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Visual communication and entertainment through animation

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Abstract
Virtual animation is used today for everything including entertainment in motion pictures and video games, advertising on television and the internet, virtual animated videos used for industrial teaching aids, and project approvals for major building construction. Many modem companies are now insisting that new products are created using 3-D modeling and occasionally animation before approving funds for further development.

The research question in this work centers around thoughts and visions being effectively communicated so others can comprehend and share in the same perspective. This research will show the use of technology in answering this important question: Exploration of the literature will describe the early beginnings and the slow progression followed by the movement into the current "high tech" era of virtual reality.

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CHAPTER I

Introduction

Scope and Research Question

Being able to communicate accurately and clearly has been a problem for mankind since the beginning of his or her existence. The late 19th and 20th centuries were the period that made the greatest strides in this endeavor. Achieving communication for use in education, entertainment, business, and general categories by using visual effects coupled with sound has proven to be the most effective means known to man. Addressing the question of how can we most effectively communicate for all the reasons stated above, this research looks at the evolution of visual and graphical means of bridging this gap.

According to Lutz (1998) learning is something we do by utilizing our senses. Before the inventions which led us to pictorial presentation, man's immediate or present surroundings were the only visual representation available. It was not until a little over a century ago that photography was invented in France by Joseph Nicephore Niepce. Since that time it has been possible to fix on a surface by physico-chemical means, pictures of the exterior world. When coupled with the phonograph invented by Thomas Edison, the capability of communicating both visually and through sound became a reality. This new media was used both in instructional settings as well as for entertainment and general communication.

The stage was set for new eras of communication using both sight and sound; however, motion had not yet been introduced. As we hear often, "a picture is worth a thousand words" and so it is with visual communication. Just as people are born with an

instinct to speak, they also are compelled to communicate through the use of images. Consider, for example, the Egyptian findings of hieroglyphics carved in the walls of caves and on stones. The ancient Egyptians adopted the idea of hieroglyphic writing from Mesopotamia about 3000 BC. Egyptian hieroglyphics generally were made up of about 800 symbols. However, by about 300 BC, the number had grown too more than 6,000 symbols. The symbols have the elegant, stiff quality typical of ancient Egyptian art.

The earliest hieroglyphs (symbols) featured many pictorial characters known as pictographs or ideograms. These characters were literal representations of thoughts and ideas. For example, Egyptians who wished to express the idea of a woman drew a picture of a woman.

Created images give mankind a means to express visually what is in his/her mind so that others can understand and share the same vision. Through continued development, processes for making "animated cartoons" or "moving screen drawings" began to emerge. Although these were very crude showings, they started a new era of effective, mechanized visual instruction and communication. Not all subjects can, however, be depicted solely using the camera for the visuals. For many instances, an artist was needed to draw a series of drawings which, when animated, communicate visually the artist's ideas and thoughts.

The scope of this research will span from the crude beginnings described above to the virtual animation being used today for clear communications in many aspects of our modern day lives. Virtual animation is used today for everything including entertainment in motion pictures and video games, advertising on television and the internet, virtual animated videos used for industrial teaching aids, and project approvals for major

building construction. Many modern companies are now insisting that new products are created using 3-D modeling and occasionally animation before approving funds for further development.

The research question in this work centers around thoughts and visions being effectively communicated so others can comprehend and share in the same perspective. This research will show the use of technology in answering this important question. Exploration of the literature will describe the early beginnings and the slow progression followed by the movement into the current "high tech" era of virtual reality.

CHAPTER II

Review of Literature

Development of Animation

Early attempts to project images.

According to Kanfer (1997) Webster's definition may be spiritually correct but technically it is wrong. Animation, it says, means, "to give life, to bring to life." In fact, film is an illusion where life lies behind the screen, not on it. The World Book describes it as a motion-picture technique in which filmmakers create the illusion of motion, rather than recording it with a camera as live action.

Lutz (1998) discussed some of the techniques used in the early days of development of animation. The picture displayed on the wall by what was called the magic lantern was an illusion very similar to a shadow. If the image was projected from a glass slide on which the artist drew a picture, the design had definition. If it was projected from a photo, the tones were clearly discernible. In these cases it is a quiescent picture.

An image thrown on the screen by the lens of a motion picture projector is also an illusion. It is an illusion because it projects a shadow of an opaque design on a transparent material intervening between the light source and the lens. In addition, it is an illusion because it synthesizes pictorial images into the appearance of life and movement. The key point in understanding these crude processes is with motion picture the viewer gets a sense of reality from the appearance of life and movement.

According to Weibel (1992) the concept of the visual changed radically with the technical transformation of the image, its apparatus, and apparative perception. The Industrial Revolution was the origin of the technical image that viewed the human body

as a machine. Human perception was matched up to the performance of machines, and found to be less reliable, slower, and more inconsistent than the machine. In 1824, Roget discovered when an image is viewed; an afterimage is built on the layers of the retina. He named this phenomenon the *persistence of vision*. Lutz (1998) goes on to say that the human eye has the ability to retain on the retina an after-image of some object just viewed. When an object impresses its image on the retina and then moves away, the image remains in the eye for a brief period of time. It is through this special quality of the visual sense that living screen pictures can be appreciated. Everything in animation depends upon the viewer's recognition of an image and his ability to follow its movement. The moving pictures of film do not actually move. All you have to do is look at a piece of film and you will be reminded that, in fact, the medium is made up of a series of still images. It is the human eye and brain that make movies move. Therefore, the illusion of movement on film is created by this physiological phenomenon which is called the persistence of vision. This very remarkable illusion is the perceptual foundation of film and television.

Early motion picture projectors used a celluloid film that contained sixteen separate pictures per foot. This film was passed through a projector with sprockets driving perforations in the sides of the film. By using this method, the speed at which the film passed by the light source and the image passed through the lens could be closely controlled. In addition, if the film was showing all the time when the individual pictures would move it would tend to blur the image. This was over come by stopping the image for a fraction of a second and then having a rotating shutter which would stop the light from projecting while the film moved. All this would happen very quickly and to the

human eye with its ability to retain images, it appeared the animated images were very life like.

Lantz, a cartoonist, indicated that prior to cels coming into use, all animation had to be done on paper (Kanfer, 1997). Every single drawing had to be penciled and photographed. The background was simply a strip of paper that was put down on pegs where the drawing was placed. Nothing could cross a line, if a character walked over to a chair, the chair would have to be drawn or it would wiggle all over the screen. This was not only difficult to do but also required a lot of time and attention to detail to produce a quality work.

Apparatuses used in early animation.

Laybourne (1998) contended the illusion of movement was created through the use of a series of mechanical toys from the nineteenth-century. These were not devices that would have direct application in the worlds of science or commerce. They existed strictly from their ability to delight. These apparatuses were toys in the real and best sense.

Laybourne (1998) also stated that the thaumatrope was a simple device included in animation prehistory. This optical toy was popular in the early nineteenth century; however, it may have dated back prior to that time. The toy is simplicity itself made up of only a cardboard, fiber, or metal disc that is attached to two pieces of string. By twirling the disc with the operator's hands, images positioned on either side of the second disc give the perception of a single image. Twirling the disc superimposes images upon each other by means of the persistence of vision phenomenon. Another device, the phenakistoscope, was invented by Joseph Plateau in 1832 (Laybourne, 1998). It was the first machine that really created the illusion of sustained movement. The

phenakistoscope, is a simple spinning wheel that contained a series of drawn images and viewing cutouts that frame the viewer's vision of the drawings.

Laybourne (1998) continues to say that a new generation of inventors hastened to refine and expand Mr. Plateau's device. The desire for longer duration's of the movement brought about the zoetrope and the praxinoscope. Both machines provided better projection devices for their drawings. The zoetrope consists of a revolving drum containing slits in the sides that are equally spaced. By viewing through these slits as the drum is spun, the viewer can catch glimpses of the series of drawings which have been created on a strip of paper and placed inside the drum. The larger the drum's diameter, the longer the "movie," and, of course, the same drum could present different strips of drawings. The machine's name means "wheel of life" titled by Pierre Devignes in 1860, however, William Horner had developed earlier versions of the same basic device in England around 1834.

Lutz (1998) indicated what appears to have been the first use of photographs to give a screen synthesis in an auditorium was shown in February 1870, at the Academy of Music in Philadelphia. It was an exhibition given by Mr. Henry R. Heyl of his invention, the phasmatrope. He displayed on a screen, figures of dancers and acrobats life-sized and in motion. The pictures were projected, using a magic-lantern, from photographs placed on thin glass plates that were spaced around a wheel capable of rotating. A "vibrating shutter" was used to cut off the light while it was on the photograph. The photograph would move out of the way, only to be replaced by another. The wheel had capacity for eighteen photographs. It was designed so that those of one set could be taken out and replaced by those of another to change a subject for projection.

The phasmatrope used photographs taken from posed models; a certain number of which would form a cycle of a certain series that could be repeated. This allowed for a continuous performance to be given by keeping the wheel in motion. At this point in development there were no pliant sensitized ribbons to record sequences of photographs of movement, therefore, Heyl used glass plates and took them one at a time using the wet collodion process (Lutz, 1998).

Laybourne (1998) went on to say, over the next century, many inventors were involved in making further refinements to these optical devices. As animation continued to develop, machines combined with the changing technology of photography to create still another entertainment, the movies. Mechanical toys were combined with celluloid film and cartoons emerged.

A key event occurred in 1892 when the inventor of the praxinoscope, Emile Reynaud, opened the world's first movie theater in Paris (Laybourne, 1998). Reynaud's Theatre Optique projected a "movie" consisting of a long piece of paper on which individual drawings were housed. The show only lasted a few short minutes.

From the time of the thaumatrope in 1826, and throughout the period when the machines noted above were in use, the production of the illusion of movement was made possible only by using drawings in graduated and related series (Lutz, 1998).

Lutz (1998) explains drawings, too, were first employed in the development of a little optical innovation in book-form, introduced about 1868, named the kineograph or more commonly known as flip-books. This book-form novelty drew comparison with the cel animation technique, one of the most sophisticated of all animation practice. Each page in the flip-book represents an individual piece of artwork that, combined with all the

other drawings, creates a movie when it is filmed using an animation camera. The registration system for the flip-book is in the binding of the pad which functions as a way of keeping drawings precisely sequenced and lined up. The action of thumbing through the pages of the flip-book is representative of the step performed first by the camera followed by the projector, if working in film, or if working digitally, by the scanner followed by the computer.

As animation continued to develop, Louis and Auguste Lumiere, kept themselves busy with a new phenomena called cinema, and Thomas Edison continued to perfect his motion picture projector (Kanfer, 1997).

Early motion pictures.

In the continuing development of movement on the screen, Kanfer (1997) explained the Hearst Studio introduction of the "rubber hose" animation. Instead of bending an arm at the elbow or a leg at the knee, subjects moved their limbs as if they were made of elastic tubes. Freed from the limitations of real-life anatomy, cartoon people and animals acted with a new amusing energy. The International Film Service artists had created an idea they called the pan. A character was shown standing in one spot and moving his legs as if he was on a treadmill. However, rather than a treadmill a long sheet of paper with a setting on it provided the background. Every time the drawing was moved, you would also move the pan. By moving the background the character would look like he was moving.

According to Kanfer (1997) the Fleischer brothers took another approach. They were convinced that speed was important in the animation process, therefore, a live model was filmed and its image was traced on paper, one frame at a time. Accordingly, as Max ran

the camera, Dave, in a black clown's attire, performed his dancing routine against a white sheet. After developing the film, his every movement was outlined in ink. The Fleischers named their process Rotoscope, patented it, and then convinced Pathe to endorse a cartoon utilizing this new technique. These human movements resulted in a movie where the motions were smooth and graceful.

Lutz (1998) indicated at this point in the development, experiments were made to obtain a pliant ribbon for use as a film media. Transparent paper was used but proved to be unacceptable. Eventually the use of celluloid film increased, and it is this material which is generally in use for ordinary snapshot film as well as for "film stock" used by the motion-picture industry.

Lutz (1998) remarked that Edison's improved kinetoscope of 1893 found immediate recognition on its exhibition at the World's Fair in Chicago. This was the first large-scale utilization of celluloid film for motion pictures. Following, James Stuart Blackton, otherwise known as The Komikal Kartoonist, had produced America's first truly animated motion picture (Lutz, 1998).

In film making there are three very important pieces of mechanism involving, the camera, the projector, and the printer described as an apparatus used to print a picture photographically (Lutz, 1998). All of these mechanisms are similar in parts of their design and working principles. The mechanical aspects of the camera and projector are so similar that some of the first models fabricated were used for both photography and projection.

Development of animated filmmaking.

According to Kanfer (1997) Walt Disney had a great drive and ability to lead. He could identify genius when he saw it; only Disney could create a public craving and then find ways to satisfy it. He had a vision for what animation could become and set out to make it a reality.

Kanfer (1997) continued to say that Disney's first cartoons were made in Kansas City, where he built an art studio to produce advertisements. He learned about animation from a book he borrowed from the library by Edwin G. Lutz. Lutz (1998) had one overriding principle, "plan the work so that the lowest possible number of drawings need be made for any particular scenario" (p. 52). Disney took this advice to heart and cut every possible corner in his first cartoons and put cycles and basic backgrounds to good use.

Kansas City became a rich source of animators even though Manhattan and Hollywood were attractive alternatives. Disney could have stayed in the heart of the country, turning out modest little comedies for his new company, Laugh-O-Gram Films Inc. However, his backers were not as numerous as Disney had expected and in 1923 his company was headed for bankruptcy.

At this point he had a choice to stay in Kansas City or head for one of the major production centers, New York or Hollywood. Mainly due to having family in the California area, Disney decided to head west and make a new start.

Sound applied to animation.

Kanfer (1997) said the inventor; Lee De Forest had been doing experimentation with sound film since the mid-twenties. Using his techniques, several cartoons with a roughly

synchronized sound track came about. Public acceptance was very low for a dog playing Verdi's "Anvil Chorus" on its teeth, or with human singers warbling "My Old Kentucky Home," therefore these experiments were discontinued.

Kanfer (1997) believed the flood tide of the twenties occurred in 1927 when The Jazz Singer, the first talking picture, was introduced. Al Jolson sold the idea of bringing together pictures and sound. After The Jazz Singer, the entertainment industry was severely shaken. At the same time when the big Hollywood studios were rushing to revise their scripts and equip their stages with microphones, the quick animation studios hurriedly made the conversion to sound.

Kanfer (1997) indicated that Paul Terry produced "Dinnertime," the first Aesop fable to highlight human voices with orchestra music for the background. The Fleischers were extremely impressed; even before sound; Max viewed Aesop's makers "the ones to beat." Walt Disney had some reservations. He had just completed an experiment using homemade sound effects. As a projector ran "Steamboat Willie," the third Mickey Mouse film, Disney and his animation staff improvised a score using a washboard, slide whistle, and harmonica. Disney was sure the use of sound would lead to good fortune, so he returned to New York to find a sound engineer and a film distributor. En route to Kansas City, he paid a visit to a friend, Carl Stalling a theater organist, who agreed to set "Steamboat Willie" to music. Pat Powers a shifty, hustling promoter, had agreed to record "Steamboat Willie" on some exceptional equipment. By now, the film's budget was up to $15,000. Disney's brother, Roy, agreed to pay the bills and the recording session took place. When the track was completed one theater, the Colony, booked the cartoon as a curtain raiser for its feature film. That movie, Gang War, was to become as little known

as its stars, Olive Borden and Jack Pickford. But the mouse at the bottom of the bill would be in the minds of people forever. He made his first public appearance on November 18, 1928. In its next issue, Variety called the cartoon "a peach of a synchronization job all the way" (Kanfer, 1997, p. 64). The New York Times said Disney had produced "an ingenious piece of work" (Kanfer, 1997, p. 64). Audiences would burst into applause at every joke; word of mouth kept the Colony filled. At this point, Disney decided to have the first two Mickey Mouse films produced with music.

There are two generations of animation remarked Laybourne (1998). First, there was animated filmmaking that is a respected art form that can trace its genesis back to the development of movies. And, second, there is the more modern digital animation, which is a refreshing mixture, that applies modern computer technology to the same fundamental process of creating movement from a series of stationary images as described in preceding sections.

Modern animation.

Laybourne (1998) also contended there are three waves in which the development of animation can be viewed. The first was based on film technology: a piece of celluloid with an emulsion coating which moves through a projector gate by means of a ratcheting mechanism at a rate of 24 times a second. Some of this nineteenth century machinery is still used to project films to large audiences. The first cartoons of Disney and others brought about the popularity of the 35mm theatrical shorts. During this period, full features began to widen both audience and purpose as animation was being recognized to be an effective means of delivering a broad range of information. At first, these filmmaking tools were limited to only a few due to their expense and bulky design,

however, this eventually changed through the development of the16mm and super 8mm cameras and related paraphernalia. The 70's brought about the end of this first wave and there was a blossoming of independent animation as artists thought up and refined new and simpler methods to animate.

Video technology would be the next evolutionary wave in animation according to Laybourne (1998). Television became a new distribution medium that, in general, delivered animation that was still first produced on film. But the needs of TV began to alter how animators did their work. Early animated series such as the Flintstones and some teaching elements on Sesame Street brought about the development of a simplified but pleasing appearance using the lower resolution (and smaller budgets) of television. Series such as The Simpsons and Nicktoons along with Ren and Stimpy and Rugrats were examples of full flowering animation, which was film based for the TV screen.

In the 1980's, TV commercials with high-budgets thrust animation techniques into new digital configurations. High priced video tools like the Ultimate, the Paintbox, and the Harry allowed animators to blend together, or composite, images from a variety of sources onto the same screen. One of the cutting-edge studios involved in new innovations, Colossal Pictures in San Francisco, developed a new process called "Blendo" which consisted of cel animation, live action video, motion graphics, and archival film (Laybourne, 1998).

Emerging cable networks like MTV promptly adopted the second wave of universal, video-based animation. The advertising departments that produced broadcast graphics for these networks became showrooms for the new composites of merged film/video techniques, and shows like MTV's Liquid Television, a collection of works consisting of

beyond-the-fringe, over-the-top animation, showed some of the first movements of the wave currently being experiencing.

The third wave has now occurred. According to Laybourne (1998) at the turn of the century, animation shifted to the computer. The expansion of this new wave in animation's development started to become apparent when suddenly, 50 percent of American homes contained computer screens as well as television screens. By the mid-1990's, modern computers were commonly equipped with the second or third generation of robust CD-ROM drives and with internet access using modems, satellites, and high-speed telephones.

Laybourne (1998) identified the fact that this most recent wave is continuing to build. Presently some cable television services are offering faster digital hookups to the World Wide Web. The Web continues to respond with new configurations of information and entertainment. The latest generation of digital, higher definition television sets (first appearing before this year, 2000) further cloud the line between computing and television. And following that, high-bandwidth switched networks using fiber optics will homogenize the worlds of television and computers, of entertainment and information.

The time of competition and mutual distrust between animators working in film and television and those working with computers is quickly vanishing. For a time it seemed that differing attitudes, aesthetics, and working methodology formed a detachment between animators employed in the various media formats. But that phase is in the past due to current digital technology. Feature films that are taken in the traditional 35mm format are routinely conveyed into a digital format--the language of computers-- where editing and orchestration takes place. It is solely within the digital domain that modern

moviemakers create those stunning special effects. Television has also gone digital. Cameras record onto digital tape machines operating on international D-2 (the D is for "digital") and Beta SP standards. Essentially all film and TV editing--plus consolidation of live-action and graphic materials--is moving toward what is termed nonlinear, digital systems. They are so named because revisions can be made in the edit list at any place, and opticals such as dissolves and freeze-frames, can be previewed immediately. In the future, digital formats that can speak with each other, will be used for television broadcast, cablecast, and switched broadband networks. And, of course, computer animation is prospering at both the low end and with more high-priced digital platforms provided by companies such as Silicon Graphics (Laybourne, 1998).

Because everything has gone digital, incompatibility is no longer a problem. Laybourne (1998) stated that film footage shot on a 16mm animation stand could be seamlessly married to a music track taken from a CD recording. A three-dimensional character produced on the computer screen can be conveyed onto the television screen or transferred onto film medium and projected onto a movie screen. Clearly, in the future, computers, TV, and film technology will operate codependently. In the process, each media form will be able to do what it does best and new levels of storytelling will become possible utilizing new tools and techniques for image building. All of us who find enjoyment in animation are in for some awesome times. Digital techniques have made it much easier and much more effective to create astonishing animation from stationary images. The esteemed (but really awkward) technique of rotoscoping has been reborn using the computer. There are numerous steps within the established processes of

character and cel animation where digital tools can become an aid in using cumbersome filmmaking gear.

According to Laybourne (1998) computers are generating a whole new approach to animation. Traditional animators are learning to remove some of the drudgery often associated with hand-drawn animation by using computers. But computers are also the tools that are helping to create unique forms of animation, the likes of which could not exist without the benefit of microchips. A large segment of this new aesthetic turf can be discovered in computer-generated images (CGI, for short) such as the 3-D animated characters in Toy Story, and the special effects brought together with live action in Jurassic Park, Space Jam, and Terminator 2--Judgment Day. Computer technology has launched visual effects to a whole new level, making once-impossible effects into more the ordinary.

This level of animation according to Laybourne (1998) may seem monumental and out of reach to a computer rookie at first. Many visual effects can be explored on home computers to include the visual world of three-dimensional images, morphing, and composited effects. Many of the people employed in Hollywood's visual effects business got their start in computer animation in their own home, using average Macs and PCs.

2D - 3D graphics and solid modeling.

The term 3D stands for three-dimensional which means that objects contain three dimensions, specifically width, height, and depth (Giambruno, 1997). Items we see every day all around us are three-dimensional, however, when viewed on a computer screen appear to be flat. Three-dimension on the computer screen almost seems to be a distortion of the truth. In actuality, 3D graphics should be called "two-dimensional representations

of three-dimensional objects. The term 2D means two-dimensional, or having only width and height, but no depth. In other words, it is a flat representation.

Giambruno (1997) goes on to say, due to 3D objects having depth, created inside your computer, you only have to "draw" them once, then any angle or perspective can be viewed without starting from scratch. Also, the proper highlight and shadow information can be calculated for a scene automatically using 3D programs and based on how you arrange the objects and lighting. Therefore, 3D programs will redraw your subject from the angle of your choice as they also create a painting of it based on the colors, textures, and lighting that you decided on when the model was developed. With all of those benefits, it is not surprising that many artists rarely go back to traditional drawing and painting once they have become acquainted with 3D.

The definition of a solid model is the depiction of a 3D shape as an enclosed volume according to Eastman (1999). The solid model may define a shape that compares to a solid object or to a space that has boundaries in its shape and volume, such as a room. A significant capability of solid models includes the fact that plans, sections and orthographic or perspective projections can be automatically derived from them. Thus, a set of drawings can be generated using these models. Currently, this is the only tried and true way to guarantee that all the geometric views of a shape--for example, a set of plans and elevations of a building--are compatible, i.e., that they represent a single building.

Giambruno (1997) added that solid modeling is a special form of 3D for engineering applications. It adds information about the weight, density, tensile strength, and other real-world facts about the material to the model's dataset. By having all of the physical information on the "real" materials available, the bridge, ship hull, or machine part being

modeled can be subjected to computer-simulated stresses. This enables engineers to evaluate the design and see if it will perform as desired without having to build a physical prototype.

The use of 3D virtual animation and simulation as a communication tool.

Laybourne (1998) elaborated on the subject of virtual reality (VR) and animation. A simple but accurate definition of animation is to convey motion to motionless objects. In the world promptly evolving around us, animation can also mean to involve ourselves in full movement. Prepare yourself for a plunge into the world of virtual reality.

Virtual reality has been in existence since the 1980's. Until the last few years it has been a very costly and involved process both to create and in which to take part (Laybourne, 1998). In recent times it has become possible for everyone to have the experience of creating and enjoying virtual-reality environments due to the development of new levels of technology and the Internet.

When you go into a virtual location, your behavior and purpose are not prearranged. VR has no beginning and no end. When you use VR you have the feeling of being in control due to the implicit experience of being there. You move from inactive viewing to active doing because VR places you in a driver's seat that allows you to animate yourself through new worlds.

To become involved in this new animation, it starts when building a place out of digital bits creates a VR scene. Basically two types of VR environments are in existence: those that are developed using 3-D modeling tools and those that are composed of an arrangement of real-world photographs.

The world of computer chips and the human mind can be combined electronically (Druckrey, 1996). He accepts the idea that digital media assumes a communicative system that blends visual representation into the circles of technology, neurology, and genealogy. Responses to the catalyst of experiential phenomena are being replaced by the study of the neuro-reflexive activities of the brain as an operating system. In this system, psychological representation is more important than cultural representation. The cognitive system becomes a more appropriate subject than the communication system. Systems replace cultures. This metaphor is in concert with the models being created to link various aspects from the Internet to the electrical impulses of the neuron. It is imperative that we continue to collect information on networked communities, the emergence of biocomputing, and genetic mapping. Evelyn Fox Keller writes that, "Even while researchers in molecular biology and cyberscience displayed little interest in each other's varying programs, information, either as metaphor or as material or technological inscription, could not be contained" (Druckrey, 1996, p. 23). The colliding of these disciplines in the industrious fields of networking, DNA-based computer programming and nanotechnology recommends the reconsideration of the subject of computing. Rather than the human-computer interface, the thrust of research is bio- or neuroinformatics, the composition of ascertaining the identity not in terms of the relationship between machine and person, but rather within the formation of ideas and meanings.

3D graphics have an extraordinarily broad range of uses in all sorts of distinct businesses and fields of study. Numerous applications in the field of communication such as multimedia, film, broadcast, and game businesses, require more 3D modelers and animators than many of the research fields (Giambruno, 1997).

Using 3D graphics and virtual animation as a communication tool is quite obvious in the film industry. Most of this application is in the form of entertainment, however, videos are produced using virtual animation to display new products and assist with sales promotions. In the application of construction or renovation of a building site, a set of architectural drawings can be used to develop three dimensional and solid models which will allow the interested parties to take a virtual tour of the inside and outside of the building before it is built. In addition, traffic patterns can be simulated and elevations of the surrounding terrain can be realized (Giambruno, 1997). In order to make some of these presentations more realistic; background photos of the actual site are used in the animation to produce a very realistic rendering of how the building would look in its planned environment. In broadcasting, commercials are a fertile ground for 3D virtual animated visuals using special software packages. Attractions such as sucking kids into soda bottles, turning a car into a running tiger, character animations like dancing automobiles and gas pumps and wisecracking M&M's have become commonplace on our television screens. Multimedia presentations are another area where 3D and virtual animation is heavily employed. Take the trade show, for example, where every display is screaming for your attention and you could be lured in by a little 3D animated character to cute to resist.

According to Giambruno (1997) 3D graphics are very often used in the World Wide Web (WWW). In these surroundings, 3D graphics may range from simple buttons or other graphical components on the page to integrated Virtual Reality Modeling Language (VRML) applications. He goes on to say 3D seems to dominate in today's games. It is used for everything from conceiving the prehistoric fighter sprites in Primal

Rage to the dozens of video cut scenes in Rebel Assault II where a spacecraft is sent exploding against a cliff wall or being turned into a vapor by Tie Fighters.

Three-dimensional computer graphics are also being used today in several scientific fields (Giambruno, 1997). One application is in the research environment involving the modeling of weather systems. The 3D graphics in this application represent high and low pressure areas, air currents, precipitation, and other factors to accurately model a storm. In medical research, a most impressive effort of late was to develop a very accurate 3D model of the human body to a level never before attained. The process involved the freezing of a cadaver, then cutting it into 1mm cross-sectional slices. After that step each cross-section was digitized and, using custom software, was reassembled into a completed model.

In many accident recreations, 3D animation is used to re-construct the accident scene to be played out in a courtroom. This type of animation utilizes evidence taken from the accident scene, eyewitness reports, and real-world physics to generate a simple representation of what actually happened. Another application is in flight simulators where real-time 3D technology is used to re-create various situations that may arise while piloting an aircraft.

Current and future applications.

At this new millennium, several frontiers of animation have erupted. All exemplify the transformational power of the computer. All offer special kinds of lures to capture the imaginations and careers of tomorrow's fearless animators (Laybourne, 1998). The Compact Disc-Read Only Memory (CD-ROM) and Digital Video Disc (DVD) are among the most exciting new technologies coming out of the digital revolution for

distribution of data. A CD-ROM will hold about 650 megabytes of digital information while the DVD will hold between 7 and 14 gigabytes.

The domain of new media is destined to grow and change far beyond the technologies that exist today. High-definition TV (HDTV) and interactive television are still a few years in the future for everyday use, but you can find a glimpse of what is coming in the digital program guides and navigation schemes of today's satellite, microwave, and closed-circuit TV environments.

The medium of animation proves to be particularly well suited to the interactive realm. For example, bits of animation can "nest" within larger fields of information, springing into life at the click of a mouse. Animated characters (including animated logos) provide powerful exclusive identities that bring fun and recognition to multimedia products. Animated characters and environments compress better than their live-action counterparts, therefore, animation has an inherent advantage when space and computing power is limited.

Laybourne (1998) recognized no longer is animation limited to the movie and television screen. It is quickly becoming common place in various types of documents, presentations, and even on the tool bars of our favorite software packages. The graphical user interface (GUI) has come alive with animated characters making icons, windows, and desktops that connect us to the powers of computing.

To date, the video limitations on the Internet are the direct result of the size of the bandwidth due to the medium used for transmission. The future promises to be much brighter when the bandwidth pipe will be expanded and computation will be in real time. Laybourne (1998) expressed the Internet will be an actual full-bandwidth delivery

system. We will be able to download to the Web, animations of any size and color depth. There will be unlimited capacity for uploading. Based on these predictions, the question might change from where the Internet will go to how will creativity keep pace?

Since the very beginning, animation has played an active role on the Web! Laybourne (1998) pointed out that in the upper right corner of all Web browsers there can be found a small pulsing square called a throbber. This little character animates in a continuous cycle to indicate that the browser is searching for the location of the link that has been requested by the Web user. A second level of animation on the Internet is in the form of advertisement or a banner that is flashing a message usually containing a logo and a commercial for a product. These teasers are, of course, attention-getters that persuade the Web surfer to go to another location or--more simply--to pause for a moment to think about a particular product or issue.

Chapter III

Conclusions

"The fundamental event of the modern age is the conquest of the world as a picture" (Heidegger, 1977, p. 25). We can see from this research, man has always had a hunger to communicate, from the ancient Egyptian hieroglyphics carved into a piece of rock to the modern day computer graphics used in movies, publications, television, the Internet and many other mediums.

As this research is reviewed it becomes obvious that from the late 19th century and all through the 20th century, there was constant development of communication through the use of drawings, then came photographic technology, followed by animation, and shortly thereafter, movies. Each step of the way, the medium used was never enough to satisfy the appetite for complete and accurate communication. There always had to be a device that could take the artistic medium and make it project on the screen or make it move or, later, make it move and talk. From the first thaumatrope optical toy, in the late 1800's, to some of the latest in digital computing devices, such as the digital virtual disc player in the late 1900's, man has strived to entertain, teach, and communicate on an ever increasing level of understanding.

Has animation been successful in communicating and entertaining over the past 100 years? The answer has to be a resounding "YES"! Through animation, millions of people have grown up and been entertained with the likes of Mickey Mouse, Donald Duck, and the rest of the Disney corral of characters. Children and young adults have been entertained and developed their hand-eye coordination through the use of animated video and computer games. However, over the past 25 years, animation has

played an ever-increasing role in business and advertising. On the business side, development of products using 3-D modeling and coupling it with animation to solve problems, use as training aids, and proving functionality of products has saved corporate America, and the World, vast amounts of money and has greatly enhanced marketing strategies. Animation in the 20th century has taken on a humanist look. It is hard to look at some commercials and be able to distinguish between make-believe characters and real live human beings. Some of the most memorable commercials are those where animation has been the key strategy used to embed sights and sounds into our minds.

The idea of communicating using visual effects and ever advancing technology will continue to bombard our minds. The Internet will continue to play an ever-increasing role as the distribution network for communicating to the World. Is the end of this technology in sight? Some say we have just begun! The end is based on how far your imagination will allow you to go.

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