").

89. Diamond v. Diehr, 450 U.S. 175 (1981).

90. Examination Guidelines for Computer-Related Inventions, 61 Fed. Reg. 7478, 7483 (1996) ("To be statutory, a claimed computer-related process must either: (1) Result in a physical transformation outside the computer for which a practical application in the technological arts is either disclosed in the specification or would have been known to a skilled artisan . . . , or (2) be limited by the language in the claim to a practical application within the technological arts. . . .").

91. *Id.*

92. *Id.* at 7482.

93. *Id.* at 7483 (citing COMPUTER DICTIONARY 78 (2d ed. 1994)).

94. *In re* Beauregard, 53 F.3d 1583, 1584 (Fed. Cir. 1995). The inventor had claimed a computer program stored on a computer-usable storage medium, i.e., a CD-ROM, floppy disk, or hard drive. The Examiner rejected the pending claims under § 101 as non-patentable subject matter, and the Patent Office Board of Patent Appeals & Interferences ("the Board") sustained the rejection. *Id.* The inventor appealed to the Federal Circuit, and the Board withdrew its opposition to the appeal and signaled its acquiescence to the patentability of such claims. *Id.*

95. Michale I. Chakansky, *Patenting Software on a Floppy Disk*, COMPUTER L.

These requirements make it quite clear that not everything placed on a floppy disk makes the combination an article of manufacture.

b. Non-Statutory Subject Matter under the PTO Guidelines

Non-statutory software inventions can be grouped into one of four categories: (1) a mere compilation of data with no physical element; (2) a computer, or machine-readable medium encoded with purely descriptive data such as music or a mere arrangement of data; (3) functional material or data structures independent of the physical element; and (4) a process that only manipulates abstract ideas or concepts, often considered mere algorithms.[96] Mere arrangements of data are considered non-functional descriptive material and are unpatentable subject matter.[97] "Functional descriptive material consists of data structures and computer programs that impart functionality when encoded on a computer-readable medium."[98] To be patentable subject matter, this functional descriptive material cannot be claimed merely for descriptive purposes. However, "[i]f functional descriptive material is recorded on a computer-readable medium, it becomes structurally and functionally interrelated to the medium and thus, in most cases, statutory."[99]

Although the law on software patents has traveled down a winding road, the PTO guidelines have shed some light on this dark and mysterious area. As a consequence, patents are widely available for software depending on how one prefers to draft the language of the claims. If the software is claimed within the context of a useful, novel, and nonobvious process, or a machine or article of manufacture, it is patentable.

2. Application of Patent Law to Animation Software

Programs that are used for modeling, animating, and rendering may be patentable depending on how one drafts the claims. The proprietary software used by some computer animation houses, such as R/GA Digital Studios and Industrial Light and Magic, which used CARI to develop the lip sync and Draco's face,[100] are also patentable. As long as an animation

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STRATEGIST, June 1995, at 6.

96. *Id.; see also* Examination Guidelines for Computer-Related Inventions, 61 Fed. Reg. at 7481–82 (1996).

97. *See In re* Warmerdam, 33 F.3d 1354, 1361 (Fed. Cir. 1994) (holding that a claim to a data structure was held non-statutory subject matter).

98. Higgins et al., *supra* note 84, at C38.

99. *Id.*

100. *See supra* note 32 and accompanying text.

program is patented as a process, machine, or article of manufacture, then it is patentable under the new PTO guidelines.[101]

a. Patenting the Software as a Process

Generally in a process claim, the claim must "define steps or acts to be performed."[102] Thus, one can merely describe the instructions set forth in the program or what the program does and include it within a claim that is executable by some sort of hardware.[103] An example of a process claim for computer animation software is the following:

> A method for creating a representation of a scene displayable on a graphical output device, comprising the steps of: providing in memory a representation of a first object; invoking an object-drawing subsystem with an identification of said first object, said object drawing subsystem performing at least part of a rendering of said first object into said scene and returning a flag indicating whether said rendering of said first object is complete; and repeating said step of invoking if said flag indicates that said rendering of said first object is not complete.[104]

The first part of the claim stating "a method for"[105] means that it is a process claim.[106] The part of the claim stating "displayable on a graphical output device"[107] links the software used in the process with the hardware used in the process.[108]

Software that translates data received from data suits and gloves into sophisticated 3-D motions within a computer-generated environment, as in performance animation, can be patented as a process (a process of translating data of physical movements into manipulations of a 3-D animated character). Process patents are an optimal way of protecting the ever-increasing array of software used in performance animation.

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101. *See generally* Examination Guidelines for Computer-Related Inventions, 61 Fed. Reg. 7478 (1996).

102. *Id.* at 7480.

103. *Id.* at 7482.

104. U.S. Patent number 5,561,752 to David Jevans, *Multipass Graphics Rendering Method and Apparatus with Re-Traverse Flag*, at claim 1 (Oct. 1, 1996) (on file with the *Loyola of Los Angeles Entertainment Law Journal*).

105. *Id.*

106. ROBERT C. FABER, LANDIS ON CLAIM DRAFTING 99–107 (3d ed. 1990).

107. U.S. Patent No. 5,561,752, *supra* note 104, at claim 1.

108. FABER, *supra* note 106, at 99–107.

For example, new programs that create automatic, higher-level behaviors based on primary motion data are already being used in performance animation.[109] This software responds to movements from a data suit and incorporates additional movements that would necessarily result from those primary movements.[110] "A simple example: if a dancer wearing motion sensors changes the angle of her hand, for example, she would cause the 3-D character's hand to move; this hand movement might then trigger an algorithm that morphs the computer-generated character's fingers into new positions."[111] These algorithms make the use of added motion sensors and additional data unnecessary. With this software, animators can give computer-generated characters "exaggerated, cartoony motion that humans can't do."[112] Process patents can protect the entire process of incorporating additional movements, including the data suits, other hardware, and software. The software alone can be protected as a method for incorporating additional movements based on primary movements in performance animation.

One advantage of claiming software as a process is that the software does not have to be limited in scope by the machine that runs it. Performance animation software supports this point because the software is patentable as a process, so long as it is limited to a practical application within the technological arts.[113] Consequently, process patents are very useful in protecting an invention that encompasses a wide array of technology beyond that of software alone.

b. Patenting the Software as a Machine

Animation software may be patented as part of a machine or an apparatus.[114] Such a strategy may be useful if the machine itself is valuable and requires patent protection. A machine or apparatus claim will look like the following:

> Apparatus for creating a representation of a scene displayable on a graphical output device, for use with an object drawing subsystem and with a memory containing a representation of a first object, comprising: first invoking means for invoking said

109. Robertson, *supra* note 22, at S4.

110. *Id.*

111. *Id.*

112. *Id.*

113. For example, a strong argument can be made that this software is limited to the practical application of creating movements in an animated character.

114. *See* Examination Guidelines for Computer-Related Inventions, 61 Fed. Reg. 7478, 7481 (1996).

> object-drawing subsystem with an identification of said first object, said object drawing subsystem performing at least a first part of a rendering of said first object into said scene and returning a flag indicating whether said rendering of said first object is complete.[115]

Furthermore, dependent claims[116] can be added to further limit and describe the "first invoking means."[117] Dependent claims can be added to ensure that patent coverage is clearly obtained for certain elements the patentee feels may be valuable, but, if included in the independent claim, would unnecessarily limit the claim.[118]

c. Patenting the Software as an Article of Manufacture

Finally, the software inventor may claim the software as an article of manufacture.[119] An article of manufacture claim may look like the following: "a computer storage medium comprising a computer program with a set of instructions for performing the following task . . . ." The remainder of this hypothetical claim can include the process described in claim 1 of Patent No. 5,561,752 as shown above. The benefit of an article of manufacture claim is that it is not limited by a machine in any way, unlike machine claims and some process claims.

Software patents are useful for software creators and animation houses who use their own proprietary software. Patents on proprietary software are especially important because animation houses are now tailoring their own software to meet highly specific needs created by their clients in the movie and advertising industries.[120]

IV. COPYRIGHTING COMPUTER PROGRAMS

A. Background of the Law

Unlike patent law, which gives exclusive rights to the art disclosed, copyright law only protects the expression of an idea and not the idea

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115. U.S. Patent Number 5,561,752, *supra* note 104, at claim 12.

116. Dependent claims are narrower in scope and more specific than the claims on which they are dependent. They read like the following: "The apparatus of claim 12, wherein said first invoking means comprises . . . ." *Id.* at claim 13.

117. *Id.* at claim 12.

118. *See* ROBERT P. MERGES, PATENT LAW AND POLICY 14–15 (1992).

119. *See* Examination Guidelines for Computer-Related Inventions, 61 Fed. Reg. at 7481.

120. Haber, *supra* note 30, at 59. Furthermore, a reliance on trade secret or copyright law can be disastrous since reverse engineering is a lawful activity. *See infra* note 145.

itself.[121] This rule was codified at 17 U.S.C. § 102(b).[122] Thus, two people, each working independently, can produce identical plays, drawings, or songs. Yet, each person can retain the exclusive right to make copies of his own work.[123] This principle holds true for computer programs and has created much confusion as to how one should separate an idea from its expression.[124]

Copyright law protects three aspects of a computer program: (1) the literal code; (2) the non-literal elements of the code; and (3) the user interface.[125] The literal elements of a computer program are its source code and object code.[126] The non-literal elements of the code are the structure, sequence, and organization of the code.[127] The program's user interface refers to the way in which the program interacts with the user and may include such details as screen displays, command names, choice of keystrokes, and menu organization.[128] Copyright infringement can occur at any one of these three levels of a computer program. Each level will be discussed in further detail.[129]

B. Development of Copyright Law for Computer Programs

Every original computer program is born with a copyright as soon as it is fixed in a tangible medium of expression.[130] Computer programs

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121. Baker v. Seldon, 101 U.S. 99 (1879).

122. "In no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work." 17 U.S.C. § 102(b) (1994).

123. Fred Fisher, Inc. v. Dillingham, 298 F. 145, 151 (S.D.N.Y. 1924).

124. Whelan Assocs., Inc. v. Jaslow Dental Lab., Inc., 797 F.2d 1222 (3d Cir. 1986). The *Baker v. Seldin* issue with respect to computer program copyrights is unsettled among the various U.S. courts of appeals and will be discussed further in this section of the Comment.

125. Computer Assocs. Int'l, Inc. v. Altai, Inc., 982 F.2d 693, 702–03 (2d Cir. 1992); *see also Whelan Assocs.*, 797 F.2d 1222 (protecting the non-literal elements of a computer program); Lotus Dev. Corp. v. Paperback Software Int'l, 740 F. Supp. 37 (D. Mass. 1990) (focusing on how the program interacts with the user, or its "look and feel"). *See generally* Virginia Ann Johnson, Note, *Byte After Byte, the Courts Nibble Away at Copyright Protection of Software*, 10 GA. ST. U. L. REV. 543, 552 (1994).

126. *Computer Assocs.*, 982 F.2d at 702; *see also Whelan Assocs.*, 797 F.2d at 1233 (copyright laws protect computer programs in either source code or object code format). *See supra* text accompanying notes 18 and 19 for definitions of "source code" and "object code."

127. *Computer Assocs.*, 982 F.2d at 701; *see also Whelan Assocs.*, 797 F.2d at 1234.

128. Johnson, *supra* note 125, at 552; *see also* Matthew J. Fortnow, Note, *Why the "Look and Feel" of Computer Software Should Not Receive Copyright Protection*, 14 CARDOZO L. REV. 421, 425 (1992).

129. *See infra* Part IV.B.

130. *See infra* note 131.

became copyrightable as literary works under Section 102(a)(1) of the 1976 Copyright Act.[131] Although the Copyright Act did not expressly provide for protection of computer programs, Congress intended computer programs to be within the scope of "literary works."[132] Subsequently, Congress added the definition of "computer program"[133] to Section 101 by the Computer Software Copyright Act of 1980, which had "the effect of clearly applying the 1976 [Copyright Act] to computer programs . . . ."[134] "Computer program" refers only to the written code of the program and not to the screen displays that a computer user sees when running a particular program.[135] The Computer Software Copyright Act was a result of the National Commission on New Technological Uses of Copyrighted Works' ("CONTU") final report.[136] The CONTU final report concluded that Congress intended to include computer programs within the scope of copyrightable subject matter in the Act of 1976.[137]

The Copyright Act[138] and numerous judicial decisions have confirmed that computer programs are copyrightable.[139] "Beginning in the late 1980s, copyright protection for computer programs evolved from the bedrock proposition that a program's literal code is protectable, regardless of the program's purpose, manner of expression, or physical embodiment, to the proposition that expressive elements underlying a program's surface can also be protected."[140] Finally, courts have held that the user interface

131. Copyrights Act, Pub. L. No. 94-553, 90 Stat. 2541 (1976) (codified as 17 U.S.C. §§ 101–914 (1994)). Section 102(a) of the code states in part, "Copyright protection subsists, in accordance with this title, in original works of authorship fixed in any tangible medium of expression . . . . Works of authorship include . . . literary works . . . ." 17 U.S.C. § 102(a).

132. "[L]iterary works . . . include . . . [c]omputer programs to the extent that they incorporate authorship in the programmer's expression of original ideas, as distinguished from the ideas themselves." H.R. REP. NO. 94-1476, at 54 (1976), *reprinted in* 1976 U.S.C.C.A.N. 5659, 5667.

133. "A 'computer program' is a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result." 17 U.S.C. § 101.

134. H.R. REP. NO. 96-1307, pt. 2, at 19 (1980).

135. "[A] set of statements or instructions . . ." does not include anything visual. Thus, the screen displays are protected as "audiovisual works." 17 U.S.C. § 101. *See infra* Part IV.B.1.

136. *Final Report of the Nat'l Comm'n on New Technological Uses of Copyrighted Works* (July 31, 1978).

137. *Id.* at 16.

138. 17 U.S.C. §§ 101–914 (1994).

139. *See* Engineering Dynamics, Inc. v. Structural Software, Inc., 26 F.3d 1335 (5th Cir. 1994); Sega Enters., Ltd. v. Accolade, Inc., 977 F.2d 1510 (9th Cir. 1992); Atari Games Corp. v. Nintendo of Am., Inc., 975 F.2d 832 (Fed. Cir. 1992); Computer Assocs. Int'l, Inc. v. Altai, Inc., 982 F.2d 693 (2d Cir. 1992); Whelan Assocs., Inc. v. Jaslow Dental Lab., Inc., 797 F.2d 1222 (3d Cir. 1986).

140. 2 PAUL GOLDSTEIN, COPYRIGHT § 2.15.2.1, at 2:191 (2d ed. 1996).

is also copyrightable.[141] However, the level of copyright protection is unclear because the First Circuit recently held that a menu command hierarchy is a method of operation, which is not protected by copyright.[142]

There are three levels of copyright for computer programs, making an infringement analysis complicated and uncertain. For example, when determining whether computer program A infringes on computer program B's copyright, one must look at the three aspects of program B to determine the potential infringement: the literal elements, the non-literal elements, and the user interface. To fully understand the nature of software copyrights, one must study the three levels of a software copyright separately and in detail.

1. Analysis of the Literal Elements

The literal elements of a computer program, including its source and object codes, are protectable under copyright law.[143] However, in *Sega v. Accolade*,[144] the Ninth Circuit greatly limited the scope of copyright protection for the computer program object code by holding that reverse engineering[145] was a fair use, subject to three limitations.[146] These three limitations provided that reverse engineers (1) could only seek access to the unprotected ideas and expressions contained in the object code; (2) had to have legitimate reason to copy and study the copyrighted code;[147] and (3) had to have no other means of access to the protected code.[148] Thus, the object code lost some protection because, upon satisfying the three-

141. Lotus Dev. Corp. v. Paperback Software Int'l, 740 F. Supp. 37 (D. Mass. 1990).

142. Lotus Dev. Corp. v. Borland Int'l, Inc., 49 F.3d 807 (1st Cir. 1995).

143. *Computer Assocs.*, 982 F.2d at 702; *see also Whelan Assocs.*, 797 F.2d at 1233.

144. 977 F.2d 1510, 1514–15 (9th Cir. 1992).

145. Reverse engineering is done by obtaining the object code and working backward to reconstruct much of the source code. The object code can be obtained by reading the ROM electronically. *See* Johnson, *supra* note 125, at 552.

146. Sega Enters., Ltd. v. Accolade, Inc., 977 F.2d 1510, 1514 (9th Cir. 1992).

147. For example, reverse engineers could make "fair use" of the protected work according to Section 107:

> In determining whether the use made of a work in any particular case is a fair use the factors to be considered shall include: (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes; (2) the nature of the copyrighted work [where utilitarian or factual expression is not as protected as a work of fiction]; (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and (4) the effect of the use upon the potential market for or value of the copyrighted work.

17 U.S.C. § 107 (1994).

148. *Sega*, 977 F.2d at 1514.

pronged test of *Sega*, an exact copy of the object code became permissible.[149]

The reasoning behind *Sega* can be traced back to the expression-idea dichotomy of *Baker v. Seldin*.[150] Those aspects of the program code that constitute, "any idea, procedure, process, system, method of operation, concept, principle, or discovery,"[151] are not protected by copyright. However, one cannot know what part of the object code is protected and what part is not protected until the object code is translated into the source code.[152] In other words, it is impossible to copy only the part of the object code that is unprotected since one cannot know what part is unprotected until after copying and translating take place. For this reason, the courts have given competitors an opportunity to discover the unprotected specifications in an object code as long as they meet the three-pronged test enunciated in *Sega*.[153]

Accused infringers do not always pass the three-pronged test of *Sega*.[154] Courts have found infringement of protected expression in cases where the alleged infringing work duplicated the copyrighted program.[155] One commentator has stated that "a competitor who copies a program in the course of decompilation or disassembly will most likely infringe the copyright if its product reaches the market in a form that embodies substantially similar expression copied from the copyrighted expression in the computer program."[156] However, *Sega* gives an accused infringer a window of opportunity to justify making an exact copy of the object code.[157] Thus, copyrights are available for the program code, but the level of protection from copying is not absolute.

2. Analysis of the Non-Literal Elements of Structure, Sequence, and Organization

In *Whelan Associates, Inc. v. Jaslow Dental Laboratory, Inc.*,[158] the Third Circuit made the unprecedented decision that "copyright protection

149. *Id.*

150. 101 U.S. 99 (1879).

151. 17 U.S.C. § 102(b) (1994).

152. *See supra* notes 18 and 19 and accompanying text.

153. *Sega*, 977 F.2d at 1514.

154. *Id.*

155. *See* Williams Elecs. v. Artic Int'l, Inc., 685 F.2d 870 (3d Cir. 1982); *see also* Hubco Data Prods. Corp. v. Management Assistance, Inc., 219 U.S.P.Q. 450 (D. Idaho 1983).

156. GOLDSTEIN, *supra* note 140, at 5:38.

157. *Sega*, 977 F.2d at 1514.

158. 797 F.2d 1222 (3d Cir. 1986).

of computer programs may extend beyond the programs' literal code to their structure, sequence, and organization. . . ."[159] In *Whelan*, the defendant had access to the plaintiff's source code and used it to develop a similar program in a different source code language.[160] The court found that although the defendant had not literally copied the code, the defendant did copy the general structure, sequence, and organization of the code.[161] The test to separate idea from expression as applied in *Whelan* was quite simple. The computer program's purpose or central function was the idea, and the means chosen to achieve that purpose was the expression.[162] This decision, in essence, gave innovative programmers patent-like protection of efficient programming techniques.[163] One authority has suggested that the court in this case erred by allowing an overly broad scope of protection.[164] Although *Whelan* established that the structure, sequence, and organization of the code was copyrightable, the test used in *Whelan* to determine infringement has been widely criticized and generally disfavored.[165]

Although the *Whelan* decision was "[t]he high-water mark for copyright protection,"[166] the Second Circuit rejected it in *Computer Associates International, Inc. v. Altai, Inc.*[167] *Altai* concluded that "those aspects of work, which 'must necessarily be used as incident to' the idea, system or process that the work describes, are also not copyrightable," and that "those elements of a computer program that are necessarily incidental to its function are similarly unprotectable."[168]

The Second Circuit believed that the *Whelan* analysis allowed copyright protection that was overly broad and impractical.[169] Instead, the Second Circuit developed a three-part test, coined as the "abstraction-filtration-comparison test," to determine non-literal substantial similarity.[170] In the "abstraction step," the court dissects the allegedly

159. *Id.* at 1248.

160. *Id.* at 1226.

161. *Id.*

162. *Id.* at 1236.

163. Johnson, *supra* note 125, at 568.

164. GOLDSTEIN, *supra* note 140, § 2.15.1, at 2:193.

165. *See* Computer Assocs. Int'l, Inc. v. Altai, Inc., 982 F.2d 693, 705–06 (2d Cir. 1992); *see also* Peter S. Menell, *An Analysis of the Scope of Copyright Protection for Application Programs*, 41 STAN. L. REV. 1045, 1074, 1082 (1989).

166. Dominic Bencivenga, *Beyond Copyright Law: How to Protect Software*, NAT'L L.J., Apr. 22, 1996, at B1.

167. 982 F.2d 693 (2d Cir. 1992).

168. *Id.* at 704–05.

169. *Id.* at 705.

170. *Id.* at 706–11; *see also* GOLDSTEIN, *supra* note 140, § 8.5.1, at 8:87.

infringed program into distinct functional levels.[171] At each level the court probes the material to remove any parts that are noncopyrightable as ideas, expressions necessarily incidental to the ideas, or expressions in the public domain.[172] This level is known as the "filtration step," and it defines the scope of the copyrighted material. The "comparison step" consists of comparing the core of protectable expression with the allegedly infringing software for purposes of determining substantial similarity.[173]

The abstraction-filtration-comparison test set forth in *Altai* has gained widespread acceptance by federal courts and scholars alike.[174] Although this test allows copyright protection for the structure, sequence, and organization of a computer program, the filtration step strips away any protection of ideas, expressions necessarily incidental to the ideas, and expressions in the public domain. Thus, after the test is implemented, usually very little of the structure, sequence, and organization is left to benefit from copyright protection.

3. Analysis of a Program's User Interface

There are two elements to a program's user interface: the individual screen displays and the total "look and feel" of the user interface.[175] Screen displays are unique in that, unlike the program itself,[176] they are protected as audiovisual works under the Copyright Act.[177] In other words, screen displays are protectable as separate entities from underlying

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171. *Computer Assocs.*, 982 F.2d at 706–07.

172. *Id.* at 707.

173. *Id.* Similarity is determined using a two-part test. First, the court considers expert testimony regarding the similarity of the non-protected aspects of the two works. At this point, if copying is established the fact finder must decide, with no help from expert witnesses whether the two works are substantially similar. Manufacturers Techs., Inc. v. Cams, Inc., 706 F. Supp. 984, 1000 (D. Conn. 1989) (citing Arnstein v. Porter, 154 F.2d 464 (2d Cir. 1946)).

174. *See* Atari Games Corp. v. Nintendo of Am., Inc. 975 F.2d 832 (Fed. Cir. 1992); *see also* Daniel A. Crowe, Note, *The Scope of Copyright Protection for Non-Literal Design Elements of Computer Software: Computer Associates International, Inc. v. Altai, Inc.*, 37 ST. LOUIS U. L.J. 207, 233 (1992).

175. Lotus Dev. Corp. v. Paperback Software Int'l, 740 F. Supp. 37 (D. Mass. 1990); *see also* Fortnow, *supra* note 128, at 433.

176. The term "program" refers to the source and/or object codes (the internal code structure) which are protected as literary works rather than audiovisual works under the Copyright Act. 17 U.S.C. § 102(a) (1994).

177. "Audiovisual works" are works that consist of a series of related images which are intrinsically intended to be shown by the use of machines, or devices such as projectors, viewers, or electronic equipment, together with accompanying sounds, if any, regardless of the nature of the material objects, such as films or tapes, in which the works are embodied. 17 U.S.C. § 101 (1994).

program codes.[178] The two-prong test for determining whether individual screen displays have been infringed involves: (1) proof of access to the copyrighted material and (2) substantial similarity.[179]

The test for determining infringement in the area of a program's general look and feel is unclear due to the decision in *Lotus v. Borland.*[180] However, the decisions before the *Lotus* case suggested a test very similar to the abstraction-filtration-comparison test of *Altai.*[181] The analysis turns on the external structure or appearance of the program, rather than on the internal code structure.[182] Also, the application of the three-stage test is slightly different.

The abstraction stage for user interfaces is different than for the non-literal elements of the code, in that the copyrighted work is not dissected into discrete components.[183] As one court has noted, "[a] court need only identify those elements that are copyrightable, and then determine whether those elements, *considered as a whole*, have been impermissibly copied."[184] Thus, at the filtration stage, even if individual screen displays or the various components of the user interface are not copyrightable, the overall look and feel of the work may still be copyrightable as a whole.[185] At the comparison stage, the test involves establishing whether a substantial similarity exists between the two user interfaces.[186]

In simplified terms, the court's job in determining copyright infringement of a user interface is simply to compare the user interface as a whole with the accused program to determine if a substantial similarity exists.[187] However, the *Lotus v. Borland* holding suggests that the first inquiry as to copyrighting a user interface is whether there exists a

178. Atari Games Corp. v. Oman, 888 F.2d 878, 885 (D.C. Cir. 1989) (holding that screen displays and the internal code structure or computer program are not so united that it is "necessary or sufficient" to register a copyright claim only in the computer program); *see* 2 MELVILLE B. NIMMER & DAVID NIMMER, NIMMER ON COPYRIGHT § 2.04[C], at 2-51 (1996).

179. Broderbund Software, Inc. v. Unison World, Inc., 648 F. Supp. 1127, 1135 (N.D. Cal. 1986) (citing Roth Greeting Cards v. United Card Co., 429 F.2d 1106, 1110 (9th Cir. 1970)); *see also* Manufacturers Techs., Inc. v. Cams, Inc., 706 F. Supp. 984, 1000 (D. Conn. 1989).

180. Lotus Dev. Corp. v. Borland Int'l, Inc., 49 F.3d 807 (1st Cir. 1995).

181. Sega Enters., Ltd. v. Accolade, Inc., 977 F.2d 1510, 1510 (9th Cir. 1992).

182. Johnson, *supra* note 125, at 572.

183. Lotus Dev. Corp. v. Paperback Software Int'l, 740 F. Supp. 37, 67 (D. Mass. 1990).

184. *Id.*

185. *See Atari*, 888 F.2d at 882–83 (concluding that a video game should be considered based on the audiovisual work as a whole and not its constituent parts); *see also* Lotus v. Paperback Software, 740 F. Supp. at 67.

186. Crowe, *supra* note 174, at 230.

187. *See supra* note 173 for the test on substantial similarity.

statutory exclusion under 17 U.S.C. § 102(b).[188] Based on *Lotus v. Borland*, menu command hierarchies are methods of operation, which are not copyrightable.[189]

The "look and feel" analysis expands protection of the computer program beyond that of individual screen displays and does away with the concept that utilitarian features of a piece of work are not copyrightable.[190] Accordingly, some argue that the courts have gone beyond the mandate of the Copyright Act in allowing "look and feel" protection.[191] "A 'total concept and feel' test, though appropriate for fanciful works of art, would create the risk of protecting unprotectable as well as protectable elements of functional works."[192]

Regarding copyright protection for the user interface, the courts seem to have followed the "look and feel" concept articulated in *Lotus v. Paperback Software*, but they have done so neither consistently nor unanimously.[193] Furthermore, menu command hierarchies have been held to constitute methods of operation that cannot be copyrighted.[194] In contrast, regarding the narrower issue of copyrighting the individual display screens, the test for infringement clearly is access and substantial similarity.[195]

C. Summary of Software Copyright Law

The three elements necessary to copyright a computer program are: (1) the literal elements (including source and object codes); (2) the non-literal elements (including structure, sequence, and organization of the program code); and (3) the user interface.[196] The copyright protection granted to literal elements is restricted by the fair use of reverse

188. Lotus Dev. Corp. v. Borland Int'l, Inc., 49 F.3d 807, 816 (1st Cir. 1995).

189. 17 U.S.C. § 102(b) (1994).

190. Fortnow, *supra* note 128, at 435.

191. *Id.*

192. GOLDSTEIN, *supra* note 140, § 8.5.1, at 8:91.

193. Lotus Dev. Corp. v. Borland Int'l, Inc., 49 F.3d 807 (1st Cir. 1995) (holding that copyright does not protect the set of menu commands included in a Lotus spreadsheet because it is a "method of operation" rather than an expression of an idea); *see also* Apple Computer, Inc. v. Microsoft Corp., 35 F.3d 1435, 1439 (9th Cir. 1994); Engineering Dynamics, Inc. v. Structural Software, Inc., 26 F.3d 1335, 1347–48 (5th Cir. 1994) (declining to apply a "look and feel" standard in favor of dissecting out all uncopyrightable material in the filtration phase of the analysis).

194. Lotus v. Borland, 49 F.3d at 815.

195. Broderbund Software, Inc. v. Unison Word, Inc., 648 F. Supp. 1127, 1135 (N.D. Cal. 1986).

196. Computer Assocs. Int'l, Inc. v. Altai, Inc., 982 F.2d 693, 702–03 (2d Cir. 1992).

engineering.[197] Infringement of the non-literal elements is evaluated under the abstraction-filtration-comparison test.[198] The user interface, or "look and feel" of the program, is evaluated under a standard based on the abstraction-filtration-comparison test, minus the dissection of the infringed program that occurs during the abstraction stage.[199] Finally, screen displays are copyrighted as audiovisual works, separate from the rest of the computer program.[200] Infringement analysis of screen displays is based on access to the infringed work by the accused and substantial similarity between the two works.[201]

D. Application of Copyright Law to Animation Software

Copyrights will not protect the new machines and methods developed to create computer-generated images. Copyrights do offer some limited protection for software and have been largely relied upon as a method of protecting software.[202] However, the rules are unclear and the scope of protection is varied among the different circuits.

A copyright offers some protection for the underlying source and object codes of animation software. However, reverse engineering by competitors is always a danger with copyrights. The code structure, sequence, and organization is also protected, but the level of protection varies among the circuits and the rules are difficult to apply.[203] Furthermore, the overall look and feel of the user interface—the structure and sequence of the commands, positioning of the tool and menu bars, visual appearance and artistic expression of icons and windows—may be protected, but it is unpredictable as to how far the courts will extend the holding of *Lotus v. Borland.* Additionally, there is always the danger that courts will find other aspects of the look and feel to fall within a statutory exclusion.[204]

Copyright law will not protect every aspect of a program. For example, the future of 3-D animation promises programs that will make it possible to create totally realistic humans capable of acting at or near the

197. Sega Enters., Ltd. v. Accolade, Inc., 977 F.2d 1510, 1514 (9th Cir. 1992).

198. *Computer Assocs.*, 982 F.2d at 706–11.

199. *See supra* Part IV.B.3.

200. 17 U.S.C. § 101 (1994).

201. Broderbund Software, Inc. v. Unison Word, Inc., 648 F. Supp. 1127, 1135 (N.D. Cal. 1986).

202. Bencivenga, *supra* note 166, at B1.

203. *See supra* Part III.B.

204. Lotus Dev. Corp. v. Borland Int'l, Inc., 49 F.3d 807 (1st Cir. 1995).

level of human actors and actresses.[205] In fact, there are programs currently available that are specifically structured to create human figures and faces.[206] The structure, sequence, and organization of these programs would be protected to the extent the code consists of expressions of ideas rather than just ideas.

To clarify, the way the program deals with the problem of manipulating facial expressions to match certain emotions is a copyrightable part of the structure, sequence, and organization of the program. However, the fact that the program deals with this problem at all probably is not copyrightable since it is just an idea. This level of protection is available under the current statement of the law as announced in *Altai*.[207]

Possibly, the most commercially feasible way to obtain any level of protection for most software is through copyright, as patents generally require several years and thousands of dollars in legal and filing fees. Patent protection is recommended for software expected to be commercially viable for many years, because the protection is much broader and the rules on infringement are much clearer than those in copyright.

A long and healthy commercial existence is usually the case with operating systems such as DOS, and there are signs that 3-D animation programs may soon be incorporated into operating systems.[208] Such software strategies will make it possible for consumers to display 3-D animation as part of a word processing document.[209] These innovative programs should arrive with patents pending, as well as copyrights.

V. CONCLUSION

Movies utilizing digital technology and computer-generated imaging to create special effects have proliferated in recent years. As the technology becomes less expensive, every movie will either be edited digitally, consist of scenes that were never actually filmed, or include characters that do not exist, or actors who are no longer alive. Technology is advancing rapidly with increasing numbers of companies and individuals involved in the creative process. The clarity of the rules and

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205. Caranicas, *supra* note 30, at 24.

206. *Id.*

207. Computer Assocs. Int'l, Inc. v. Altai, Inc., 982 F.2d 693 (2d Cir. 1992).

208. Grant S. Boucher, *Desktop Hollywood F/X: Amazing Special Effects Require Modest Hardware and Software, but You'll Need an Extraordinary Imagination*, BYTE, July 1, 1995, at 103.

209. *Id.*

the broad scope of protection afforded by patents make them a preferable choice over copyrights in terms of protection of intellectual property in computer-generated special effects. Copyrights have always been important to Hollywood, but the inventive nature of special effects require unique protection that only patents can provide.

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