SCAN '92

Proceedings of the Twelfth Annual Symposium on Small Computers in the Arts

November 5th - 8th, 1992

The Franklin Institute Science Museum

20th and the Parkway

Philadelphia, Pennsylvania

Presented by:

The Franklin Institute

Small Computers in the Arts Network

The Pennsylvania Council on the Arts

KINETIC PAINTING

Samia A. Halaby

Starting with the desire to use the computer to make paintings I ended up with works which are abstract paintings which move and make sounds. The most appropriate name for them is kinetic painting.

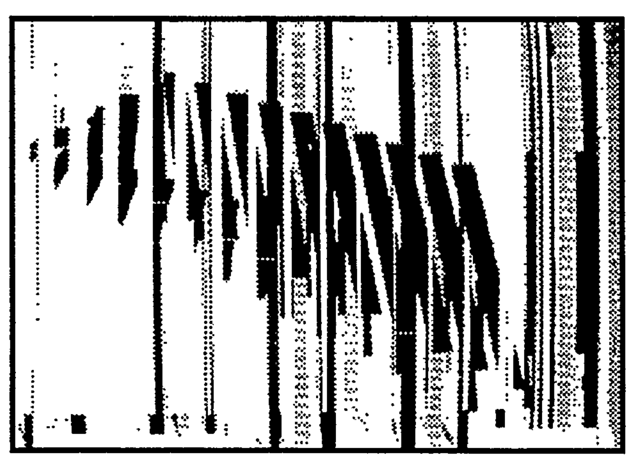
The path which lead from computing to kinetic paintings was that of a theoretical persuasion that painting should be true to its media. Whether the nature of computer art is best expressed with programming or with software is an open and a fruitful question to pursue. For now I am exploring the programming end.

Programming logic influences the rhythm of the paintings and the logic of their wholeness. How a kinetic painting begins and how it builds up, that is, the total logic of its movements is intimately dependent on loops and switches, the layering of routines, and the nature of variables. A combination of numeric constructs which control the behavior of a variable combined to control the changes of a group of graphic commands repeated within a loop is given visual reality in the painting called *Bird Dog.*

Bird *Dog* depends on the following simple program ideas. A group of routines which are called Yoyos control a variable so that it moves back and forth between an upper bound and a lower bound'. Two such Yoyo routines decide the x and y coordinates of a point. Each of several points which define a shape are dictated by such Yoyo routines. Thus a triangle needs six such routines. If I call these six routines one hundred times in a loop and use them to draw a triangle then the triangle will travel on the screen's surface according to the upper and lower bounds of each yoyo. This is the simple most basic building block used for Bird Dog.
The kinetic painting Land uses these same Yoyo routines to set up a group of shapes which expand and contract and overlap thereby describing the growing and shrinking of many things in nature. An initial shape expands and contract depending on the design of the Yoyo routines. Their cycles can be more complex than simply moving back and forth between two limits. They can for example each time expand a bit more than the previous time. The shapes are made to divide and then continue their complex expanding and shrinking. Color changes in a cyclical manner, as well, seeming to cycle between bright daylight and dim evening colors.

Another painting is called Rain. This kinetic painting resulted from fascination with the imperfection of random number generators. The imperfection was that when randomness failed then a certain recognizable pattern would emerge. I designed two very simple and very primitive random number generators and used the pairs of resulting number to place small shapes on the screen. Two routines each using an array of numbers produced coordinates which fell within the limits of the screen's. These two routines were called from a set of nested loops. Each loop used these routines to draw the small shapes as well as to draw a *Windshield-wiper* routine. The Windshield-wiper routine was synchronized with the phasing of the random number generators. Essentially, it gradually cleared the screen as a windshield-wiper might from side to side so that we may be able to see the development of the patterns as they phased in and our of random distribution.

The result seemed reminiscent of rain which sometimes seems to fall in a random fashion and sometimes seems to have a discernible pattern as for example when the wind drives it against a window. In this painting the shapes often fell in what seemed a totally random way but would gradually created an orderly pattern. The pattern would be 0 set of rows created by the small shapes which rows changed their slants between periods of random scattering. In this painting the colors were chosen by Yoyo routines.



Bird Dog

THE COMPUTER AND COLLAGE

LILLIAN SCHWARTZ

A new application of computer technology combines image processing with an artificial-intelligence computing based environment to study and work from great works of art with a purpose to understanding past art as well as to creating new visual imagery.

Ever since cave paintings artists have adapted compositions or pictorial ideas from each other's creations. Even these earliest works of art demonstrate a sophistication and discrimination that suggest they were built on other works of art.

From Ancient Times, to the Middle Ages, and through the Renaissance, artists usually worked in groups, building on their predecessors, working for their Masters, and hopefully going beyond them. In the Modem World schools served the same purpose for some, but many worked alone or with others, using books and exhibitions for study and exposure to the visual arts. Today in addition to our colleagues, schools, books, and exhibitions we have computers.

VAN GOGH -*Starry Night*

I have studied Van Gogh's *Starry Night* in the Museum, in books, on a poster, and now, on the screen of my computer.

My initial reaction to *Starry Night* was it was created as a result of an emotional outburst, a myth often attributed to the working methods of Van Gogh. But alter removing all color from the painting and concentrating on the composition alone, *Starry Night* showed a careful construction, not the result of one creative burst of energy.

I magnified *Starry Night* to study the brush strokes more carefully. I was aware that Van Gogh worked from Millet's woodcuts and that the unique way that he applied the paint was directly related to the chiseled marks that delineated a picture on a woodcut. To continue in this direction I decided to repaint *Starry Night*. I followed in his footsteps, feeling the upward twisting of the cypress forms and the rush of the comet-like shape across the sky. I recreated the cypress tree by using trapezoidal shapes of the actual painting of *Starry Night* itself as a symbolic gesture to emphasize Van Gogh's *expressive* function that he had adopted from Japanese art. *Starry Night* appeared even more like a wood-cut. To soften this chiseled look I used the computer to cover the surrounding hills with other paintings I had previously stored in the computer: Picasso's *Demoiselles,* Leger's *Three Women,* and Rousseau's The *Sleeping Gypsy*.

Sleeping Gypsy seems to bring the town to life; the *Three Women* provides more structure; and the pinks in *Demoiselles* add a peacefulness to this new reordering. The final outcome is a "computer-collage" of art from different movements that grew out of each other into a contemporary phenomenon. What seemed radical at the time can now be brought together by the computer to constitute a unity.

MATISSE-Dance

Matisse owes a great deal to the Japanese print, Chinese painting, primitive sculpture, and, through Gauguin, to Persian painting. I found Matisse during my oil painting days and created *Happy Birthday* based on one of his decorative and sensuous compositions. And, now, I wanted to try working from his *Dance*. In contrast to his richly decorated works *Dance* is made up of broad areas of color, no background or accessories, and achieves a rather formal effect with the linear composition of just five figures.

Dance has been critically recognized as representing a departure from naturalism toward abstraction. The Catalan fishermen dancing on the beach eventually became female nudes, and the traditional dance became freer.
Since the colors were limited to large areas of green grass, blue sky and flesh tones I could use the computer to pick up colors to simulate Matisse's palette. The black and brown of their hair and bodies were silhouetted with only a few select lines for defining features; the dancers in the rear were as large as the ones in the foreground, destroying perspective.

With the computer, it was possible to create a M*atisse* palette. By enlarging and changing the background areas around the figures, they became more isolated from the composition. This "cutting" suggests what later became Matisse's paper collages. More over, the dancers were now involved in a ritualistic ceremony, dancing around a sacrifice which was not present. I used Modigliani's simplified and distorted *Nude* for the body. I kept the more modeled flesh and rounded breasts of the *Nude to* contrast with the evenly-painted tones in Matisse's *Dance.*

The background and the foreground were reduced to monochromatic colors to emphasize the lines of color directing the viewer to focus in on the *Nude*.

I then removed all the color from the Matisse dancers to silhouette them in an abstracted, colorful background to emphasize the original flesh tone of the *Nude*. The elegant stylizations of Modigliani's *Nude* seemed to complete my appropriated *Dance,* further flattening the overall composition.

And, finally I placed this kaleidoscopic picture on a "wall" with me looking at it.
Here, composition and color were subordinated to the *idea*. The computer was used to reveal the future evolution of Matisse toward his paper collages; and direct my creative energies into a different expression, influenced by Matisse's *Notes d' un peintre, "Composition is the art of arranging in a decorative manner the various elements at the painter's disposal for the expression of his feelings.*

PICASSO - Demoiselles

Picasso's *Les Demoiselles D'Avignon,* according to Janson in his *History of Art,* "was stimulated as much by the *Fauves* as by the retrospective exhibition of the great Post-Impressionists... That the *Demoiselles* owes anything to Cezanne may at first seem incredible." Janson stresses that Picasso had studied Cezanne's late work "with great care, finding in Cezanne's abstract treatment of volume and space the translucent structural units from which to derive the facets of Cubism."

The subject for Picasso's *Demoiselles* was a brothel: originally, there were five disrobed prostitutes around a sailor but as Picasso worked, the figures became more abstract and dehumanized. The final painting was broken up into a semi-abstract design made up of the still life, the figures and the drapes.

When I studied Demoise*lles* before using the computer I had difficulty clearly defining the two women in the center of the painting. One appeared to grow out of the other. I also felt the colors were almost pastel.

Upon using the computer, however, it was now possible to identify these abstract shapes and to find that, on closer analysis, most of the colors were strong but appeared more pastel because of their deliberate juxtaposition.

The colors were very close in saturation but by changing the hue of one color the two figures were more clearly defined.

I then divested the painting of all color to examine the composition alone. The shapes were large, mostly angular, with ellipses for the eyes and circles for the grapes.

I was not quite sure what I wanted to do with this work but my next step was to look even more closely at the palettes.

An interactive color program permitted me to pick out the colors of the figure at the left and the two nudes in the center painted in light browns and pinks. I made up a number of palettes of colors from the primary series as well as extrapolating between the infinite shades.

The most obvious step for me was to paint with Picasso's palette. I divided up the background into larger areas. By carefully outlining Picasso's shapes I was getting more of an understanding of the overall structure. Art students sit in Museums and copy great works of art for the same reason. But having the painting in the computer allowed me to magnify parts of the work or to become more familiar with the features and shapes by following the brush-strokes with my mouse.
I began reordering the painting, changing the faces, adding more primitive skirts and masks to match the primitive large head on the right that I wanted to keep. I created a new palette and continued working in and around the shapes, removmg or rebuilding, at the same time revealing forms that were not obvious to me before. After making a series of Appropriation works based on *Demoiselles,* I realized that changing the colors did not seem to make a dramatic difference in the power of the composition of this painting. What I did get was that the abstract shapes, regardless of their color impact, clearly represented the creative steps for the beginnings of cubism.

I could follow Picasso's efforts as he evolved and applied them to my next project, a three minute videotape called *Beyond Picasso*. The images that make up the tape reveal steps of a style reminiscent of Picasso. The paintings served as points of departure, en route to another style or theme. The images were painted rather then digitized. The strong shapes were repeated, interpolated into new shapes with their own colors to realize subtle changes culminating in a new image for each frame of video.

Further discussion of this process, and more images than can be represented in this paper, are included in The Computer Artist's Handbook, L. F.Schwartz and L. R. Schwartz, W. W. Norton in the Chapters on Color, Art History, Animation and Video.

CONCLUSION

The use of the computer in the analysis of the creative act, and the study of appropriation in the history of creation, provides new means for assembling images in the computer-collage medium. By divesting a work of art of all its colors, the composition alone can be examined or used as the structure for a different arrangement. A palette can be made up of the artist's painting itself or colors abstracted from the painting to both study the use of color by great artists and to use in new structures. In addition, the electronic colors now allow for combinations or arrangements of colors unknown to past artists. The art of collage, where a number of different artists' works can be assimilated and reordered, can now be realized in a unique and provocative manner.

FIGURES

Matisse and Modigliani - reordered, recreated collage by the author. Copyrighted 1985,88 Computer Creations Corporation. Printed with permission The Computer Artist's Handbook - L.F. Schwartz and L.R. Schwartz, W.W. Norton, 1992.
Two Images from Beyond Picasso, video by L. Schwartz. Images printed with permission The Computer Artist's Handbook - L.F. Schwartz and LR. Schwartz, W.W. Norton, 1992.

Proceedings of the Twelfth Annual Symposium on Small Computers in the Arts

November 5th-8th, 1992

The Franklin Institute Science Museum
20th at the Parkway
Philadelphia, PA 19103

Presented by:
Small Computers in the Arts Network, Inc.
The Franklin Institute Science Museum

1992 Proceedings of the Twelfth Annual Symposium on Small Computers in the Arts

Presented by:
Small Computers in the Arts Network, Inc.
The Franklin Institute Science Museum

Sponsors:
The Pennsylvania Council on the Arts
The Samuel S. Fels Fund
University of the Arts, Philadelphia, PA
Moore College of Art and Design, Philadelphia, PA
Silicon Graphics, Inc.

SCAN:
Dick Moberg, President
Mark Scott, Vice-President
Misako Scott, Program Director
Brian Souder, Concert Coordinator
Julie Shay, Business Manager

Proceedings Editor: Anne Seidman

Cover Graphic: Anne Seidman

Thanks to: Edward Wagner, Cutting Edge Gallery, The Franklin Institute

ISBN 0748-2043

Sales Information: This book is sold at a cost of $15.00 per copy.

About the Small Computers in the Arts Network (SCAN)

The rapid development of the personal computer over the last decade and a half has opened doors in all walks of life that were only dreams in the past. For artists of all types, this means exciting new tools have emerged, bringing about interactivity between many areas in the arts; practitioners of music, graphics, sculpture, performance and arts education, college professors and engineers are finding themselves increasingly able to bridge technical, physical, and creative gaps as the use of small computers grows.

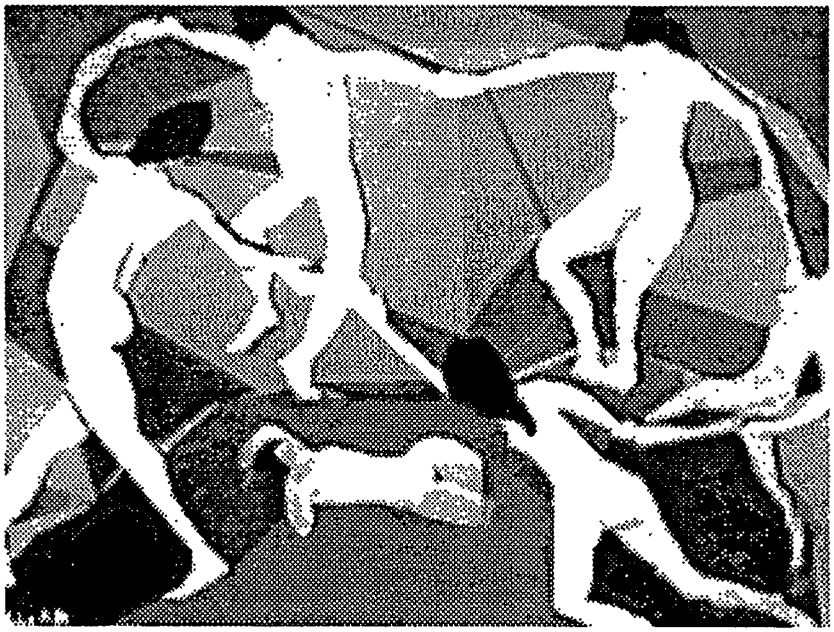
SCAN was founded twelve years ago, evolving out of the Philadelphia Computer Arts Group, which had held Philadelphia area electronic music concerts since 1978. SCAN is now a non-profit corporation. We publish a newsletter quarterly, in which we publish artwork and short articles, as well as information regarding coming events (concerts, openings, publications, seminars, etc.) in the electronic arts field. SCAN provides an environment of personal and creative enrichment for all computer-assisted art enthusiasts, both seasoned and novice alike.

SCAN's biggest event is our annual symposium held this year at The Franklin Institute Science Museum in Philadelphia, a city rich in artistic tradition and influence. The conference serves as the medium for the exchange of new ideas, art forms, and technological innovations, propelling the arts down new trails. Through presentations, exhibits, performances, and shows, SCAN '92 will explore the new realities in art, music, art education, ethics, electronic music, multimedia, arts production, performance and the impact of software and hardware development in the production of art.

Dick Moberg, President

TABLE OF CONTENTS

From Beyond Picasso 1986



Matisse and Modigliani 1985

Explorations Using The Knight's Tour

Ronald R. Brown
September 28, 1992

[NOTE: Some of the material about the first knight's tour has previously appeared in [1] and [2]Just as a composer uses 12 notes arranged on parallel lines to create a musical score, or a chemist uses the 92 natural occuring
elements to form a new compound, I utilize 64 'elements' arranged on an 8 x 8 grid to create 2-D designs and 3-D constructions. These 'elements' are simply the numbers 1 - 64 arranged so thatany number can be 'reached' from the previous number by moving in an 'L-shape', '1-2', or '2-1' movement. This movement is identical to the way a knight moves on a chessboard. In fact, the 'layout' I use is a solution to what is called the "knight's tour" problem - to move a knight on a chessboard so that every square is jumped on only once.

The John G. White Collection of Folklore, Orientalia and Chess at the Cleveland Public Library contains manuscripts from around the world which discuss the knight's tour problem and give solutions to it (also see [1] or [2] for several references which contain solutions to the problem). It was through that library's services that I discovered that the Franklin Institute published an article about the knight's tour problem back in 1827 - some
165 years ago [4]! I will refer to one of the solutions in that article below.

I am presently working on a computer program which not only finds solutions to the knight's tour problem, but also allows one to
'watch' and 'listen' as the computer searches for one. Thanks to this program, I have already found several hundred solutions out
of the many millions which are estimated to exist (no one knows exactly how many solutions there are). The search times have
varied from 1 second to over 20 minutes (running on a 386DX - 20 MHz).

The intent of this paper is:
(1) to explain and explore the possibilities of my approach using two different knight's tours,
(2) to show/explain some 2-D designs using a 2-D paint program, SPLASH (from Spinnaker Software),
(3) to demonstrate my computer program that finds knight's tours,
(4) to show several knight's tour animations using AutoDesk Animator,
(5) to show/explain some 3-D constructions which are on
a videotape, and
(6) play a short tape of music using the first knight's tour as a basis.

To begin, I would like to utilize two different knight's tours and compare them according to the methods I am about to explain.

One Knight's Tour

Figure 1(a) is one solution to the knight's tour problem - it is found in The History of Chess [3]. What's interesting about this particular knight's tour is that the sum of the numbers in each row and each column is 260. Also, it is said to be 're-entrant' or 'closed', in that position 64 and position 1 are a knight's move away from each other. Most knight's tour solutions (from my observations of the ones I have found) are not re-entrant. Figure 1(b) is the result of connecting the center points of the cells in consecutive order. The result is, what I feel, a pleasing graphical representation of the knight's tour.

A great deal of unexpected visual 'order' is manifested when some simple explorations are done on this knight's tour. For example, by connecting the odd numbers to the even numbers, i.e., 1-2, 3-4, ... 61-62, 63-64, two axes of symmetry are found which divide the large square into four quadrants - each identical to the others. Figure 1(c) is the result of making those connections.

Figure 1(d) is the result of connecting the even numbers to the odd numbers, i.e., 2-3, 4-5, ... 62-63, and 64-1.

It should be noted that the union, or 'sum', of Figure 1(c) and Figure 1(d) is the knight's tour path itself, Figure 1(b).

Figure 1(e) is the result of 'looking backwards'. That is, I have connected the 'extreme' numbers together and worked 'inwards' connecting 1-64, 2-63, ..., 31-34 and 32-33.

Figure 1(f) is the result of connecting the first 'half' of the tour to the second 'half'. That is, 1-33, 2-34, 3-35,

... 31-63, and 32-64. I doubt if anyone would have predicted the resultant radiant appearance.

I have made 3-D constructions using Figures 1(b) through 1(f) using wood dowell rods and plywood. In general, I have used the numerical value of the position to determine the height of the construction at that position. For example, at position 25, the construction is 25/8 = 3 1/8 inches in height.

It should be noted that any piece I do in 2-D can also be done in3-D, and vice-versa.

A Second Knight's Tour

For comparison purposes, I have selected another re-entrant knight's tour. This knight's tour is one which is discussed in The Franklin Journal and American Mechanics' Magazine of 1827 [4]. It is attributed to a 'M. De W ***'. Both the Cleveland Library and the Franklin Institute were kind enough to send me a copy of the original article.

When looking at a Figure 2(x) diagram, you may want to compare it with the corresponding Figure 1(x) diagram.

Figure 2(a) is the knight's tour and Figure 2(b) is the path that is obtained by connecting the centers of the cells in consecutive order.

Figure 2(c) is the result of connecting the odd numbers to the even numbers (1-2, 3-4, ..., 61-62, and 63-64) and Figure 2(d) is the result of connecting the even numbers to the odd numbers (2-3, 4-5, ..., 62-63, and 64-1).

Again, note that the union, or 'sum', of Figure 2(c) and Figure 2(d) is the knight's tour path itself, Figure 2(b).

Figure 2(e) is the result of 'looking backwards', that is, by connecting the 'extreme' numbers together and working 'inwards' (1-64, 2-63, ..., 31-34, and 32-33) and Figure 2(f) is the result of connecting the first 'half' of the tour to the second 'half' (1-33, 2-34, ..., 31-63, and 32-64).

An uninformed observer would probably surmise that Figures 2(c) through 2(f) were created randomly. However, the apparent 'disorder' that appears in each of the diagrams is misleading - they are all related to each other by the same underlying structure of the given knight's tour.

Because I have just recently received the above knight's tour from the Franklin Institute and the Cleveland Library, I have not had time to construct any pieces based on it

2-D Designs Using SPLASH (Spinnaker Software)

[NOTE: SPLASH has a utility program, SLIDESHO, that shows 'slides' consisting of .SS files.]

All of the slides to be shown are all based on the same knight's tour. The observer is encouraged to envision these 2-D designs with 3-D equivalents.

Slide	Construction Method
1-5	First knight's tour, and variations
6-8	Variations of a triangle being rotated - same color
9-11	Variations of block filling with 3 different colors
12-13	Variations of 32 shades of grey (and blue)
14-18	Variations of 64 shades of grey
19-23	Variations of multi-colored triangles being rotated
24	Four knight's tours

Knight's Tour Computer Program

To run this program the user:

1) provides an initial column and row starting position,
2) enables/disables 'Sound' capability,
3) enables/disables 'Random Searching',
4) enables/disables 'Graphics' capability,
5) enables 'Box Filling' or 'Line Connect' graphics,
6) enables/disables 'Clearing at Restart', and
7) sets a Delay, from 0-450 ms between graphic/sound events.

[NOTE: A slide will be used to explain 'Random Searching']

Once the search has begun, the operator can use the following keys to toggle or re-adjust the initial settings on-the-fly:

- 'S' - toggles sound,
- 'B' - toggles between 'Box Filling' and 'Line Connect',
- 'C' - toggles 'Clearing at Restart',
- 'R' - toggles between Random Searching' and 'Non-Random Searching',
- 'F' - toggles between 'Freezing' and 'Resuming' the search, and
- '0 - 9' - adjusts 'Delay' time

When a knight's tour is found, the tour is displayed in

Text Mode' with 'Musical Notes' beneath it. The first note is the row of the starting position and all other notes are row 'offsets' from it.

Several 2-D Animations (AutoDesk Animator)

When viewing these animations the observer is encouraged to visualize 3-D animation equivalents.

	Animation	Structure
1-2	Colors flow along the path of the knight's tour	
3	One knight's tour rotates back and forth across the screen transforming into another knight's tour.	
4	One knight's tour is transformed into a second knight's tour 'exploding' outward,	
5-6	The knight's tour 'pulsates' as it expands and contracts.	

3-D Constructions - Videotape

Here are some constructions made from plywood, wood dowell rods, and/or wooden slats. All are based on the same knight's tour (except for Knight's Tour II).

Construction	Structure
1 Rotated Monoliths	Slats are rotated and 'grow' in height
2 Tour de Four	Four knight's tours - see slide
3 Cylindrical Tour	Cylinders varying in height
4 Step Ladder Tour	Criss-crossed rods stacked on top of each other
5 Digit-Talis	All positions having the same digital root are connected together and lie on the same plane (9 planes exist). Ex: dr(31) = 3+1 = 4 = dr(22) etc. Both are connected on plane # 4
6 Step Pyramid	Offsets from the corners are connected to each other and neighboring cells.
7 Knight's Tour II	Another example of a knight's tour
8 2080 Points of Light	Cell 'n' contains n nails - each in the appropriate sub-cell location. (1+2+3+ ... +63+64 = 2080)
9 Skipped Evens	2-4, 6-8, 10-12, etc.
10 Hate Part A	(The syllables a-part-heid backwards) 64 apartheid laws appear - one in each cell. Made from barb-wire and scorched with flame. White and black parts are symbolic. Recently won an award from Binney & Smith (makers of Liquitex paint and Crayolas). Laws are from Apartheid in Practice, United Nations, 1976
11 Lingam Mountains	No comment
12 Square Network	Cells are connected together
13 Odd to Even	Refer to Figure 1c
14 Even to Odd	Refer to Figure 1d
15 Nueva Nova	Refer to Figure 1f
16 Primus	Prime numbers connected to unity (1)
17 Multiples of 4&5 (Towers)	Self explanatory
18 Multiples of 4&5 (Network)	Self explanatory
19 Optical Tour	2-D parallel lines rotated in relation to cell number
20 Rotated Triangle	See slide

In Conclusion

The possibilities for my 2-D designs and 3-D constructions are boundless. I envision 3-D constructions where children (or adults) can play on them, where colored liquids flow through transparent pipe, where lasers can 'paint' knight's tours in the sky, etc.

For the curious, or 'scientific' observer, each of my pieces can be regarded as an exercise in pattern recognition. For others, hopefully, they will at least be enjoyed.

Presently, I am exploring the possibility of composing music using the knight's tour approach and intend to add 3-D graphics to my computer program while it is searching for a knight's tour. In the future: a Knight's Tour 'Virtual Reality' Art Gallery!.

End: Three renditions of "Knight's Tour Song I" on audiotape.

References

[1] Brown, Ronald R., "The Use of the Knight's Tour to Create Abstract Art"; Leonardo, (Pergamon Press, London, Volume 25 Number 1, 1992) pp. 55-58;

[2] Brown, Ronald R., "Using the Knight's Tour to Create Abstract Art", The Chess Collector, (Chess Collectors International, London, Volume 1, Jan. 1990) pp. 17-21 (an abridged version of the Leonardo article);

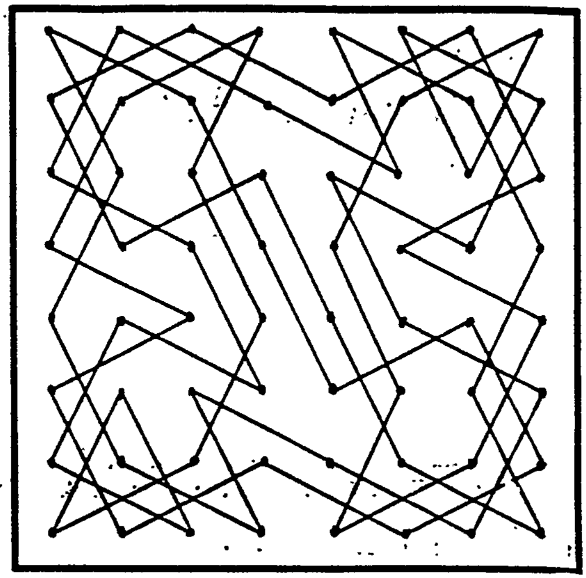
[3] J. Gizycki, A History of Chess, B.H. Wood, ed., A. Wojciechowski, D. Ronowicz, W. Bartoszeski, trans. (London: Murray's Sales and Service, 1972) p. 107;

[4] Jones, Dr. Thomas P., ed. The Franklin Journal and American Mechanics' Magazine, (The Franklin Institute, Philadelphia, 1827) pp. 132-135;

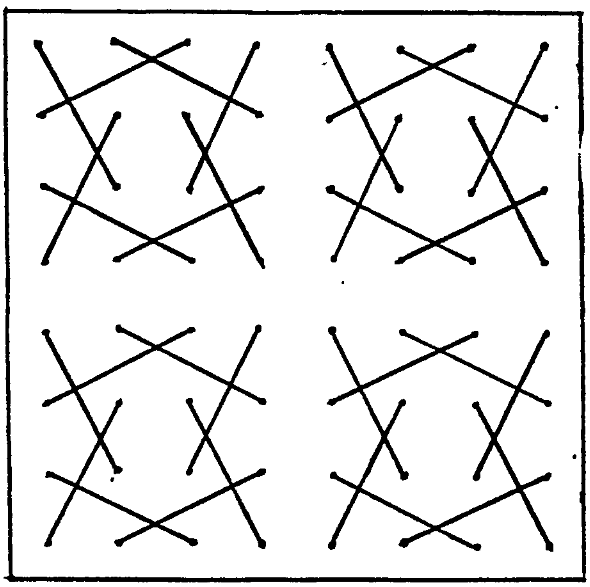
Figure 1

50	11	24	63	14	37	26	35
23	62	51	12	25	34	15	38
10	49	64	21	40	13	36	27
61	22	9	52	33	28	39	16
48	7	60	1	20	41	54	29
59	4	45	8	53	32	17	42
6	47	2	57	44	19	30	55
3	58	5	46	31	56	43	18

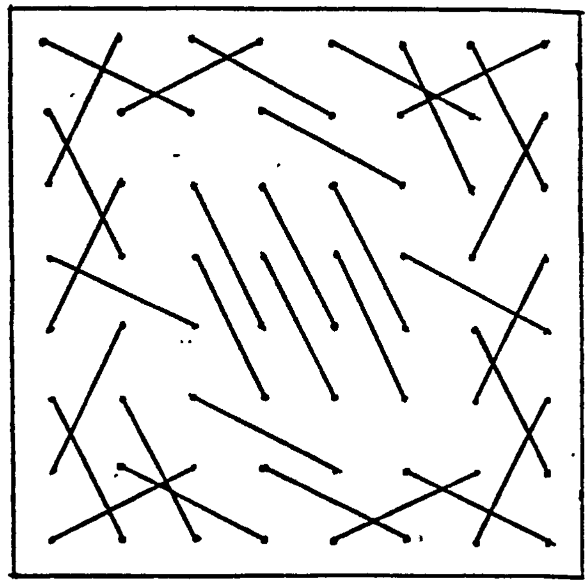
(a) Knight's Tour



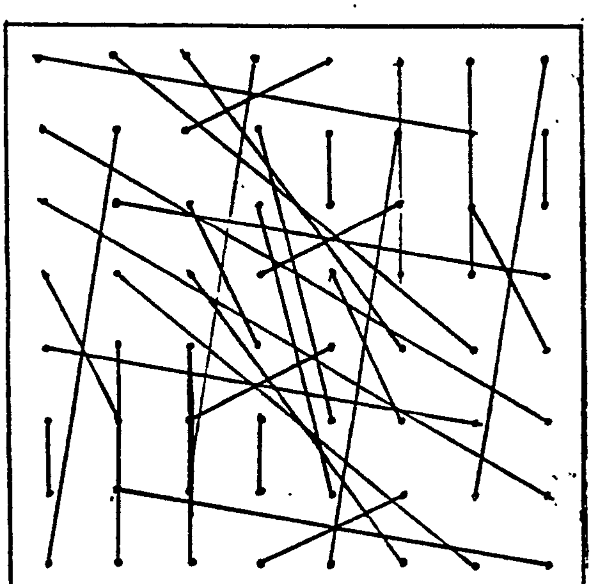
(b) Knight's Tour Path



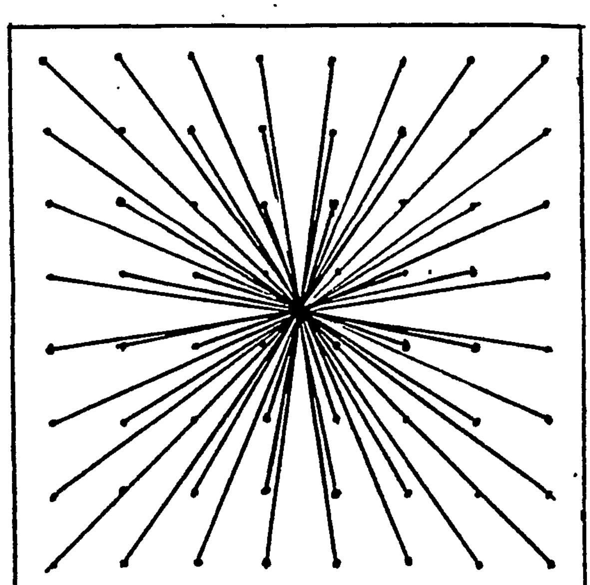
(c) Odd numbers to even numbers
1-2, 3-4, ..., 61-62, 63-64



(d) Even numbers to odd numbers
2-3, 4-5, ..., 62-63, 64-1



(e) Extreme numbers connected

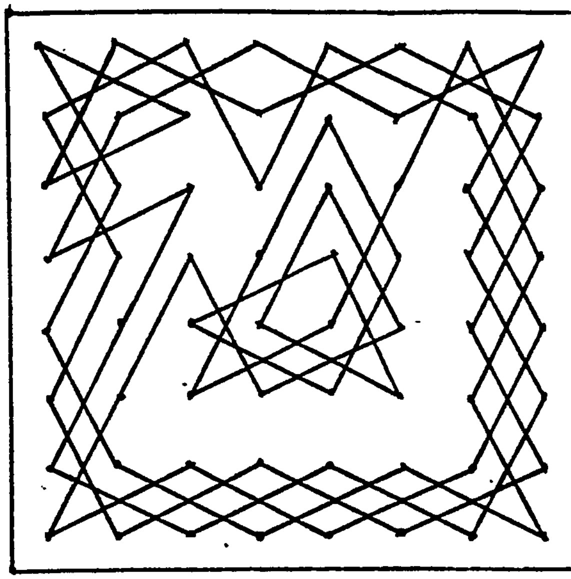


(f) First half to second half

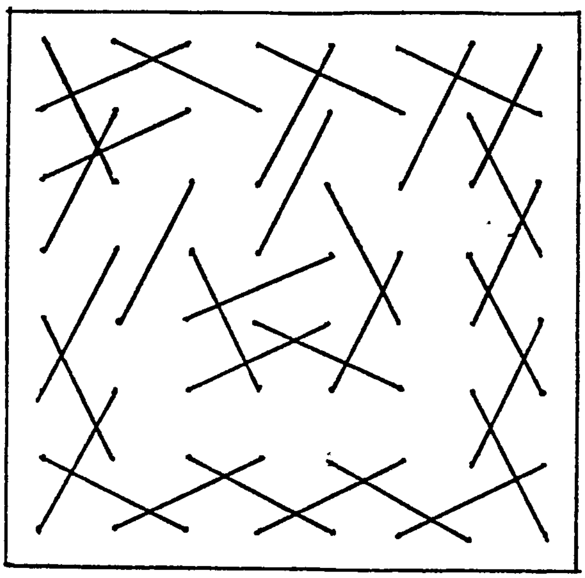
Figure 2

25	22	37	8	35	20	47	6
38	9	24	21	52	7	34	19
23	26	11	36	59	48	5	46
10	39	62	51	56	53	18	33
27	12	55	58	49	60	45	4
40	63	50	61	54	57	32	17
13	28	1	42	15	30	3	44
64	41	14	29	2	43	16	31

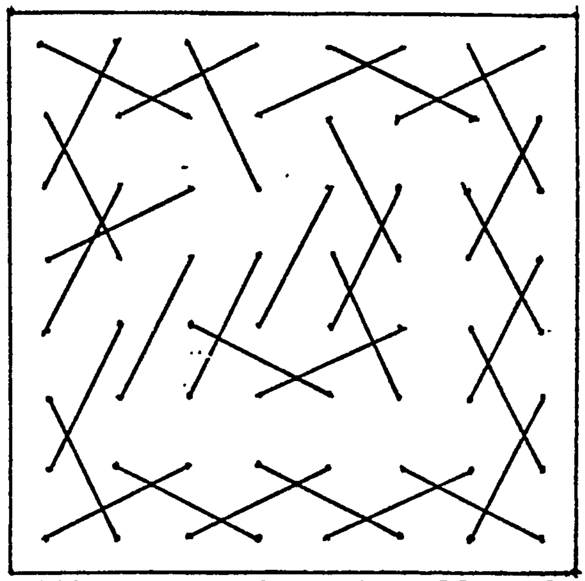
(a) Knight's Tour



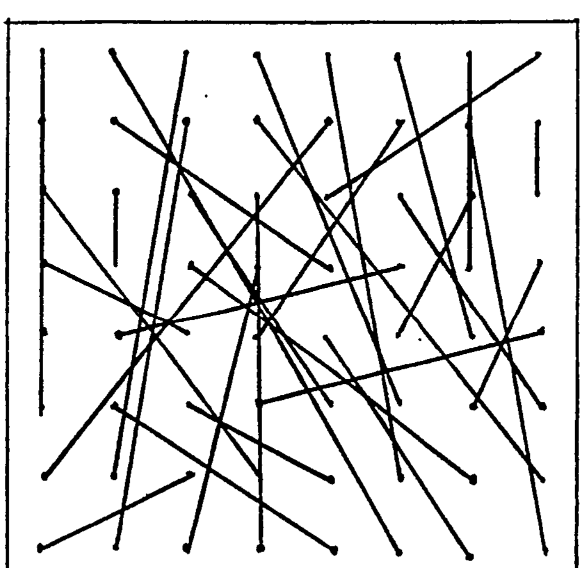
(b) Knight's Tour Path



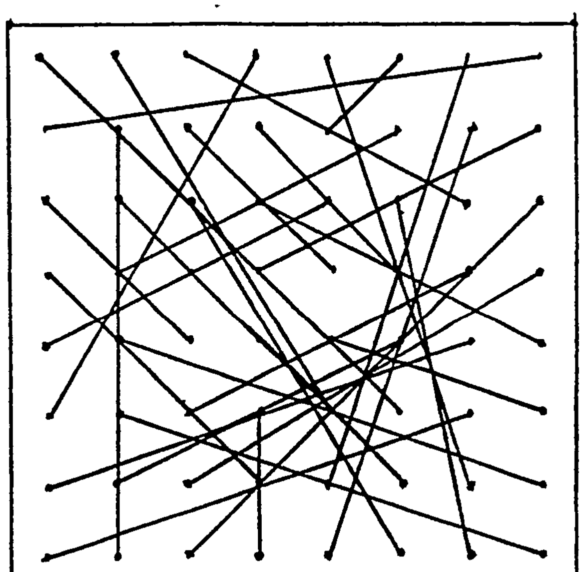
(c) Odd numbers to even numbers
1-2, 3-4, ..., 61-62, 63-64



(d) Even numbers to odd numbers
2-3, 4-5, ..., 62-63, 64-1



(e) Extreme numbers connected



(f) First half to second half

Collaborative Strategies for Transmission Art Events

Byron Grush
School of Art
Northern Illinois University
DeKalb, IL 60115

Abstract
I use the phrase, "transmission art event" to indicate those events which utilize telecommunications to facilitate an art experience, particularly the transmission of images and/or text messages between a number of participants.While some might include FAX, slow-scan television, closed-circuit and satellite broadcast television or mail art in this definition, I am primarily interested in the transmission of data over networks (like Internet and Bitnet) and via modem over standard telephone lines. My notion is that transmission events are often concerned with collaborations and/or interactivity: possibly between artists or between artists and their audience.This paper explores some of the issues and possible strategies that such events suggest.

Introduction
On July 28th, 1992, several collaborative computer art projects were joined together into what was termed a "Telepresence Virtual Space Event." The projects and spaces which were linked electronically were *Postcards From an Exquisite Landscape*[1] at the Chicago Siggraph Computer Art Exhibition, *Brave New Pixels 4*, at the Northern Illinois Art Museum Gallery in Chicago, *Art Out the Window*[2] at the *Electronic Cafe International*[3] space at the art exhibition of Siggraph '92 at Chicago's McCormack Place, and *Room With a View*[4] at Media Management in Atlanta, Georgia. The three projects were all variations of a sort of "virtual gallery," that is, they were collections of computer images by many different artists stored at remote sites as data which could be transmitted at high-speed and at high resolution over standard voice-quality phone lines. In addition to the stored data images, live still frames and voice were sent between the sites.

This type of event gives rise to many issues. First, it suggests that certain collaborative works are able to produce results which individuals would be unable to produce working alone. In this case, the whole seems to be more than just the sum of its parts: it is a synergistic creation that takes on surprising yet meaningful forms. Second, the immediacy and spontaneity of transmission art challenges the formalism and prescriptivism of the tradition art exhibition. Content and style become matters of the moment and can rarely be predetermined, prejudged or predicted. Third, there is a problem of
ownership for the individual artist who participates in a collaboration. The work leaves the control of the artist and may be presented without identification or in improper form.

The Network
Many educational institutions, government facilities, business and organizations are connected through a system called Internet. Internet in turn is connected to other international networks. A primary use of this international electronic network is the transmission of electronic mail, or email. A user with a login account on a system with an Internet address can communicate with another anywhere in the world if that person also has an Internet address. Through an elaborate system of servers, routers and gateways it is even possible to log onto another machine by using telnet or ftp[5] or to transfer data with uucp, kermit, zmodem and other programs. Some commercial companies like Compuserve also have Internet connectivity. Thus a user with a computer, a modem and some kind of communications program like Procom or Kermit (and a budget) can subscribe to a service giving them access to Internet email. The WELL in San Francisco is a favorite with many artists and hosts Art Com, a bulletin board and forum for art events. Usenet is a subscription service found on many systems (including the WELL) which runs the NeWs, a multi-subject interactive conference.

Network art projects are becoming more common and some attempts to document them, disseminate information about them or to consolidate the spirit of various individual projects into a notable and noticeable presence are taking place. This year, the Decentralized World-Wide Networker Congress[6] was formed to focus on the role of the networker. Statements were solicited from the telematic and mail art community and collected into a database at the University of Iowa (see footnote on Decentralized World-Wide Networker Congress). A recent issue of Leonardo was devoted to Telecommunication Art.

InterJam
At the SCAN conference in 1991 I proposed an electronic collaboration I called InterJam. This was to be an animated work contributed to by a number of individuals who would send their segments over the network. I patterned the idea after the the more traditional form of animation collaboration called"anijam," where a group of animators supply sequences to a film using a common theme but interpreting it in their own style. I wanted to use the network in order to neutralize the differences between the various computer platforms and software which the participants might have at their disposal.

I discovered a myriad of technological tools: Amigas, Macintoshes, IBMs, Sun and SGI workstations, MIDI labs, video and film facilities. Image formats varied from Tiff to GIF to Targa to Anim to Fli to Flux. Since there was no easy way to standardize on software or hardware, the project, for me, became a constant learning process about file conversion. Some of the participants were able to work in or convert their images to GIF or IFF. My own contribution started as 8mm video, was rotoscoped to ink and paper, frame grabbed on a Targa board, converted to GIF, then to an Autodesk Animator Flic file and eventually was transfered to an Amiga Anim file for recording onto video tape.

Most single image formats are easily converted with programs like Alchemy or even within some of the better paint packages like Tempra. The animation file formats, however, were another story. Most animation formats use some form of image compression which is not easily converted. Autodesk Animator, a DOS-based program comes with a convertor that attempts to translate Amiga Anim files to its Flic format. DOS to Amiga or Amiga to DOS sometimes worked, but more often, we found we had to save individual frames one at a time, convert them and load them into the animation software running on the other type of machine. The least success we had was with trying to convert Macintosh formats.

Although tedious, all this image converting was important in order to bring together people who worked in different environments. Computer manufacturers and software companies not only do not care about us as a community of creative individuals with a need to communicate, they typically go to great lengths to keep us apart by building incompatibility and planned obsolescence into their products. Some software companies are beginning to realize that their customers do have a need to bring data from "foreign" formats into their applications, and so the words, "import" and "export" are beginning to appear in pull-down menus next to "load" and "save." in spite of commercial and shareware attempts at conversion and standardization, incompatibility remains a major problem for electronic collaborators.File Transmission

Unix users within the InterJam group were able to send images to me over the network by creating ASCII files from their pictures with a Unix program called uuencode. Once in ASCII text file format, the images can mailed using the mail program. At the other end, the file is turned back into a raster file with the program, uudecode. There are versions of uuencode and uudecode for DOS and Amiga which can be down loaded from various network sources (see footnote on anonymous ftp sites). All the platforms have some kind of file compression programs like ZIP and ARC which are useful for reducing the physical size of the files.

Many of the InterJam files were actually sent on floppy disks through the mail. The second project we did, *Postcards From an Exquisite Landscape*, finished this year, was concerned with single images rather than animation files. Thanks to Walter Wright at Truevison, I was introduced to Tom Baggs of Xenas Communications and his SEND->IT![7] software. The software, a DOS-based Targa system and high speed modem are used to transmit Targa resolution files in (sort of) real time over the phone. The use of this system suggested the possibility of some sort of real-time interactivity for *Postcards*. Thus the network collaboration of InterJam began to evolve into a Telepresence Virtual Space Event.

Postcards From an Exquisite Landscape
Chicago Siggraph, the midwest chapter of ACM/Siggraph, hosts an annual computer art show called *Brave New Pixels*. For the show, InterJam produced a printed mural arranged in grid format. The individual images were printed on a color, wax thermal printer and measured 8" by 6 1/4". The installation was an 8 by 8 grid intended to be populated with images as the show progressed.During the opening of the show, we used the SEND->IT! system to link with *Art Out the Window*, and *Room With a View*. Live images were transmitted, often of people in the galleries or of the work of various artists represented at one of the three shows.

Occasionally screens were dumped to a Mitsubishi video printer and these images were added to the installation. By the end of the Brave New Pixels 4 exhibition, 57 of the 64 grid frames held images contributed by 16 artists. The live transmission was an important aspect of the project, bringing a vitality to it and involving the audience in the process. In one sense, *Postcards* was a sort of art-show-within-an-art-show. It was nearly rejected because the reviewing committee had difficulty evaluating an event which hadn't yet happened. Here was a living art exhibit being created on the spot. It was not quite a performance but it had that immediacy and spontaneity often associated with performances. It added the dimension of time, but it subtracted the dimension of space —at least of distance— from the reality of the event.

Strategies

From my own mistakes, false assumptions and from observing the relative success of other telecommunication projects, I have formulated the following set of basic principles for those who might wish to conduct a telecommunication art event:

1) Keep it simple. The animation project was too difficult to coordinate and execute. Too much time was needed to pass images back and forth between participants. The image files were too large.
2) Settle on a file format. Although the flexibility afforded through using multiple formats is convenient for your participants, you will spend all your time converting files. The sense of a lack of structure will work against you in the long run. At the risk of loosing a few participants, it is better limit the project to one or two formats.
3) Provide a time table. Last year's *Reflux*[8] event was notable for its success in coordinating numerous collective events. It did so through a well-defined plan including events which followed a specific time table.
4) Organize an event, preferably a public exhibition, which can be the focus of the collaboration. Postcards was successful primarily because it was part of a jured art exhibit. InterJam group members had the motivation to produce images for the project since it was part of a well known art show. An event lasting one evening is better than a long-running one.
5) Supply plenty of feedback. Participants need to get a feeling for what is going on. They need to communicate with each other, see each other's work and know that something positive is happening. Make sure the feedback system you use is practical.
6) Be specific about rights and usage of art or writing which is submitted. Make sure proper credits are given. Protect your participants from being "ripped off" by other participants or by your audience.

Issues

Quality control seemed to be important to many of the participants in *Postcards*. Several people asked about the specifications of the printer I was using. In some cases, artists wanted the best possible quality for prints of their work, but in other cases it was to be understood that the image submitted was a "low res" version of the original (thereby preserving there sale value of a high res version). Others frankly weren't as fussy about quality. In the case of *Postcards*, I was printing from data files and had noway to know if colors were correct or too dark or too light. Should artists need to relinquish control over their product when they engage in collective art?

Who owns the work? In *Postcards*, the concept was to develop a virtual landscape by working in the tradition of the surrealist's "Exquisite Corpse" drawings. Elements from one artist's images sometimes found their way into another's. The extension of image elements or concepts across the scope of the work results in a collective image with greater impact and meaning than can be found in its individual parts. But who owns the collective image, and who owns the parts?

Computer art, like photography before it, has had an up-hill battle for acceptance within the traditional art arena. By casting computer images into the "framework" usually occupied by paintings and drawings, some computer art has begun to find its way into galleries. Transmission art, email art, electronic conferencing, FAX art and electronic collaborations challenge the entire notion of how art should be presented and experienced. The gallery, museum, critic, historian and other functionaries of the traditional art scene are in danger of being taken out of the loop and reduced to bystanders.

InterJam Forum

InterJam group members communicate through email. InterJam is actually a mailing list in the form of an "alias" on a machine on the Internet. If mail is sent to the InterJam address, each person on the list receives a copy. Lately, we have been using the mailing list as sort of forum to discuss different aspects of email collaboration. At first I wanted to impart an interactivity to the InterJam project. This might have been achieved by establishing an anonymous ftp site on a machine on the Internet. As yet, I am usable to set up such a site, but I hope to do so in the future. For now anyone interested in being included in the forum should contact me with an Internet or Bitnet address (or Compuserve account number) by emailing a message to interjam-request@art.niu.edu or directly to me at byron@art.niu.edu.

1 Artists participating in *Postcards From an Exquisite Landscape* included Tom Baggs, Mary Beams, Steve Bradley, Hal Brokaw, Sam Bruskin, Leslie Bishko, Sandro Corsi, Maurice Clifford, Wayne Draznin, Byron Grush, Derek Hardison, Dan McVeigh, Wynne Ragland, Paul Rutkovski, Kurt Schultz, and Lydia Swangren.

2 *Art Out the Window* is a "virtual gallery" first developed for a three city simultaneous art opening including Twightlight Studios in Hoboken, Xenas Communications in Cincinnati, and Media Management in Atlanta. Images are transmitted over the high resolution SEND->IT! Event Network used by the I-75 Corridor Artist Project and developed by Xenas Communications. Artists participating in *Art Out the Window* include Tom Baggs, Dan McVeigh, Wynne Ragland, Jud Yalkut, Roger Greive, Julia Yarden, Michael Straw, Joe Stoner, Jaime Castells, Sandra Binion, Marge Garrett and Tom Fritz.

3 *Electronic Cafe International* was created by co-directors Kit Galloway and Sherrie Rabinowitz. Since 1990, ECI has been involved in the production of interactive telecommunication art events around the world. Kit and Sherrie have been actively innovative since the late '70s when they pioneered satellite telecommunications technologies for an art venue. They have many on-going projects and are happy to hear from potential volunteers and interns: 310 828-8732, FAX 310 453-4347.

4 *Room With a View* is a "Telepresence Virtual Space Event" which has been held in collaboration with Tom Baggs of Xenas Communications in Cincinnati and Wynne Ragland of Media Management in Atlanta. Telepresence links remote cameras with high resolution images from remote places over voice grade telephone lines using the SEND->IT! system. Audio is transmitted as well on a second line. Recently, *Room With a View* participated in linking the *Electronic Cafe* at McCormack Place in Chicago with the Northern Illinois University Art Museum Gallery in Chicago and Media Management in Atlanta for the concurrent art exhibitions, *Siggraph '92 Art Show* and *Brave New Pixels 4*. *Room With a View* is proposing a series of permanent telephone numbers worldwide that automatically send real and surreal landscape images over private dial up networks for visual connoisseurs and voyeurs.

5 FTP (file transfer protocol) is a program which runs on Unix or dos platforms which can be used to log onto remote machines and perform certain useful functions such as uploading and downloading files. There are hundreds of ftp sites worldwide which allow logins with the login ID, "anonymous." A list of sites is available from pilot.njin.net. From the command line, the user types "ftp pilot.njin.net" (for example) and at connection is asked for a login ID and password. At an anonymous site, the user could use "anonymous" as a login ID and his or her email address as the password. Typing "?" at the ftp prompt usually gives you a list of legal commands. You may need to set the transfer mode by typing "binary" (or "ASCII" for text only files) before you attempt to download a file.

6 *Decentralized World-Wide Networker Congress 1992* was organized to focus attention on the role of the networker and as a meeting place for all kinds of networkers to share information about themselves and their activities. I first heard about it from Chuck Welch's essay, "Communication Across Borders: Mail and Telecommunication Art." H. R. Flicker at The University of Iowa and mail artist Crackerjack Kid established the *Networking Databank Congress* in order to document the congress. Inquiries should be directed to Crackerjack Kid,Networking Databank Congress, PO Box 978, Hanover, New Hampshire 03755 or by email to Cathryn.L.Welch@Dartmouth.edu.

7 SEND->IT! Communications software was originally developed for the Truevision Targa/ Targa+ graphics platform to transmit images quickly and easily over voice grade phone lines. It includes software which can grab live video, save and load TGA format images and transfer single files or batches to another remote SEND->IT! system. It includes a high-speed modem. For information about this unique product, contact Tom Baggs at Xenas, 513621-2729.

8 *Reflux* was an art telecommunication event designed as a learning environment for decentralized interchange directed by Artur Matuck in association with Universidade de San Paulo, Brazil, and the Studio for Creative Inquiry at Carnegie Mellon University, during 1991 and 1992.

Making the Jump from 2D to 3D Applications on Small Computers

Dr. Bill Kolomyjec
Pixar
1001 West Cutting Blvd.
Richmond, CA 98404

Abstract

Why do many people who use small computers find it hard to make the jump from 2D to 3D programs? This non-scientific paper discusses some common perceptions and possible reasons why there might be a reluctance by some to venture into 3D. Major issues of training, 3D paradigms and user interface are discussed. With the magnitude and variety of 3D software becoming available, there is no doubt that small computers will play a major role in popularizing 3D.

Introduction
Issues related to making the jump from 2D to 3D applications on small computers are the focus of this paper. Until recently the insufficient compute power of small machines and the high cost of 3D software products have been barriers, but these walls are crumbling. Small machines of sufficient power and a variety of affordable 3D software are readily available. This discussion will consider other issues apart from capability and cost.

With the advent of small computers, in particular Macintosh, and a new kind of computer graphics application program such as MacDraw, graphic designers and artists began flirting with 3D. Text and shapes became "objects" that could be shuffled like cards; moved to the front or pushed behind other graphical entities. Drop shadow effects could be added to simulate 3D. This and other applications were the first to allow individuals to break with traditional 2D design tools; to use what has come to be known as a "priority system" or 2- 1/2D. To be able to interactively prioritize graphic elements depth-wise on the 2D page was a significant innovation with great appeal. Designers, artists and other desktop publishers quickly adopted this and similar techniques. Unfortunately, the majority of these users have not progressed much farther than 2 - 1/2D.

It's relatively easy to simulate 3D with 2 - 1/2D drawing tricks but in truth this is not 3D. Until recently, before one could make the jump to 3D, additional information and/or experience had to be obtained by traditional means in schools and studios. The standard method for learning 3D has been courseware or training in conventional 3D methods such as orthographic projection and perspective drawing. Learning 3D this way consisted of constructing solutions with a T-square and triangles to thousands of mutilated block drawing problems. Today, individuals are still being taught 3D in "wireframe" using a variety of CAD software with a variety of 3D interfaces. It's no wonder learning 3D is often perceived as crawling through fifty yards of broken glass on one's hands and knees - a brutal experience.

Making the jump
We are beginning to see 3D applications that beckon us to learn 3D on our own. A new breed of low cost 3D software packages are available that promote discovery learning. Two examples are 3D software for scene arranging, as well as software for creating dimensional type. 3D scene arranging software simplifies the 3D computer making process by eclipsing the drudgery of 3D modeling. Scene arranging consists of arranging pre-modeled objects or artifacts into scenes, assigning material appearances to them using textures of procedural shaders, positioning a camera and adding lights. 3D scene descriptions are then rendered to produce photorealistic quality images.

Dimensional type enables 2D desktop publishers to manipulate familiar entities, i.e., letterforms to create 3D objects. A user enters letters, words or phrases and the application converts their outlines (Type1 or TrueType fonts) into 3D objects. The 3D text may be manipulated into a single scene or further manipulated into keyframes for animation.Rendering is used once again to produce an appropriate resolution 2D image(s). Rendering produces a 2D image(s) from 3D scene descriptions in PICT of TIFF file format. In turn, these images may be pasted into a 2D layout application or a QuickTime™ movie.

Excuses
With the newer 3D software paradigms it is no longer necessary to shy away from 3D. Yet, there appears to be a general paranoia associated with jumping into the third dimension. Given below are some of the popular excuses for not getting involved in 3D, comments that you might hear from individuals who are reluctant to make the jump.

My world is flat, I don't need 3D.

3D is too hard to learn and do.

I don't need 3D to be a good image maker.

Many desktop publishers work in 2D so they think in 2D. Paper is flat, text is flat, line art and photographs are flat and these elements are all shuffled together to make a flat image. These are people who see everything in the 3D world around them as a 2D instance or projection. Quite probably these individuals perceive film and video as flat because it's viewed on a screen that is flat.

There is no question that *initially* it is easier to learn 2D techniques as compared to 3D techniques. But there are many reasons for trying to learn 3D, especially now that newer paradigms are available. For example, have you ever wrestled with perspective distortion in 2D images? 3D programs solve these visual problems automatically! The most important reason for knowing 3D is that it makes you better at 2D. It would be fair to say that designers and artists who lack a working knowledge of 3D techniques are prone to make 2D drawing mistakes.

3D is not difficult; it's simply different. A good 2D/3D analogy is the comparison of driving - a 2D activity, to flying - a 3D activity. Indeed 3D adds another degree of complexity, but it also adds another degree of freedom. Is painting or photography (2D imaging activities) easier to learn than sculpture or theatrical set design (3D imaging activities)? The answer is no, not really, they just require different training and experience.

Learning 2D visualization techniques is an important prerequisite to learning 3D - just as crawling is prerequisite to walking. However, the learning experience doesn't have to be brutal; you don't need to learn formal drawing systems or CAD programs to do 3D.

Major Issues

Historically, 3D training methods have been inconsistent. 3D is taught differently to different client groups. Engineers and scientists receive different fundamental training in 3D skills than do artists and designers. It seems that no one really knows what constitutes proper training in 3D. Over the years many questions regarding 3D teaching and training methods have been discussed. For example: Are formal instructional methods better than informal methods? Is the direct method better than the reference plane method? Can left brain oriented instruction (language) teach right brain oriented skills (imaging)? Can 3D instruction be generalized or is it inherently individual? In spite of all the debate, most of us agree that any self-motivated person can learn 3D.

In addition to training, there are several major issues that have to be recognized by people in the 3D industry before 3D will become pervasive. Before any type of 3D software product can be developed an individual or company must decide on how to represent a 3D object and/or scene and how to present that 3D object and/or scene to the viewer. Thus, the issues of underlying technology or 3D modeling and rendering methods needs to be discussed.

A major source of irritation to everyone using 3D has to do with how 3D objects are described internally in a software package. In order of user complexity, 3D objects can be described using: Point and lines only, i.e., wireframe. Polygonal surfaces and polygon meshes, typically as Boundary representations ,or B-reps, that describe the outer skin of an object as a series of connected polygons. Higher order surfaces such as quadric surfaces, patches and patch meshes. The most mathematically general representation of a 3D surface, namely, NURBS (Non-Uniform Rational B-Splines) and related trim-curves. And, Constructive Solid Geometry (CSG) methods that involve boolean operations with solids such as creating objects by unioning and differencing one primitive 3D shape with another. Each method has advantages and disadvantages as compared to the other, each has a major influence on the ease of use, speed, capability and quality of the software.

Rendering technology is another contested arena in 3D. There are the ever popular and fast polygon shading techniques of flat, Gouraud, and Phong Shading. There are the major rendering paradigms known as Ray-tracing, Radiosity and the Reyes Algorithm (the basis for Pixar's PhotoRealistic RenderMan renderer). Again, each method has advantages and disadvantages as compared to the other, each has a major influence on the ease of use, speed, capability and quality of the software.

To compound the issues of modelers and renderers is the problem that the data they create and require are not always interchangeable. Recently, several proposal have been suggested to standardize object and scene description methods with rendering paradigms, namely Silicon Graphics' GL, Sun's PHIGS with its graphics extension and Pixar's RenderMan Interface Specification. Ironically each standard is published but each is implemented uniquely. The net effect on the consumer is similar to the confusion associated with picking a phone company.

Lastly, 3D user interface mechanisms are a major issue. Once a 3D software vendor decides on a modeling paradigm and the level of rendering they wish to support, then, and only then, should a user interface be written. Every company seems to have their own brilliant idea as to what constitutes a good 3D interface. Thus, no two 3D packages have exactly the same user interface. Some generalizations can be made if you look at enough packages, such as, single versus multiple window presentations, etc. But the real problem is that since there seems to be no standard method for learning 3D, how could anyone presume that a single, static, user interface is going to have a universal appeal. Therefore, one might think that it is probably best to provide a 3D software user with choices or a means to customize the interface.

Summary and Conclusion

Not too long ago there was much discussion regarding issues of when to use 2D page layout software and when not to. Arguments regarding use of 3D will go the same way. The truth is that today the 3D consumer market is in its infancy. A few early adopters are already using 3D, while the masses are waiting to see what is going to happen. Low cost 3D software tools on small computers can only accelerate the jump.

The major barriers of computer graphic hardware performance and 3D software product cost on small machines have not gone away but they have been significantly reduced. Current ballpark figures suggest that 3D can be done on desktop machines that range in price from $2,000 to $5,000 using 3D software products that range in price from $250 to $3,500. There are few real excuses for not making the jump to 3D. However, you need to be aware that there are some major issues that need to be confronted and resolved. Consensus and closure on these issues may take years and should not keep interested people from doing 3D.

We continue to need newer and better 3D software products to bridge the gap between 2D and 3D to expand 3D literacy and the 3D market. It is important to remember the motivation for learning 3D is not to make 3D an end in itself, but rather, a means to an end. When you add 3D skills and tools to your image making arsenal then you should become a more complete and competitive computer picture maker.

Empathy and the Acceptance of Computer Graphics as Art1 9

Richard Helmick, M.F.A
Department of Environmental Design
University of Missouri
Columbia, MO

EMPATHY

Abstract
This essay attempts to explain why the art establishment and other viewers are reluctant to accept computer graphics as a medium for art. The author argues that a sense of craft processes used in making art are a prerequisite for empathic response to art. The craft processes in computer graphics are inherently hidden. Difficulties in assigning a referent to computer art also discourages an empathic response from many viewers. The author concludes that the short range outlook for acceptance of computer art by the official art world is not good. Computer graphics is an extremely indirect, complex, and volatile medium. Many additional years of education and exposure will be required before computer graphics will become accepted as a full-fledged art medium.

Empathy and the Acceptance of Computer Graphics as Art
Why has the art establishment been reluctant to accept computer graphics as a medium of aesthetic expression? The conventional wisdom is that little or no serious art has been created in the medium of computer graphics during thirty plus years of experimentation. Mihai Nadin, in his article Emergent Aesthetics, states that the conflict between established art and computer art is a fight between "...that which is old, respectable, valuable, significant, progressively integrated into culture and tradition and the new promise, challenge, and hope...". (Nadin, 1989). Nadin's main thesis is that computer artists compound the struggle by trying to preserve old aesthetic forms of expression in the computer art they create.

This essay attempts to shed additional light on the acceptance problem by arguing that an empathic response to computer graphics is difficult because the craft process (how the work was made) is inherently hidden. The original meaning of the word "empathy" referred to feelings within viewers which allowed them to appreciate art. (Oremland, 1984) Our use of "empathy" as identification with the condition of another person is relatively recent. (Oremland, 1984)

Questions about how works of computer graphics are created are symptomatic of the difficulty viewers have responding empathically. When asking "how was this work made" viewers are not seeking interesting information only. They are seeking an avenue to empathic response. While people can appreciate, even if superficiality, optical realism and special effects without understanding how the effects were crafted, this essay will argue that knowledge of craft processes is a valuable aid to empathic response.

Confusion about a referent for a computer graphic work exacerbates the difficulty existent with empathic response. This essay will also argue that works of computer graphic art are self referential even if viewers think the referent is the realistic objects, events, and/or special effects portrayed.

EMAPTHY AND ART
Aesthetician Theodor Lipps explains the nature of aesthetic empathy by relating how one enjoys the art of dance.
........from my seat in the theater I observe a dance which is performed upon the stage. In this case it is impossible for me to take part in the dance........But this does not eliminate my inner activity, the striving and satisfaction I feel as I contemplate the movements enacted before me.......I experience the actual movements.......But in this lies the peculiarity of esthetic imitation, that the alien activity takes the place of one's own. (Lipps, 1903 pg. 380)
Virtually all of Lipp's examples relate to motion, including the appreciation of architectural space. He suggests that the empathic feeling of expansiveness one might experience in a great hall or cathedral might be caused by involuntary and unconscious expansion of one's chest. However he thinks that one is largely unconscious of one's own bodily states since one's attention is directed at the object of aesthetic contemplation. (Lipp, 1903)

Using Lipp's idea that aesthetic empathy can be related to motion, one could conclude that aesthetic empathy toward Jackson Pollock's "action painting" is due to one's sense of the prior motion of the artist. The artist recorded his motions in paint trailings and spatters. Pollock's bold gesture evokes empathic response. Records of gesture and media signature give clues to how the work was created. The viewer of Jackson Pollock's painting has no doubt that Jackson poured and spattered paint onto the canvas. No one would suppose that he finessed the paint with small brushes. In fact some viewers sense Jackson's actions and techniques so strongly that they believe that they could do it themselves.

One could generalize that works in which tool marks are evident suggest motion and give clues to how the works were created. Examples include carvings in which chisel marks are preserved, paintings in which brush strokes are in evidence, and drawings in which the gestural quality of the marking tool is emphasized. One can imagine ones self, almost kinetically, creating or recreating the work if one can sense the craft process. One reason the French Academic artists of the nineteenth century, Bouguereau and Gerome, are so little appreciated is that they deliberately sought to hide the craft process. Their paintings are enamel like surfaces with no visible brush strokes. Art historian John Canaday derides the work of these artists by describing their painted surfaces as slick and tight. (Canaday, 1959) Sam Hunter refers to Bouguereau's immaculate, empty style. (Hunter, 1960) No craft process is sensed. No motion is sensed. No emotion is sensed. Empathic response is not encouraged.

Even uninitiated art viewers can "read the marks" left by loaded paint brushes and carving tools because they have had experience with common tools since their childhood. For serious appreciation of art, however, even common tools need to be revisited. This author has heard educators suggest that art historians, aestheticians, and art critics might analyze and interpret works more accurately if their education had included studio course work.

When tools are uncommon, indirect and complex, viewers require even more deliberate education to understand them. The tools and methods of printmaking, as old and traditional as they are, seem to require repeated explanation. Computer graphics are one of the most complex and indirect media yet devised by man. Society is going to require a great amount of education before an empathic response to art created with these tools is possible.

Aesthetician Theodore Greene maintains that there are three aspects to appreciation and criticism of art: the historical, the recreative , and the judicial (Greene, 1940) Briefly, the historical encompasses knowledge of a factual nature. The recreative is imaginative insight into the unique aesthetic expression of the work. The judicial refers to judgements made concerning the artistic value of the work. (Greene, 1940) Knowledge of a factual nature might include knowledge of media as well as a knowledge of the life and times of the artist. Such knowledge can be taught directly and can nurture imaginative recreation. Jerome Oremland echoes Greene's concept when he states that art appreciation results from a combination of art's evocative power and the empathic intricacies and historical knowledge of the viewer. (Oremland, 1984) I believe Greene's imaginative recreation to be kin to Oremland's empathic intricacies.

The combination of historical knowledge and imaginative recreation or empathy enables one to analyze and judge works correctly. Psychologist and art historian Mary Gedo uses her empathic responses to help her complete this task. She states "I believe that the years I spent as a clinician have made it easier for me as an art historian to assume an empathic attitude toward an artist and his oeuvre - that is, to orient my perceptual stance to be within the perspective, the state of mind, of the artist whose work I am studying...."(Gedo, 1984 pg. 269)

Viewers are unable to judge computer art correctly because the prerequisites of historical knowledge, particularly knowledge about the medium, and imaginative recreation or empathic response have not been met. If one could recognize computer graphic techniques on sight one would more likely be empathic and thus be able to judge the artistic merit of works more accurately. The knowledgeable viewer could recognize differences among Lambert shading, Gouraud shading, Phong shading, ray tracing, and radiosity for example. Only then could the viewer appreciate the aesthetic mileage the artist was able to coax out of these techniques.

ART AND IT'S REFERENT

An additional problem viewers have with computer generated art is ascertaining its referent. Viewers are familiar to works that refer to landscape, portrait, etc. Works are commonly classified and named by referents. Landscape painting, portrait painting, still life painting are examples. Historically, painters have lovingly painted the visual attributes of these references and viewers who were not knowledgeable about theories of art could still appreciate the illusionistic aspect of the work because they were familiar with the referent being depicted.

Jackson Pollock's work was initially rejected because people could not find a traditional objective referent. People also rejected Pollock's bold gesture because it was severed from the illusion of sensible objects. Viewers did not initially realize that emotion could be a referent or that art itself could be a referent and that such referents might be expressed more directly through gesture and media signature than through the illusion of sensible objects. The problem was exacerbated because Pollock's gesture seemed to lack skill. The gestural quality of Pollock's work evoked such strong imaginative recreational impulses and empathy that viewers felt they could have created the works themselves. Strong empathy for the craft process without an objective referent caused uneasiness among viewers. After all, artists are supposed to create works that viewers sense they could not have created.

Realistic objective referents often found in computer graphics and animation are as misleading as the absence of objective referents were in Pollock's painting. The very fact that computer graphics can mimic the appearance of photographs causes computer graphic works to refer primarily to photographs and only secondarily to the objects depicted. An analogous situation exists in the Super Realism (also called New Realism) paintings of the 1960s. J. Patrice Marandel observes that "Today's painters' aim has changed; they cannot discover reality any longer. Their subjects are photographs..." (Marandel, 1971) Gerrit Henry stated "The Triumph of Photo Realism was, baldly and unequivocally the triumph of the technomechanical, and if artist of the persuasion had any slogan at all, it was, 'I am a camera.'" (Gerrit Henry, 1974) Things get very convoluted when viewers realize they are looking at computer graphics, not photographs. Computer graphic works become self referential; pictures of pictures as Kim Levin suggests. (Levin, 1973). The objects depicted then act only as tertiary referents.

SUMMARY

Computer graphics images give only subtle clues as to how they were crafted thus discouraging empathic responses from all but the initiated. Since most curators of art museums and directors of commercial galleries are likely to be among the uninitiated, the traditional art world cannot take seriously art created with computer graphics. Initiating the art world to computer graphics will likely take longer than the initiation period for photography because computer graphics is technically more complex and indirect than other technically based media. Photography did not become a full fledged member of the art community until fifty to seventy-five years after its invention. The problem for computer graphics is exacerbated by the rapidity with which the medium develops. Better technology and procedures are introduced into the medium at such a furious pace that even the initiated find it difficult to remain abreast of developments. Computer art and animation will likely remain in its current ambiguous position between the popular arts and the fine arts for some time to come.

References

Canaday, John (1959). Mainstreams of Modern Art. New York: Holt, Rinehart and Winston.

Gedo, M. (1984). Looking at Art from the Empathic Viewpoint. In J. LIchtenberg, M. Borstein, & D. Silver (Eds.), Empathy I (pp 267-300) The Analytic Press

Greene, T. M.(1940). The Nature and Criteria of Criticism. In M. Rader (Ed.), A Modern Book of Esthetics (pp. 460-466).Chicago: Holt, Rinehart & Winston.

Henry, G. (1974). The Silk Purse of High-style Interior Decoration. In G. Battock (Ed.), Super Realism (pp. 163-169). New York: E. P. Dutton & Co., Inc.

Hunter, Sam (1960). Modern French Painting. New York: Dell Publishing Co. Inc.

Levin, K. (1973). Malcolm Morley: Post-style Illusionism. In G. Battock (Ed.), Super Realism (pp. 170-186). New York: E. P. Dutton & Co., Inc.

Lipps, T. (1903). Empathy, Inner Imitation, and Sense-Feelings. In M. Rader (Ed.), A Modern Book of Esthetics (pp. 374-382).Chicago: Holt, Rinehart & Winston.

Marandel, J. P. (1971). The Deductive Image. In G. Battock (Ed.), Super Realism (pp. 36-48).

New York: E. P. Dutton & Co., Inc.
Nadin, M. (1989) Emergent Aesthetics-Aesthetic Issues in Computer Arts. Leonardo, Supplemental Issue, 43-48
Oremland, J. D. (1984). Empathy and Its Relation to the Appreciation of Art. In J. Lichtenberg, M. Borstein, & D. Silver (Eds.), Empathy I (pp 239-265) The Analytic Press

CREATING ABSTRACT IMAGES USING 3D SOFTWARE AND MIDI

Bruce Wands
Director of Computer Education
School of Visual Arts
209 E. 23 St.
New York, NY 10010

ABSTRACT

This paper will examine the author's image making process and, in doing so, attempt to give the reader insight into the relationship between image and sound portrayed in the work. The history of the combination of music, abstract images and animation will be discussed to give perspective on this topic. A brief description of how MIDI (Musical Instrument Digital Interface) works will be presented. The process of 3D image creation will be described. Finally, the author will outline his creative process in a step by step manner.

BACKGROUND

I would like to explain some of the reasons why I have chosen to combine music with images. My involvement with the arts began with music. As a musician, I was always fascinated by the abstract patterns I saw when I closed my eyes while playing. There seemed to be some correspondence between the visual patterns and the patterns of the notes on the fretboard of the guitar. The longer I played, the more I noticed that my approach to music became more intuitive than formal. Although classically trained, I no longer learned music from sheet music. I learned it by memorizing the patterns my hands made on the fretboard of the instrument. These patterns were formed from the chords and scales upon which a particular piece of music was built.

When I began to get involved in the visual arts, I found myself wanting to recreate these musical patterns as images. I certainly was not the first one to think this way. Walt Disney set the standard for the visualization of music with "Fantasia". My study of the film was both inspirational and frustrating. The wonderful visualization of the music was very close to what I was striving for, but its execution required a large team of artists and animators many months of intensive work. Someone who was closer to my personal vision was Oscar Fischinger. Fischinger was also a pioneer in this field. He had gained recognition for his work with abstract musical animation in Germany and was hired by Disney for a short period of time to work on "Fantasia". Fischinger's work , unlike the more literal interpretations of Disney, is based more on abstract objects and shapes. Throughout his career, he used a variety of techniques to create his work. He worked with hand drawn images, shot single-frame with a traditional film camera and cut-out shapes photographed in stop motion. Another technique he introduced was using a wax slicing machine. He would create various molds of wax, mixing colors and densities, and then photograph each sequential slice. When played back, he would have an abstract animation. His final, and longest, film involved a painting that was synchronized to music. He would paint a few strokes, photograph the canvas, paint a few strokes, etc.

Other influences included Norman McLaren, who did work with the optical portion of a film sound track and John Whitney, who created some of the first computer animated films. McLaren took a literal approach and actually photographed the soundtrack as it was optically printed on motion picture film. These images formed the basis of his film animation. John Whitney's work had a very fluid, electronic look to it. Larry Cuba also produced some films that involved computer programming and music.

Within the past several years, two developments have allowed my work to take its present form. They are MIDI and the availability of 2D and 3D animation software for the personal computer.

MIDI

MIDI (Musical Instrument Digital Interface) is a technology that has matured rapidly in recent years. In essence, MIDI gives a digital synthesizer the ability to receive and output a standardized set of musical data. This standard has revolutionized the music recording business. Virtually all professional recording studios now use MIDI. It is also affordable to the average musician. Software packages range from sequencers (recording software), to editor librarians (used to store different synthesizer sound settings), to automatic composition and notation software. Such a wide range of software has put an enormous amount of power into the hands of the musician. Now, one can improvise or allow the computer to assist with a composition or performance, and then print out sheet music of this performance all within the space of a few minutes. As part of this new technology, the typical computer functions such a cut, paste and copy can be used to edit music after it has been recorded with MIDI. The main MIDI parameters are pitch, note on, note off, duration, velocity and aftertouch. The MIDI notes are numbered from 1 to 127. Note on and Note off are listed either as a function of their musical notation, real time or in SMPTE time code notation. Duration is the numerical value of the length the note is held. Velocity and aftertouch are indicators of how hard or softly a note is started or finished, respectively.

By using sequencing software, a musician can play a MIDI instrument and have this data recorded real time. This data is displayed in a variety of ways, depending on the software. One can see musical notation, a graphical representation, or numerical notation. The reduction of these parameters to numbers and the ability of 3D modeling and animation systems to allow numerical input lead to my experimentation with integrating these two systems to produce images.

My approach has been to take this MIDI data and to use it as the basis to create abstract computer imagery. MIDI allowed me to expand my musical repertoire from guitar and bass into the realm of digital synthesizers and drum machines.

3D MODELING AND ANIMATION SOFTWARE

The maturation of the desktop publishing market and the recent emergence of multimedia has brought with it the development of many full featured and affordable 3D modeling and animation software package. Until recent years, software for 3D modeling and animation has remained too expensive for the average computer artist. Although some packages were affordable, they did not offer the features of workstation level performance. On the Macintosh platform, there are 3D packages such as Showplace, Swivel 3D Professional, Stratavision, etc. and on the IBM platform, Autodesk 3D studio is one of the more popular programs.

3D software packages allow the artist to create a camera, objects and lights in a mathematical "environment" and have the computer draw an image showing the scene with influence of the lights on the surfaces in true perspective. What this gives the artist is total control over this world. All 3D software packages have several features in common. They work within a "world space". This is a mathematically defined environment that uses the Cartesian co-ordinate system. The "world" exists in X, Y, and Z traveling a certain number of units in all directions, up, down, in and out. Within this space you create objects, surfaces, lights and a camera that eventually create an image that "looks" into this three dimensional world.

The process of image creation beings with defining an object in two dimensional space with points, lines and curves. Objects are generally defined by cross-sections, either horizontally or vertically. This two dimensional object is then given dimension by either extruding it (giving it depth), rotating it (swinging it around an axis), or wrapping a surface around a set of curves. Another method of 3D modeling is to build an object by using primitives. That is, modifying basic geometrical shapes such as a sphere, cube, cone, cylinder, etc. until they look like the object you are trying to recreate. For example, a table can be built by flattening a cube for the table top and stretching four cubes to form it's legs.

Once a object has been modeled, it is given various surface properties. These are its color, the size of its highlight, it's shininess or dullness, etc. Surfaces can also have images placed upon them by using a process called texture mapping

The object is then put into a scene that has a camera, lights and objects positioned by the operator. This scene is then rendered. Rendering is the process whereby the computer takes the three dimensional data provided by the software and converts it into a final two dimensional image with all the lighting, perspective, etc. are calculated. For animation, many still images are required. Since video runs at 30 frames per second, as many as 1800 images are needed to complete a minute of animation.

CREATIVE APPROACH

Before I describe the image making process, I would like to put forward some of my reasons for making images this way. I derive most of my creative inspiration from music. The music I write is improvisational in nature, having its roots in jazz and rock. The spontaneity of improvisation to me is a creative process. By using MIDI, this improvisation can be recorded in digital form. The parameters that I work with are note on, duration and pitch. For me, the underlying principles of rhythm, harmony and melody in music have a direct relationship to the visual elements of composition. Some of this philosophy came from the reading of Herman Hesse's "Magister Ludi", or "The Glass Bead Game". In this novel, Hesse describes an order of monks who played this game. The object of the game was to choose a mathematical formula, work of art or piece of music and find a way to relate them. I would like to present a few short selections from this book to illustrate the point:

> "The analytical study of musical values had led to the reduction of musical events to physical and mathematical formulas. ..."The visual arts soon followed suit, architecture having already led the way in establishing the links between visual art and mathematics. ..."a frame with several dozen wires on which could be strung glass beads of various sizes, shapes and colors. The wires corresponded to the lines of the musical staff, the beads to the time values of the notes, and so on. In this way he could represent with beads musical quotations or invented themes, could alter, transpose, and develop, change them and set them in counterpoint to one another."

One way to look at my work is that I am playing the glass bead game with computers, music and visual images. Although the images that I create are abstract, I want them to communicate the same message as the music that inspired them. In order to do this, the images themselves must transmit the musical components visually. The difference in the media, still images versus time-based, invisible sound does present some problems. My solution rests on a new interpretation of the data. While the music is used to construct the basic elements of the image, I do not take a literal route. Once the data has been entered into the 3D software, I let my eye take over from that point on. My goal at this stage is to create a visually pleasing image. The colors, camera view and lighting are chosen based on the visual design of the piece.

THE IMAGE MAKING PROCESS

Musical Component

The process begins with the composition of a piece of music. I compose most of my music using an electric guitar with a MIDI converter. This takes the notes played on the guitar and feeds them as MIDI data into a synthesizer. I usually first lay down a basic track which defines the overall feeling and length of the musical piece. Then, I will add additional tracks, either with MIDI or with traditional instruments to finish the composition. I work with a Macintosh computer and Performer sequencing software. The tracks are recorded into the computer as well as onto a four track audio recorder. The computer records the MIDI data, the recorder takes in the analog sound. The tracks are then mixed in stereo, effects added and the music portion of the process is completed.

Visual Component

Once the music is composed, I take the MIDI data generated by the sequencer and begin to interpret it. The main parameters that I use are note on, duration and pitch. The note on parameter gives me a point in time when that note was struck. This is the temporal element and is plotted along the Z axis. The duration is how long a particular note was held. My basic interpretation of this is the "size and shape" of the note. I use a variety of techniques to display this, from the size of the object representing the note, to the length of the object, etc. But, it is always looked at as a quantity value. The final value I look at is the pitch. Since notes are viewed as either "high" or "low", I display this value on the Y axis.

I will often use primitives to represent the musical notes. When I compose a piece of music, it has a tempo and a general feeling associated with it. If the music is strong and rhythmic in nature, I would tend to chose an angular type of primitive. If it is slow and soft, I would look to curved shapes. My choice of lighting also follows in my response to the music. Warmer tones lean towards reds and yellows; while stark, isolated sounds move toward blues and greens.

From this point on, the process is a visual one. I have the basic structure of the image entered into the database. By moving the camera to see the data from a variety of perspectives, I will eventually land on one that I like. I will enlarge or reduce the notes in relationship to each other to see what develops visually. Sometimes I will make a series of copies and contrast them against each other. I take a lot of time with surfaces and lighting before I am happy with the final result. A number of test renders are usually done before I output my final image.

CONCLUSION

Hopefully, the reader has gotten some insight into how MIDI and 3D modeling systems work and how they can be combined to create images. The computer is allowing artists to work in a variety of media through its ability to reduce all kinds of creative input into the common denominator of numbers. The ability of the computer to manipulate these numbers easily and quickly offers artists and musicians new opportunities to explore creative frontiers that have not been available before.

The artistic matrix, aesthetic considerations in the creation of non-linear expressions

by Stephen A. Wroble
Instructor, Computer Art
Schoolcraft College
Livonia, Michigan

Abstract

This paper is concerned with the aesthetic issues related to the kinds of non-linear (interactive) expressions that the computer has made possible. In such expressions the user typically interacts with the artwork by controlling the sequence in which they receive information. The artist therefore does not have full control of the medium but shares the medium with the user.

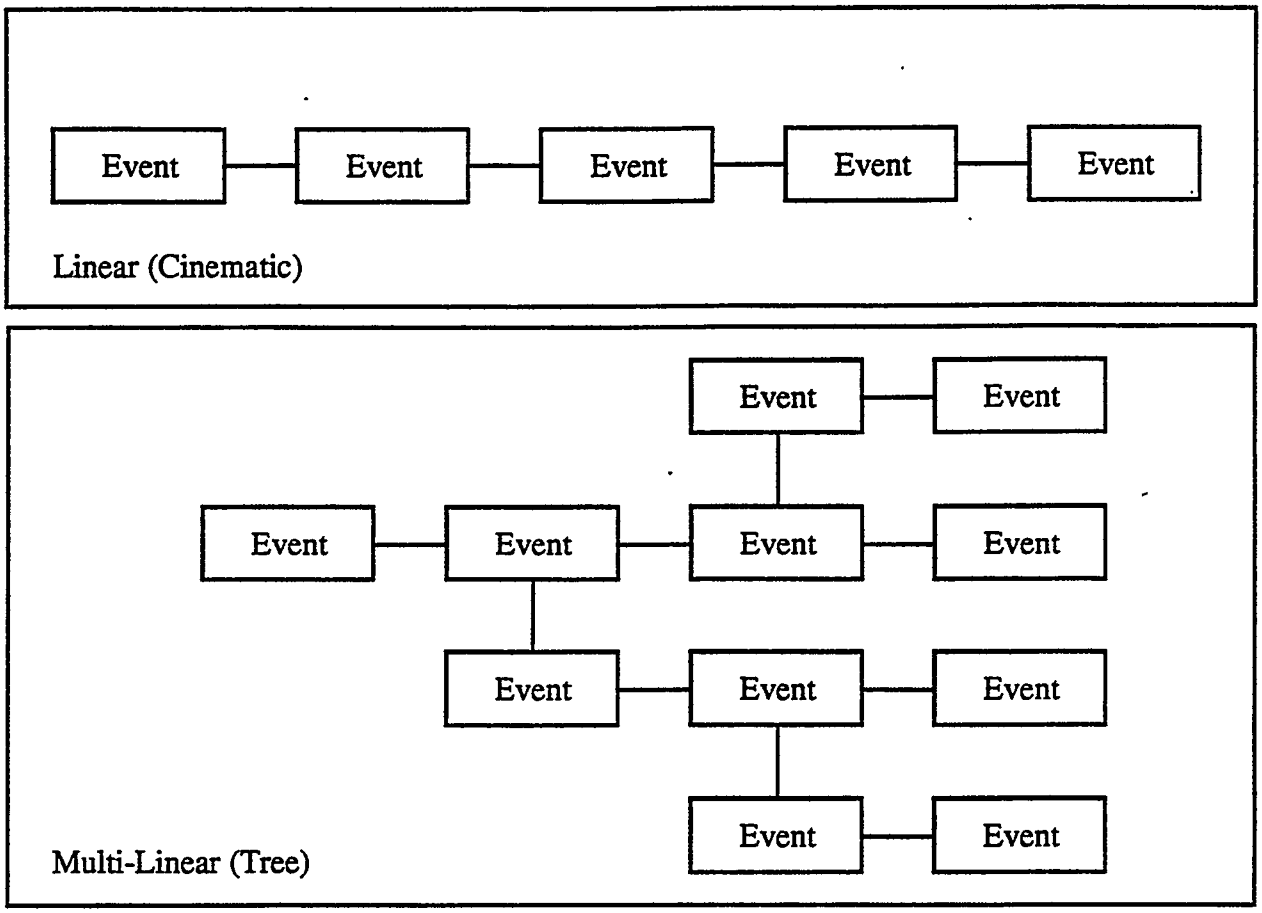
We often think of interactive computer works as a kind of user controlled cinema or literature. But traditional cinematic and literary techniques require a passive viewer who expects to be manipulated by the artist. These techniques can be applied only incompletely to an expression in which the viewer is not passive.

Yet aesthetic expressions are still possible in interactive works. A new aesthetic must be (is being) developed which acknowledges the active nature of the viewer/user as an integral part of the piece. This new aesthetic could possibly be based on the aesthetic considerations used in the creation of computer games.

Background

Three years ago, I realized that the animation I was making on my computer was not essentially different from conventional film animation. As a matter of fact, I was studying film and video techniques for ways to improve my own work. My studies of the cinema led me to the work of the Soviet Montage School and in a roundabout way, to the work of the Futurists in the early years of this century.

My work with animated words, inspired partly by Futurist typography, got me thinking about the relationship between words as symbols and words as meaning. I made the rather obvious 'discovery' that the same words in different order have different meanings(!) This in turn led to my more recent work involving the random arrangement of words and images into sequences which seem to have meaning in spite of their random arrangement. (Random sequencing approaches the technique of montage from the direction opposite that of the cinematic approach. See my paper in last year's SCAN proceedings.)



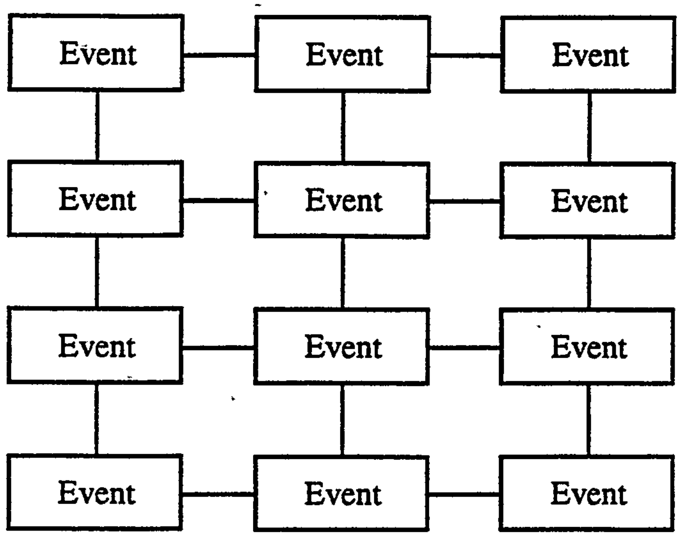
At the same time, I was concerned with the nature of computer graphics, not just as a cinematic tool but as a medium in itself. My experiments with randomness gave me enough understanding of computer processes to attempt some interactive works. I found that because of my cinematic and literary expectations, I was making interactive works that were traditional stories (linear) with branches: they were multi-linear but not non-linear. My work with random sequencing led me to believe that more was possible.

I set out to make a narrative that was truly non-linear. A true non-linear expression would allow the viewer/user complete freedom within the structure of the work. The viewer/user would be active, not just in choosing the sequence of words and images, but in forming conclusions about the meaning of the work. The viewer/user would be intellectually engaged with the work.

Linear and multi-linear expressions

Virtually all of the narratives we encounter are linear. This includes cinema as well as literature. Other, more artistic expressions are also linear, like poetry and music. We have certain expectations when we encounter such expressions. We expect, for example, that the expression will proceed in a step-by-step manner with each step building upon the last. We expect the artist to give us the expression in some ultimately understandable sequence. We expect some degree of emotional involvement, which the artist supplies by controlling the sequence. We also expect to feel some kind of satisfaction when we reach the end.

These expectations amount to an accepted perception about what these art forms ought to be. This forms the basis of our understanding of aesthetics in such expressions. We judge a work according to how well the artist



Non-Linear (Matrix)

succeeds in providing us with an understandable and/or emotional experience. We value how artfully the artist meets our expectations. (This is an oversimplified definition of aesthetics, to be sure, but it does provide a reasonable basis for this discussion.)

The processes involved in creating linear expressions are well understood. We know how to make movies, how to write literature, how to sequence events in an artistic fashion; viewers know what to expect from such expressions, and the artist is aware of the viewer's expectations. The artist's goal then is to meet those expectations as artfully and creatively as possible.

The audience expects to be passive, allowing the artist to control the expression, even allowing the artist to manipulate their emotions. The artist approaches a traditional linear expression with the assumption that the audience will be passive. These methods, unfortunately, don't necessarily apply to interactive works where the audience cannot be passive. The result is a self contradiction: the artist is trying to control the audience while giving more control to the audience.

When we model our attempts at interactivity on cinema, we end up with a linear expression that branches, or with a series of linear segments with cross-indexes. I refer to these as multi-linear expressions. To be truly non-linear, the information should be accessable in any order, in any direction.

The matrix

A true non-linear expression should be a collection of messages each with multiple connections to other messages. The viewer/user should be able to move along multiple paths in any direction and find meaning along any of them. Ideally, there should be no beginning or end to the expression, so that the viewer/user can continue or stop at will.

Although this may appear to be impossible, my work with random sequencing has convinced me that the opposite is true. However, the artist must abandon any expectations of manipulating the audience. There can be no plot as such, each viewer/user puts the story together individually as they gather information.

If diagramed, the structure would resemble a matrix rather than a tree. The viewer/user would move through the matrix in a series of circular paths rather than a line or series of line segments. In the construction of such a matrix the artist engages in issues of user interface, connectivity, and intellectual engagement, rather than issues of plot development, emotional engagement, and closure.

As far as the artist is concerned, the viewer/user is receiving the information in a random fashion. The story must be written in such a way that each message contains a single thought. The viewer/user derives meaning not from the messages themselves, but by drawing conclusions from the messages received so far. The viewer/user's understanding is likely to evolve as they move through the matrix.

Two non-linear works

The Electronic Gallery - An essay on modern art (sort of)

My first attempt at a truly interactive expression was The Electronic Gallery. I modelled this piece on a database type of application. It looks something like an informational display or a learning module for a history of art class. But the information it contains does not conform to that model.

The Electronic Gallery consists of 16 rooms featuring 29 works of Modern Art. The viewer/user can move from room to room and read the tags associated with the art by using the mouse. There are also some signs and a few surprises hidden around the gallery (sometimes attempting to move to another room will activate a message instead; walls and ceilings sometimes reveal messages as well.)

At first, the messages appear to be straight descriptions of the art, just what you would expect to find on the walls of any art gallery. The messages are quite long, by my standards, each one is a short paragraph. There is no attempt to direct the viewer/user to the next message so messages are read in a more or less random fashion.

It becomes an essay rather than a database because conclusions are drawn, and my opinions are expressed. Collectively, the messages reveal my feelings about censorship in the arts, funding for the arts, and public attitudes about modern art.

Many of the people who saw The Gallery didn't understand that the seperate text passages could be related. As a result, they saw The Gallery as a kind of funny database rather than an expression of an opinion. I believe the problem is that the seperate passages are each self contained, once the viewer/user thinks he/she understands the piece, they don't look for deeper meanings.

In my next project, I tried to overcome this problem by making each message shorter.

The Town - A non-linear narrative

The Town is a story about life in a small, midwestern town in late twentieth century America. But it's not a traditional kind of story; in fact, it may not be recognized as a story at all.

The Town consists of a scrolling map, which is an aerial view of a small town. By using the mouse to select buildings in the town, the viewer/user activates a short text display with information about the people and events associated with that building. Some passages are historical, some deal with the present. As the viewer/user collects information, connections are revealed and a picture begins to form about life in the town.

The various individuals who live in the town each have their own story. The stories are interwoven, inter-related, and interdependent, like the town itself. The story has no beginning or end, no plot, no climax, no real development at all. But there are heroes and villians, there is conflict, and sometimes, there are solutions.

I have tried to avoid any suggestion of linearity. Each passage is a single sentence. There are 27 buildings in the town with a total of 64 text passages involving eight citizens. Sentences are collected by the viewer/user in essentially a random order.

The problem has been to create a story that is interesting enough to hold the viewer/user, yet simple enough to understand. It's really more like a game than a book.

Computer games

Some of the best examples of non-linear expressions today are computer games, especially those games that deal with simulations or role playing. In these games the viewer/user makes decisions that affect the entire scenerio, it is sometimes possible to back up and correct previous choices.

Of course, a computer game is assumed to have a goal, with an implied winning or losing conclusion. But such a conclusion is not inherent in the format, it is theoretically possible to make a never-ending game. In a popular city simulation game, for example, it is possible to prolong the game for months. (I know from experience.) Such a game is more experiential than it is competitive. It ends only when you choose to stop.

A computer game is evaluated by how interesting it is and how easy it is to use. The viewer/user expects to have a great deal of control over the situation, but too much predictability makes a boring game. The viewer/user does not expect to be entertained, but they do expect to be able to entertain themselves. This is a fundamental difference between games aesthetics and cinema aesthetics. Any emotional or intellectual experience is initiated by the viewer/user. The designer only creates a structure which makes the experience possible.

Conclusions

We always approach a work of art with certain expectations. The artist begins a work with certain ideas about what art is, the viewer more-or-less shares those expectations. These expectations determine our understanding of the work and form the basis of aesthetics.

If we base our expectations about interactivity on cinema or literature, we must then preserve some degree of linearity in the work. The work will be multi-linear and, if the work is successful, the viewer/user will come away understanding the message (or one of the messages) the artist intended.

If we base our expectations on computer games, where the viewer/user expects to be active, it is then possible to be truly non-linear. If the work is successful, the viewer/user will come away with a unique understanding, depending on how extensively they travelled through the matrix.

The most well known examples of non-linear expressions today are computer games. We have a well developed understanding of what to expect from a computer game. Those expectations should form the basis of an aesthetic for interactive computer art.

MIKE MOSHER
(415) 961-4104
302 Easy St. #19
Mountain View, CA 94043
mikemosh@well.sf.ca.us

"Christopher Cumulonimbus"

The Story of a Macintosh-assisted musical performance at SCAN '91

On November 16, 1991, at SCAN '91: Eleventh Annual Small Computers and the Arts Network conference, held at the University of the Arts in Philadelphia, two collaborators and I gave the first performance of a work called "Christopher Cumulonimbus".

"Christopher Cumulonimbus" is a computer-assisted improvisational rock and poetry performance that explores the cloudlike, evanescent quality of 500 years of America's history, from European discovery to increasing virtuality and electronic (dis)simulation. The piece ran for an appropriate 500 seconds (8:20), and consisted of five short movements of 100 seconds each. The music was accompanied by fifty collage-paintings on the Macintosh in a HyperTalk-programmed HyperCard stack, alluding in scanned and manipulated images to five centuries of American and European history, each visible for ten seconds. Periodically there appeared the storm cloud motif from which the performance's title pun is drawn, timing the performance as a visual clock to signal and stimulate the musicians. The HyperCard stack thus participated as the performance's conductor and *aide-memoire*, as well as timing as a slide show of images then projected above the stage.

For the musical score of "Christopher Cumulonimbus" I played five very simple chord progressions upon a Yamaha electric keyboard, setting the mood for each of the five sections. Mike Lieber, recruited from among the conference's participants a day prior to the concert, accompanied me upon a guitar synthesizer, and the two of us ran through the five musical sections a couple times the evening before our performance, watching the HyperCard sequence proceeding upon the Macintosh.

The musical mood of the first post-Columbian century, the 1500s, is intended to be tribal, unexplored, primeval by the use of octaves playing a 4/4 progression of G Bb Eb, finally ending upon G. In the following century the mood is somewhat nautical, with the dancelike use of fifths alternating the G major and a D major chords in 3/4 time. For the next century of American history, the 18th Century is suggested in minuet-like arpeggios in G C A D. Part four, the Nineteeth Century, tis played in a somewhat country-western musical mood indicating industry, prosperity and national confidence. Finally, the energy of the Twentieth Century is embodied in a sort of Chuck Berry-like 4/4 rock n' roll progression G C G C F C G, building up to end on a heroic final G major chord.

Nancy Freeman read my libretto, a poem in five sections about each century since Columbus' discoveries, fitting the text into the time allotted for each of the five movements. She read the libretto somewhat quietly and with restrained *sotto voce*, though in future performances I could see the role filled by one or more singers improvising upon on the text. The extreme simplicity of the musical structure is intended to allow unrehearsed musicians to play in a performance and so complexity doesn't distract from the measured, stately (Byzantine?) progression of the imagery projected, nor the wordy, sometimes punning, libretto being read or sung.

Both the visual and verbal imagery for "Christopher Cumulonimbus" are eclectic. In designing a screen-sized image for each decade, I soon realized that over half of American history took place in the colonial era before the American Revolution of 1776.

Columbus himself is visible at the beginning, and a scanned photograph of a college friend represents Queen Isabella. There follow many images from European history for the next couple hundred years, for that continent was making its impact felt upon the Western Hemisphere. Martin Luther and Henry VIII of England are caricatured to represent the 1520s and 1530s, while a collage representing Nostradamus is used for the 1550s, the decade when he published his predictions. The importance of the New World to Europe is spoken of as "A woods, a jungle or a gold mine for our Faith to hide in", where "Gold is God, Gold is Good, let us thank it for our foolishness."

In the Seventeenth Century, much imagery alludes to either Spanish colonization or the natural state of the Americas, and includes the discovery of Niagara Falls and the newfound popularity of tobacco. In this age of exploration, "LaSalles and DeSotos melted down the river/Into great Cadillacs and Pontiacs". In the Eighteenth Century, a cartoon of the death of Louis XIV is shown to representi the decade of the 1710s. A few decades later "Franklin hatches schemes, fortunes, intrigues and aphorisms" and is depicted for both publishing *Poor Richard's Almanac* in the 1730s and for his kite-and-lightning experiment of the 1750s, in the second instance by scanning his image on the fifty cent piece with the Apple Scanner.

Much of the imagery for the 1700s, 1800s and early Twentieth Century are assembled from scanned advertising artwork of those centuries. "Puff a Daniel Webster ground up in my Henry Clay" accompanies a manipulation of my 1978 lithograph of Webster for the count of ten. "My best headsplitting cask of amontillado/Waylaid by a Whig desperado" alludes to the death of Edgar Allan Poe in the 1840s as Bacchic figures and spiders appear onscreen. Following the Civil War (a Black Union regiment is shown) the nation progresses through images of buffalos, railroads, the Haymarket bombings of 1888 and a brass bed germane to Margaret Sanger's birth-control campaigning.

The swiftly-changing Twentieth Century gets called "the auto-dufy Otto von Bakelite/Plastic fantasextastic age". As the pageant of the century nears the present, an irradiated mobile home for the 1950s is contrasted with '60s psychedelia, '70s sexual-ecological awareness, through portable computer-aided greed of the 1980s, finally to a realm of new digital muses and new anxieties in the present decade. The libretto raves on that "

Senator Chuck Berry buries Warhol/Each time he dies at Altamont/In not the Caves of Altimira but/The United States of the Virtual".

The HyperTalk scripting (HyperCard code on the Macintosh) to run the piece was extremely simple, largely contained within a single button on the card following the opening title card. This script consists of a series of "Go next card" and "Wait" programmed for a certain duration, usually 600 ticks (10 seconds). At the card representing the beginning of each century, the cartoonlike image of a cloud covers half the card for 5 seconds, a signal to the musicians to change to playing the next section's chord progression; for the following 5 seconds the cloud dissolves to reveal the image upon the entire card. SCAN provided a Macintosh IIci computer with an internal hard disk running HyperCard 2.0, though the stack was created in the still-more-prevalent version 1.25. The Macintosh was attached to a Barco Media Wall, which made the screen image sufficiently visible to the audience and stage though fracturing it over twelve video screens yet somewhat degraded them. The keyboard, guitar-synthesizer and microphone were all mixed and amplified through a PA system.

When employed at Apple Computer, Inc. (1987-90) my championing of HyperCard as a fine arts medium met with little comprehension within the company , but at SCAN I got the opportunity to meet several artists working with it in creative ways. Though I've performed original songs and old blues on piano since 1990 around the Bay Area under the name Mike Mayonnaise,"Christopher Cumulonimbus" is my first ambitious "rock operatic" performance piece since "Twilight of the Gymnasty" (broadcast on Ann Arbor MI public access television in early 1974), as well as my first combination of HyperCard and live music. Because my proposal for the piece had confidently suggested recruiting musicians from SCAN participants, the performance at the conference was scheduled to open the "Free Jam" session, in which it was hoped musicians and computer graphic artists would come together to improvise and inspire each other with visuals on the Barco. Perhaps because the hour followed a vigorous day of presentations and preceded evening performances, little spontaneous improvisation subsequently took place. Nevertheless, it was an honor to debut my short but ornate performance piece under the skylight roof of the Great Hall of the University of the Arts, in grand old Philadelphia, city of Franklin, Independence's Declaration and the Constitution, all of which play their part in the imagery of "Christopher Cumulonimbus".

--December, 1991

"Christopher Cumulonimbus" was subsequently performed as part of the YLEM Forum of Interactive Art at the Exploratorium, San Francisco CA, on September 2, 1992.

Libretto, "Christopher Cumulonimbus"

I. *1492-1592*

MUSICAL MOOD: Tribal. Unexplored. Primeval.
Octaves. **G Bb Eb**; end on **G** (4x).

Knights of the Roundjug Water Table
Spain must preserve in amber people just like us
No matter the cost, no matter the coarseness.
Devices of torture like the clock and the iron maidenform
Prince Henry the Navigator Comics present
People of India vs. the Cumulonauts
A woods, a jungle or a gold mine for our Faith to hide in
Gold is God, Gold is Good, let us thank it for our fooishness.

II. *1592-1692*

MUSICAL MOOD: Nautical. Religious.
Fifths. **G D G D**; **Em** in there somewhere.

I wish I were a courtier, oily and painting
To celebrate big lies and bigger women.
We are the principalities
Religious intolerance is our beneficence
This way to the Soul, egress of progress
Good Pilgrims' progeny light me a Salem
Those are the savage-ass tribes
New World Ordinarily Extraordinaire.

III. *1692-1792*

MUSICAL MOOD: Dignified.
Thirds. **G C A D.**

History c'est Bunk and le Bunkest est moi
The King is myself and I am the State and the estate
Makes me healthy, wealthy and great.
LaSalles and DeSotos melted down the river
Into great Cadillacs and Pontiacs
Franklin hatches schemes, fortunes, intrigues and aphorisms
While white Kings fall like dominoes
The Revolution will not be televised...yet!

IV. *1792-1892*

MUSICAL MOOD: Industrious. Prosperous and confident.
Country beat. **G C G D**; end on **Am**.

Constitution, retribution
England's down for the count, down and out, down by law
Homegrown industry! Banal canals
Puff a Daniel Webster ground up in my Henry Clay

Everybody's reading the New Republic tonite
My best headsplitting cask of amontillado
Waylaid by a Whig desperado
Now we are dogged by a great Civil Whore

The Edison of Software is glowing
Anarchy is authority and Labor goes insane
The Ghost Dance of High Finance
The Paul Bunyan Union will endure their dominion.

V. *1892-1992*

MUSICAL MOOD: Neotribal yet dissonant towards the end.
Berry-Rock fifths. **G C G C F C G.**

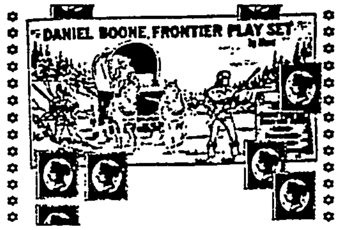
Entering the auto-dufy Otto von Bakelite
Plastic fantasextastic age!
Votes for syphillis and short-wave,
Influenzas of inflation, dance the cholera and Charleston.

Women bake, then jump out of,
The whirling cake of Democracy.
Diesel-deutsch Medieval-kraut Frankenstein,
Krupp guns sticking out of his head and Levis,

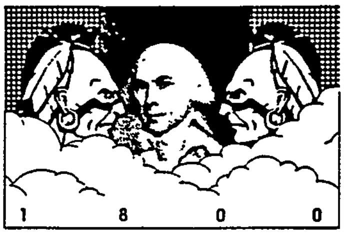
Made Americans finally cry
Hiroshima Mony Mony Mon Amour!
Senator Chuck Berry buries Warhol
Each time he dies at Altamont,

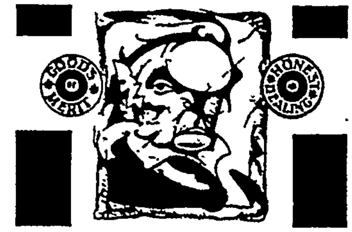
In not the Caves of Altimira but
The United States of the Virtual
Cloud on!, polychrome Mega-Christ of our
Christopher Cumulonimbus!

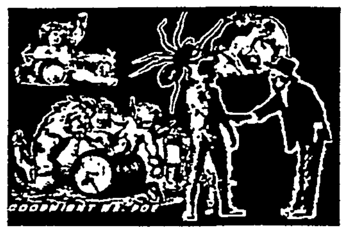

..An American History.
MOSHER
1 5 0 0
1 6 0 0
1 7 0 0

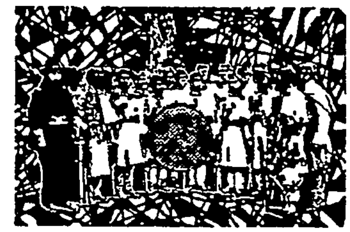

DANIEL BOONE, FRONTIER PLAY SET

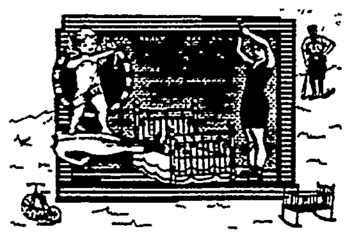
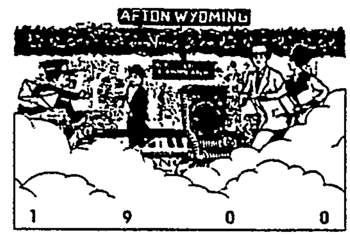


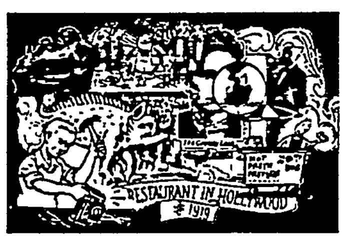

1 8 0 0

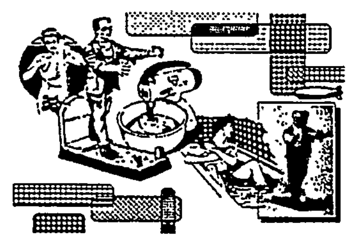
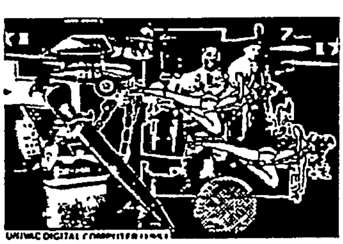



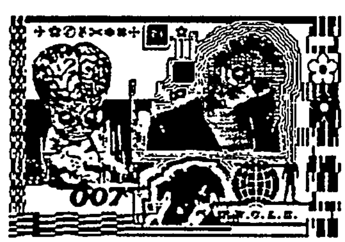




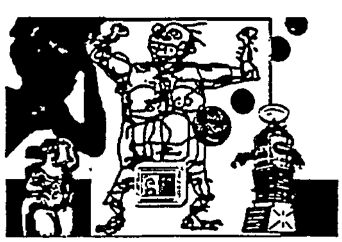
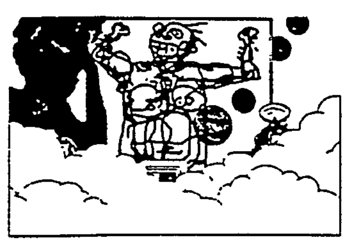



AFTON WYOMING
1 9 0 0

AFTON WYOMING

RESTAURANT IN HOLLYWOOD
1919


007

THE DISASTER THAT WASN'T
MONSTERS
OUTER LIMITS

© Mike Mosher 1991

Computers in Human Behavior, Vol. 6, pp. 223-234, 1990
Printed in the U.S.A.
0747-5632/90 $3.00 + .00

Aesthetic Considerations of the Electronic Museum and Attitudes Towards Art

Harold J. McWhinnie

University of Maryland

Abstract — *This theoretical article will briefly outline the idea of The Electronic Museum-the use of computer technology to replace the traditional form of the art museum with its emphasis on the care of precious objects with a museum of electronic images that can be exchanged throughout the world by electronic methods. It will speculate upon the influence of this new technology on the behavior and roles of: 1. Artist, 2. Speculator, 3. Art Critic, 4. Art Historian, and 5. Art Museum Director. The development of the modern microcomputer in the past decade has sparked a revolution in art, art education, and human behavior in art. Many writers in aesthetics, art criticism, and art education have not as yet addressed the psychological issues that are related to the development of new technologies in art, including the electronic image. Issues such as How do these technical innovations effect our attitudes towards the art object? and How do they effect our definitions of talent in art?*

BACKGROUND

While the use of the computer for various artistic areas has been with us since the early 1960s, the advent of the microcomputer has opened these new technologies to the artist and has brought the personal computer into virtually every art studio in SoHo or Chelsea.

In even the past several years, improvements in computer hardware (the machines themselves) and software (the programs which operate the systems), such as "The Mac II" (Apple Computer) and the PS/2 (IBM), have greatly improved the qualitative aspects of the computer image in terms of improved resolution of images on the screen (the number of pixels per square inch). Such resolution permits the image to look more like it was drawn upon paper and less

Requests for reprints should be addressed to Harold J. McWhinnie, Department of Design, Department of Curriculum and Instruction, University of Maryland, College Park, MD 20742.

like a computer drawing. This advanced screen resolution has improved the degree to which simple lines and line drawings can now be printed which look like pen and ink drawings without the telltale step like effect of the pixel, (the print of light which comprises the image), that basic structure of all computer images. The software packages which are now on the market have, like the hardware itself, greatly improved in both creative and graphic capabilities. They are easier to use, more user-friendly, and one no longer has to be a computer expert nor have access to vast computer networks to be able to use this new technology.

There are profound implications of these new directions, for not only education in the arts, but for a variety of human behavioral responses to the electronic museum.

THE ELECTRONIC MUSEUM

Several years ago, the author wrote an article about The Electronic Museum (McWhinnie, 1987). The intent of that piece was to try to show how the original idea of Andre Malraux (Malraux, 1946), that the photograph and advances at that time in color photography for art books and for slides, would allow EVERYMAN to have his own art museum on his living room coffee table. That book was published more than 40 years ago. One should pause to think what the standards for art reproductions were at the time.

The volume of art book publishing over the past 40 years has proved the Malraux thesis to be more than correct. The microcomputer, a telephone, and a videodisk player now enables EVERYMAN to not only have his own art museum with instant access to the computer screen, but will also do two things that the art book as museum does not allow for:

1. The instant collecting and exchange of images by means of the telephone line and the computer throughout the world. (Such a system is now in place on a pilot basis at Atlantic University in Florida.)
2. The continued changing and manipulation of the computer images from the videodisk. One can be their own copyist without ever leaving the studio. In Gombrich's view "art is based on art" and this would be a further extension of his basic thesis.

Up until this time, computer software, as well as the basic hardware, had not progressed to the point that quality artistic images could be produced, shared, and printed. That has all begun to change dramatically with the new generation of the microcomputer. Today, one can only predict that such changes will continue to develop. The hardcopy, the physical image itself, will lose its preciousness. Some of these aesthetic questions will have to be addressed as they have been in recent years in the general area of photography. However, the photographic image as printed from negatives can be manipulated in the darkroom by the individual artist, whereas such flexibility is not yet possible with the computer printout.

These new technical directions would seem to call for entirely new definitions of art, the art object, and the question of talent a skill as the criteria for artistic accomplishments. Within the past decade, the idea of using images from works of art to be recycled or appropriated from one artist to another has become one of the main ideas of the present post-modernism movements (Carrier, 1989). This use, exchange, as well as a modification of the artistic image, has implications for both creation and education in all areas of art and design. Graphic images can be collected and framed from many sources, books can be written with images and plates and published instantly on a photocopying.

Questions of Symmetry and Computer Art

Vera Molnar has over the past few years explored variables or randomness in the visual arts. The advent of sophisticated computer based systems for art and design graphics has enabled the artist, as well as the scientist, to explore more deeply questions of symmetry and randomness in matters of art and design. Randomness has often been confused, at least in the minds of the art critic and some aestheticians, as being associated with chaos and disorder. However, randomness has been more recently shown to be a viable approach to the use of the computer in various forms of artistic expression.

Some of the philosophical, aesthetic, and critical issues of the role of randomness in art and the challenges which systems of randomness present in modern art theory has become a critical issue in aesthetics. Also, current post-modernist trends in art and design (design since 1970) have opened the general artistic community to a new interest in questions of symmetry. There is a new openness towards a multiplicity of design strategies which was not apparent or even possible in the worlds of art and design in the modern period (pre-1970). Many of the trends and ideas in this paper have to be considered within a content of post-modern aesthetics. In one sense, randomness, the development of endless patterns, shapes, and forms from mathematical formulas, demonstrate that there is a system of order, order which can be made visible and apparent even in the use of random methods and the computer as a tool (Moles, 1959).

Molnar (1981) has observed that the choice of elements in a painter's work seems to be arbitrary, every painters' selection is a function of their artistic taste, temperament, and field of interest or school to which they are affiliated. Molnar chose to make her art out of the purest of abstract forms, simple and regular geometric shapes, privileged forms having qualities necessary for the building of valid visual artistic expressions. Her choices were, however, the result of her subjective taste, the plastic strength of geometry, and her love of the rational purity of mathematics rather than any pure formal qualities which existed outside of her experiences as an artist.

The role of the artist-designer seems to shift, the artist becomes a spectator of the events of artistic creation and design problem solving. The artist's role is to observe the problems and other visual solutions generated by the computer and select those which hold interest. In one sense, the classical role of the artist-designer as creator has been disconstructed by the post-modern critic. Those new roles are only now becoming obvious.

When the initial selection of the forms has been achieved, what are the assembly rules and the artistic procedures which the artist follows? (Chanda, Chandhuri & Majumder, 1984) One can, according to Molnar ,proceed as follows: (a) follow the classical rules of composition. (The golden section as well as other principles), (b) reject all rules, or (c) achieve a new synthesis of rules and no rules which is part of her view of the random qualities which can be added to the work.

What random systems seem to offer the artist-designer is the opportunity to achieve in that new synthesis of rules and no rules a higher order, a higher level of symmetry. One can observe in hundreds of examples a system of order that may not have been previously evident in only a few examples. (Julesz & Schumer, 1981).

The difference between the production of an artist and that of the kitsch-maker is the degree to which the artist has mastered his cultural heritage. Again for Molnar, the symbol of this double orientation of artistic creation is the Roman god Janus, having two faces, one looking forward and the other looking back towards the traditions from whence all art emerges.

Here is where computers and computer graphics systems can make the task of the artist easier; for as a tool, the computer can model and present to the artist all possible virtual pictures. For Molnar the problem becomes one of sampling and she proposes a system of ordered samples, random samples of all the possible or virtual realities of art and design solutions that were possible within the forms that her programs were creating. She also used a criteria for the selection of her random samples based upon the cannons of classical art. In other words, the synthesis which she sought between the old and the new (Molnar and Weikart, 1989).

WHAT IS FORM?

For the Molnars, the concept of form, in the broadset sense of the word, is reduced by the computer scientist to a lack of randomness within an organized set of design elements. In this way, the property of form is a negative one, the delineation of features of form that distinguish forms from randomness, or noise. In Molnar's view there are only a few instances in which pattern-recognition is treated as a human problem. Almost all recent research, such as that of Russell Kirsch, is directed towards algorithms which detect patterns instead of towards mechanisms which explain how the human sensory systems detects patterns. For Molnar, the detection of patterns seems to be at the very core of the aesthetic responses Loeb, 1971).

In a recent *Leonardo* article, the Molnars continued with the explorations of questions of form, of randomness, of noise and art. In that article their conception of form was related to both perception and to art. Art is viewed as one of the more exciting conceptions created by human consciousness. This ancient topic has received a new imputus from the research on the automated recognition of form, and area that has been closely related to questions of artificial intelligence. This new branch of research often neglects the human aspect of the problem, the capacity of the human being as a basic receptor (Hill, 1979). They also view the artist-designer as a receptors, a collector, and judge of the visual inputs created by computer-based programs and design options. Slowly, creativity in the arts has undergone a significant change. The works of the Molnars and the Kirschs suggest a very different role for creativity in the arts as we move forward to the electronic art within the present post-modern period.

Russell and Joan Kirsch (1988) have also used the capacity of the computer to view paintings and to make a variety of decisions. In a sense, they have followed up upon this same line of inquiry but seem to have worked quite independent of the knowledge of what the Molnars were doing in Paris (Green, 1957). They are pushing the limits of these new artist-spectator roles even further with the idea that the computer can be "taught" to critically look at and identify at least possible works of art. The Kirsch's asked the computer to "look at" works by Miro and Diebenkorn in terms of the rules or grammars of design employed by both artists in their work.

The basic strategy used by the Kirsches in their research was to prepare a set of algorithms based on the design principles and creative strategies both artists seemed to empty in their work. They then had the computer analysis various random patterns and configurations that had been based on the preselected grammars of design and composition (Kirsch, 1988). In a sense, their computer created or recreated new Miros or Diebenkorns according to the grammars used. They tested their results by having the artist Diebenkorn view the solutions. He confirmed that several of the computer's creations were in fact recent works of his own.

Molnar has observed the following about the perception of symmetry as a part of human information processing

> In spite of at least a century of intensive research, psychologists are still unable to link the level of perceived symmetry to the physical elements of a picture. In a statistical processing of a picture, the skewness of a one-dimensional distribution can be measured, but skewness means degrees of deviation from symmetry. So skewness measures asymmetry. The same concept may be applied to a two-dimensional distribution and the asymmetry of a shape may also be measured on a continuum. In this approach the parameter for symmetry is considered to be an analogy of the third moment of the statistical distribution of the elements. (Molnar, p. 2929)

Symmetry is one of the most indistinct of conceptions in the artistic vocabulary. For Vitruvius, symmetry consisted in the agreement of the measure between the distinct elements and the whole, which for many became a definition of the golden section. The relationships of mean and extreme ratios. For the Molnars and others, the use of the computer, creation of randomness, can produce patterns that are aesthetically pleasing, but are not examples of a mathematically defined symmetry and yet are perceived to have some of those aesthetic elements, values of order, balance, and above all proportion which one defines as being symmetrical (MacGillavry, 1976).

WORK OF MICHAEL ECKERSLEY

This brings us to the work of one artist who has quite consciously adapted the use of shape grammars and the Kirsches to produce random patterns for possible design solutions.

Professor Michael Eckersley (Figure 1) of the Design Department of the University of Maryland has explored a variation on the Molnar method. He uses algorithms to have the computer generate and to print out possible designs or solutions. He then selects, as an artist-designer, which pattern may have aesthetic interest and renders those selected patterns in a more traditional artistic media. It seems that many artists who have explored various aspects of the basic computer environment have used the machine as a part of the generative process which is subject to a personal and critical evaluation (Molnar, 1981).

SOME AESTHETIC ISSUES

More critical however are the aesthetic-critical issues which are raised with the advent of high-quality computer printouts. In an article in Leonardo (McWhinnie,

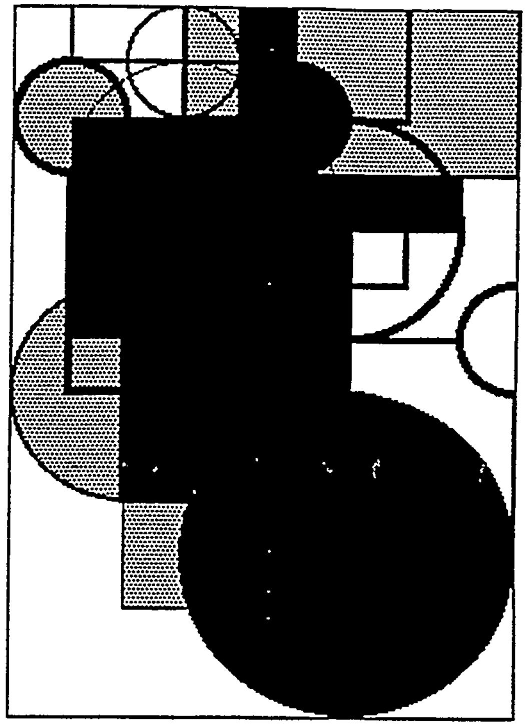


Figure 1. Michael Eckersley, *Random Patterns* (1989).

1989), this author has outlined how the computer permits a simulation of reality itself. It is able to present an abstraction of reality that has been based upon not a referent in the world, but upon an abstraction. Abstraction is based upon abstraction, upon abstraction, upon abstraction, and so forth. Abstractions, which can imitate reality, are based upon abstractions of abstractions and so forth to eternity. (Is this the black hole of art?)

Truckenbrod (1987) has observed as follows:

> Computer imagining is the intergration of computer graphics systems into the creative process. Artists absorb and assimilate the unique characteristics of computing systems and their capabilities, intuitively using them as a vehicle for visual expression. (p. 1)

In Truckenbrod's view, traditional mediums of artistic expression, such as painting and drawings, should not be used as a basis for developing the capabilities of the computer in the visual arts, but wholly new mediums should be explored for computer based systems. Her new methods tend to be lens-oriented (based on the photographic image), which are highly adaptable in the electronic universe. In her view, computer imaging as a multidimensional medium involves many possible input devices and becomes a multifaceted means of image manipulation which is not characteristic of other artistic mediums. The significant aspect of the computer imaging medium is seemingly the infinite malleability of the visual image. This malleability occurs because the computer is an multi-dimensional system.

Figure 2. Terry Gips, *Media Memory* (20 x 24 colorchrome print 1988).

Terry Gips (Figure 2) describes her use of the electronic media as follows:

> The camera is often thought of as a device for "catching" the elusive, the intangible, the changing. The vision of the moment is traced onto film and fixed for future use and reuse. It was this fixing, the putting of a selected segment of reality into memory, which definitively established photography as a discrete image-making medium 150 year ago. Photography enhanced natural memory because the original trace remained intact (if well protected) not only through the life of the recorder (photographer), but also through generations. Various interpretations and uses could belie the original, but theoretically the matrix (negative) did not "forget. (Personal Communication, 1990)

After its fixing or "remembering" power, the richest and simultaneously most problematic aspect of photography is its technology which enables facile image reproduction and distribution. With the spread of computers into artists' studios, we encounter both of these issues again—this time with expanded dimensions. On the one hand, electronic traces are far less stable and can be manipulated, reproduced and distributed much more easily than chemically formed film traces. On the other hand, the computer user can store and recall more information more quickly and more accurately than the photographer working form a notebook of negative or a stack of paper prints.

Although the idea of memory is not new to photographers, it may be found that the computer is more like mental memory than is the darkroom. For this author, the computer is becoming the new "processing" environment. In this four-dimensional space,this author experiences the maneuvering of images in much the same way one experiences the mental maneuvering of memories. The computer seems to be more than an ordinary tool, more than an extension of the hand. It feels like an extension of the mind, a mind with physical parameters, a space for image making, for thinking and remembering. The authors' current work explores this metaphoric space of the computer and its relation to memory.

Gips has been quoted at some length because her own statement shows some of those essential shifts in the thoughts of the artists towards these processes, shifts in thinking which effect the psychological understanding of the creative process as well as the effects which the computer will have upon the creative process in the future.

One major implication of the electronic universe is the question of the definition of talent in art. The use of the electronic image makes the question of hand skills somewhat mute. The creative focus has shifted to the questions of selection of already created images. The definition of artistic skill may shift from questions of manipulative skills to perceptual skills and the ability to perceive order and significant usual relationship in that multiplicity of visual forms made possible by the new technologies.

Philosopher and art critic David Carrier has also been among the few recent thinkers in the arts to address significant variables implicit in the development of the interactive videodisk as a means of instruction in art history.

Carrier (1988) argues that just as the development of the slide projector revolutionized the teaching of art history and led to the development of Heinrich Wolflin's comparative method, so does the interactive videodisk once more change some of those basic assumptions that are made in both art history and art education. Carrier has assisted in the development at Carnegie Mellon University of an interactive videodisk program which treats the work of Vermeer and of the Van Megen forgeries. The student who used this program is forced to address the

Figure 3. Harold J. McWhinnie, *Painting of Vincent's Hat*, done from computer altered slide (1988).

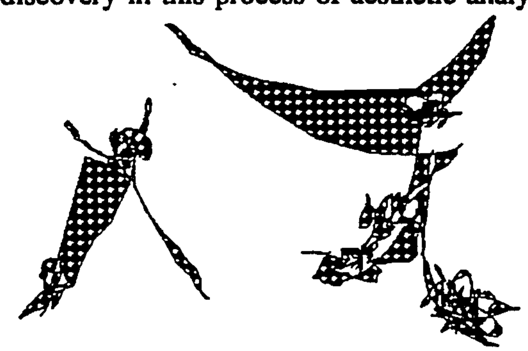
stylistic and aesthetic issues involved in the now famous Vermeer case of some years ago.

Carrier and Cavalier (1989) have reported data from their more controlled study of the use of the interactive videodisk in an educational setting. They reported data which indicated a highly positive result from the students who took part in their study. (Conference Proceeding 1989, University of Maryland Seminar).

RESEARCH METHOD

Art Analysis From Videodisks

In recent work (Figures 3, 4, 5), the author has explored the use of the interactive videodisk and the work of Vincent Van Gogh. This system allows one to call up upon the computer screen about 3,000 Van Gogh images. These images can then be copied and manipulated with a variety of computer software programs (paint and draw packages) and appropriated for creative purposes.This author has made at least one interesting discovery in this process of aesthetic analysis, that no matter



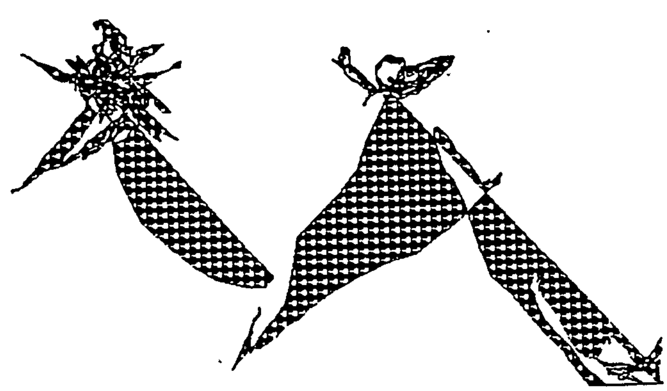


Figure 4. Harold J. McWhinnie, *Random Patterns* (Hypercard).

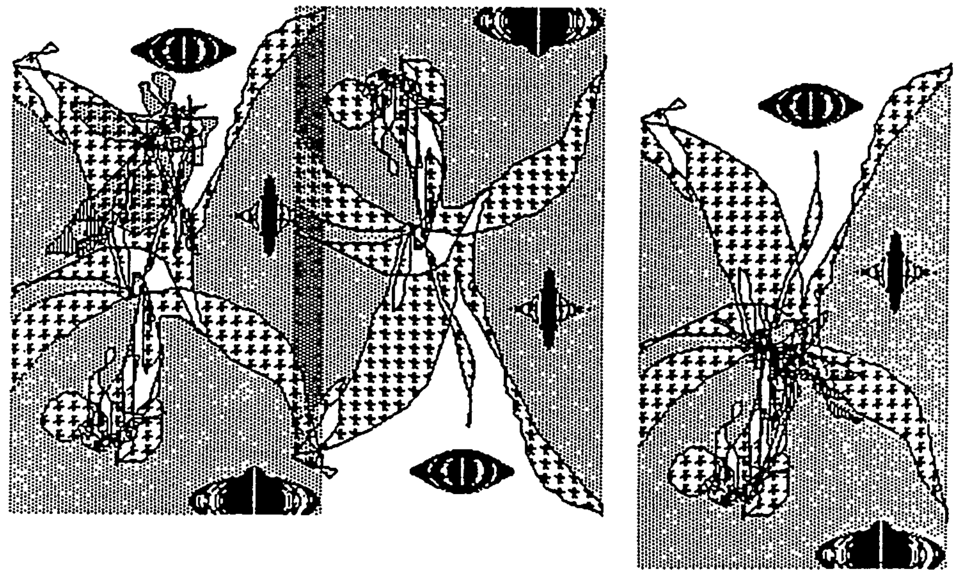


Figure 5. Harold J. McWhinnie, *Random Patterns* (Hypercard).

how much one seeks to destroy a Van Gogh image, the basic element of his shapes, not the texture of the paint, the qualities of the line, nor his colors remain as powerful linkages to the original works. It was his shapes that gave to his works a lasting impact, a lasting significance, a universal recognition. This process of deconstruction has led to a new understanding of his work and the qualities of that which he produced (McWhinnie, 1989).

This is a process in which one can select one element, in this case, the nature of the shapes, and eleminate other confronting variables such as paint, texture, color, line qualities, and so forth.

While this author has addressed issues in the visual arts and the impact of electronics on the aesthetic issues implicit in the use of the computer, much of this discussion also applies to issues in electronic music as well. Questions such as the ability to compose music without the necessary skills to play an instrument of any kind. How do we now define the museum or composer? Likewise, the visual artist is able to plan and compose his images without skill in the conventional modes of drawing and painting. These are all questions of how we now will come to define the artist, define what is artistic skill or design abilities, and how we should now educate the artist in the new age.

SUMMARY

For the art critic, the computer based electronic environment seems to pose the following questions:

1. How does one respond to the abstract (quasi-abstractions) as simulations of reality?
2. How does one respond to the appropriated images which have been employed and manipulated in the works?
3. What can a computer programed to do aesthetic analysis tell us about an artist's style, his design process, and his work in general?
4. What are the emerging roles of the art critic, the art historian, the museum director, and finally the artist in the new world of the electronic environment?

These are only some of the questions which have been touched upon in this brief article but which are deserved of separate and individual treatments. Several scholars today, such as David Carrier, Russell and Joan Kirsch, and Joan Truckenbrod seem to be addressing these aesthetic-critical concerns which have been stimulated by new technologies in computer-based artistic mediums. There is a need to move away from the purely technical when discussing the electronic artistic environment and to become more involved with some of the aesthetic and the conceptual questions that have been poised by these new and every growing technologies.

If some are beginning to consider the philosophical issues arising from the electronic universe, what about the behavioral and the psychological issues? What are the range of psychological and educational studies which could develop from these new directions.

Will our aesthetic critical categories be sufficiently honed to the new technologies to be able to critically address the significant questions now poised for the creative artist and the designer? Several scholars today, such as David Carrier, Russell Kirsch, and Joan Truckenbrod seem to be addressing these aesthetic-critical concerns. There is a need to move away from the purely technical when discussing the computer environment and some of the conceptual questions probably by this new technology.

REFERENCES

Carrier, D. (1989). Technology and the teaching of art history. *Leonardo*, Fall.

Chanda, B., Chanduri, B.B., & Majumder, D. Dutta. (1984). Some algorithms for image enhancement incorporating human visual response. *Pattern Recognition*, 4, 423-428.

Green, B.F. (1957). The use of high speed digital computers in study of form perception. *Form discrimination related to military problems*. Washington, DC.

Hill, A. (1979). A view of non-figurative art and mathematics and an analysis of a structural relief. *Visual art mathematics and computers*. Elmsford, NY: Pergamon Press.

Julesz, B. (1971). *Foundation of cyclopean perception*. Chicago: University of Chicago Press.

Julesz, B., & Schumer, A. (1981). Early visual perception. *Ann. Rev. Psychol*, 32, 575-627.

Kirsch, R., & J. (1988). A computer looks at Diebenkorn's work. *Leonardo*, Fall.

Loeb, A.I. (1971). *Color and symmetry*. New York: Wiley and Sons.

MacGillavry, C. H. (1976). *Symmetry aspects for Escher's periodic drawings*. Bohn: Utrecht.

McWhinnie, H. J. (1987). The electronic museum. *Computer and Graphics*, Fall.

McWhinnie, H. J. (1989). Aesthetic vs. simulation. *Leonardo*, Fall.

McWhinnie, H. J. (1989). Analysis of Van Gogh. *Proceedings NECC, Boston Conference.*

Moles, A. (1959). *Information theory and aesthetic perception.* Urbana, IL: University of Illinois Press.

Molnar, F., & V. Noise, form, art. *Leonardo,* 1, 15-20.

Molnar, F., & Weikart, C. (1989). Fourier analysis as a tool for aesthetics research. Unpublished manuscript.

Molnar, V. (1981). The role of randomness can play in visual art. *Computer Arts Society Quarterly,* January.

Truckenbrod, J. (1987). *Creative computer techniques.* New York: Reinhold.

TV IS AS MASS MEDIA AS SEX[1]

"as collage technique replaced oil paint, the cathode ray tube will replace the canvas"[2]

Twenty years ago Hilton Kramer dismissed Nam June Paik's proclamations about new applications for video asserting, ""Mr. Paik's pronouncements abound in exaggerated promises his art shows no evidence of keeping."[3] Paik's 1982 retrospective at the Whitney Museum of American Art rightfully established Paik as the pioneer and master of video art. And now, the videosphere heralded by McLuhan and Youngblood, and promoted by Paik has come of age. It has been nearly thirty years since Paik predicted that the cathode ray tube would replace the canvas. Slowly but steadily during the last two decades, video art has gained a foothold in popular culture; establishing itself in gallery and museum collections around the world. While video gained ground in the art world, wide ranging advances were taking place in the field of visual technology and graphics. Recent technical innovations in electronic visual imaging and in data transmission have been momentous. At this very moment, the video revolution which Nam June Paik spoke of with such far-sighted optimism is crashing around us like a breaking wave. This wave's momentum received its strongest shove from Paik.

The interactive electronic canvas demonstrated this year by the International Painting Interactive at SIGGRAPH lives up to Paik's wildest imaginings. An "electronic exquisite corpse,"[4] IPI's interactive electronic canvas is not the only of Paik's prophesies which has found its way to today's electronic consumer market. A thin, wall-mounted color monitor which mounts on the wall, and a video-telephone which plugs into a standard telephone jack are on the market as well. There is also the CD-I, or Compact Disc Interactive, by Philips Consumer Electronics. A compact disc interface for your home television set, CD-I offers, according to one enthusiastic review, a "portal to the world."[5] Just as Paik had hoped, the video innovations which he looked to forward and himself helped to create (with the video synthesizer) are now filtering from the field of high technology into our own offices, homes and living rooms.

One needs only to peruse current consumer electronic and computer magazines, to tell that Paik's electronic visions have become mainstream. Even the artist himself has become mainstream, as evidenced by ads which harken back to his formerly fantastic sounding visions:

> *My electronic canvas can be as precise as Leonardo; as free as Picasso; as profound as Renoir; as violent as Pollack and as lyrical as Jasper Johns.*
>
> High master in video art - Nam June Paik...Samsung products are used as his electronic canvas.[6]

Not surprisingly, many of the individuals responsible for recent video and electronic imaging innovations, including Stephanie Slade of IPI, share the visions of thinkers like Paik, McLuhan and Youngblood.

> *The real issue implied in art and technology is not to make another scientific toy, but to humanize technology and the electronic medium.*[7]

Paik's attitude toward the medium was shaped by Marshall McLuhan, Norbert Wiener, and Buckminister Fuller, who believed that technology would radically and hopefully positively alter the world. As these media thinkers predicted, television has indeed become the central component of 20th-century culture. Paik's video career began his intention to subvert entrenched social values by using television as an aesthetic medium thus promoting new ways of thinking about it.

> *Using all kind of electronic riddles, still I hope to retain the "classical scorn" of artist toward the present society.*[8]

In 1969 Paik premiered Participation TV and TV Bra for Living Sculpture in the show "TV as a Creative Medium," at the Howard Wise Gallery. The show's success revealed the potential for television as a new art, and led the way for subsequent artists to use television as means of artistic and philosophic expression. Paik, like his mentors McLuhan and Wiener, came to believe early on that the power of medium was both destructive and creative. Now, in the 1990's, no one can dispute that television has affected a global change. Pioneering video, Paik set out to fulfill Wiener's observation that "the most fruitful areas for the growth of the sciences were those ... neglected as no man's land between the various fields." To this Paik replied,

> *Research into the boundary regions between the various fields and complex problem of interfacing these different elements, such as music and visual art, hardware and software, electronics and humanities in classical sense...this has been my major task since 1958....*[9]

VIDEO PAINT SYSTEM--

> I *have treated the cathode ray tube as a canvas, and proved that it can be a superior canvas.*[10]

In 1970 Nam June Paik and Shuya Abe created the video synthesizer-- an electronic "palette" of luminous light and color, so that artists could have access to the processes which were previously available only at large production studios. As many as seven black and white cameras could be used as inputs, to which any quantity or quality of color could be added, and the images manipulated and distorted. Paik found the video medium "vastly superior" to that of painting, stating in characteristic fashion, "*The color is much more vivid and the programming is much easier.*"[11] That same year he shared his video synthesizer with the public-- in Video Commune, a 4- hour live broadcast at WGBH in Boston, during which Paik invited people off the street to come into the studio and manipulate the synthesizer. IPI's video canvas at Siggraph in July demonstrated a further realization of the video commune.

ELECTRONIC EXQUISITE CORPS

I am confident that the introduction of the computer to this already well proven area will bring immediate success.[12]

At the SIGGRAPH Art Show (the 19th annual international conference on computer graphics and interactive techniques),in Chicago, July 25-31 1992, Paik's visions of a electronic global village and an electronic canvas accessible to the public was fully realized by a video paint project called International Painting Interactive. IPI, the creation of Stephanie Slade of Slade Corporation, was a globally linked, video "exquisite corps."[13] Comprised of artists worldwide linked though a network of computers to an electronic canvas (or video wall), IPI was a live creation, constantly changing as each new site joined in the international collaboration.

IPI in Chicago linked over 100 artists by computer networks at 14 sites, including colleges and universities, and sites all over the world. Computer stations in cities such as Los Angeles, New York, Boston, Chicago, and at universities including the University of Santa Cruz, NYU School of Graphics, the University of Montreal, and Victoria,-- were all routed onto the video wall from a control room. The artists interacted with pre-recorded video, music, and a digital replay of previously stored paintings. As they worked, the artists could see the interactive painting as it progressed on the Chicago video wall on their own computer screens. A second wall in Philadelphia, at the Franklin Museum of Science, displayed the work in progress.

Communication means two-way communications.[14]

With the same fundamental tools which Paik utilized in his video art in the late fifties-- pixels, electrons and light, artists painted on their screen using a custom software paint package and Silicon Graphics machines. Network specialists aided computer graphics engineers in interneting computer labs via ISDN-- Integrated Service Digital Network, phone lines and modems to the 14-monitor video wall. Because of the interactive nature of routing of the images simultaneously from the remote sites to the video wall, no one could predict the outcome at any given moment.

Variability and indeterminism is underdeveloped in optical art....[15]

According to IPI Artist Coordinating Director Victoria Vesna, collaboration superceded ego in this project. Some of the individuals contacted to participate in the exhibition declined because they wanted their image displayed on the entire screen or didn't want others to interact with, i.e. change or manipulate their work.[16] No longer isolated at a single work station, IPI provided artists with a two-way link and direct keyboard dialog with painting colleagues world wide.

I always overwhelmed by my engineering. My TV's are more the artist than I am.[17]

Like Paik, IPI creator and executive producer Stephanie Slade has other farsighted, high-tech, globally conscious ideas as well. Indeed, if she has her way, McLuhan and Youngblood's "electronic global village" will move from the realm of idea to the realm of reality. Among Slade's goals are the creation of an artists' network, and a worldwide resource bank (ANI-- Art Net International and ARNI-- Art Resource Net International). She believes that these organizations will promote a philosophy of humanism and creative freedom. Slade sees many advantages to the electronic medium. Computer systems such as those utilized by IPI will enable artists to create beyond the physical boundaries of their primary location. Working with computers allows artists free experimentation, and enables them to save all their ideas without destroying any of them. To those working in such a fashion, technology would not be viewed as a controlling factor, but as a new freedom. Says Slade:

"New technologies create new freedoms, and creativity wants to be free."[18]

Paik and Slade agree with McLuhan that artists pick up the message of culture and technological challenge long before its transformational impact takes place. Together, their work and ideas form a continuum in the evolution of media art and theory.

In 1984, Paik predicted that a large, very thin TV screen would soon be available to artists.

Then video art can be part of oil painting's culture."[19]

The July/August 1991 issue of <u>New Media</u> announced the arrival of just such a monitor. The 8.6-inch liquid crystal monitors, marketed by Sharp Corporation in Japan as the "Liquid Crystal Museum" are only 2.75-inches thick and are meant to hang on the wall. While Paik's sculptural installations introduced the public to new ways of viewing television, by treating the television as an object, these monitors may represent the quintessential "television as object." In fact, Sharp is marketing the monitors as pieces of decorative art. Three basic styles are available: the stream-line, stand alone Crystal model; the art models, which come in picture frames and resemble wall mounted paintings; and the Objet models, which resemble modern masterpieces. The 456-pixel by 960-pixel display uses Sharp's thin-film transistor technology and a double-speed scanning system to produce a clearer, higher-contrast image than previous LCD televisions. A compact dedicated tuner that receives UHF,VHF, and broadcast satellite is also available. It is 1.2-inches thick and can be mounted on back of the television. Sharp is currently working on a 14-inch model of the flat-panel liquid crystal television.[20] If these are successful, televisions may become more even more ubiquitous. None of these advances would surprise Paik. For he sees still more to come:

> *Paintings in the next century will most likely be electronic wall papers which can be programmed to be very complicated or very simple. There will be standardized electronic canvases so that if you want to show your paintings in Iceland of the Republic of the Congo you would just mail your program card. The card would be inserted and the canvas would light up from behind.*[21]

VIDEOPHONE

> *As a responsible citizen, I am very worried about the moral consequences of the picture telephone...the picturephone will undoubtedly soar the sales and spur the design of gorgeous negligees....*[22]

In 1965 AT&T unveiled its Picturephone at the New York World's Fair. It has taken all the intervening time for a practical model to reach the consumer market. In the 1980's Sony and Mitsubishi introduced inexpensive plug-in-the- wall videophones, but these could only send black and white images, and conversation had to be suspended during transmission. Videoconferencing became part of corporate culture in the last decade, but still it required special networks and expensive equipment.

AT&T has finally removed all such obstacles with the introduction this year of the VideoPhone 2500. An ordinary looking business phone, it plugs into any standard phone jack. A flip-up video screen displays a live picture of the person at the other end of the call, while a video button allows either party to block use of video screen at any time. The VideoPhone uses a high speed modem, that transmits information across existing phone lines. Video images can use 92 million bits per second, but AT&T's VideoPhone makes use of "codec," a device which marks significant innovation in data compression. Built into each VideoPhone, Codec processes only the parts of the image that change from instant to instant. It does not transmit the data for a given block if the image in the block hasn't changed from one frame to the next, but instead keeps the same image on the screen until it changes. If the small changes take place such as one's lips moving, then codec sends just the difference between the previous and latter image. A major change in the block is recoded entirely, and the new image completely replaces the old. This process of scanning blocks of information for changes reduces the number of images captured by the system from thirty frames per second to ten. Together with a 3.3-inch TV screen which requires fewer pixels to create the image, the signal is compressed from 92 million bits per second to just 11,200 pits per second. This number is a manageable sum for existing phone lines which can handle 19,000 bits per second.

Years before 900-numbers Paik posited,

> *But what happens if there is a professional good-night service, which has a staff of buxomy blondes, doing picturephone answering service?*[23]

CD-I--

> *TELEVISION HAS BEEN ATTACKING US ALL OUR LIVES, NOW WE CAN ATTACK IT BACK.*[24]

When he created the video synthesizer in 1970 with Shuya Abe, Paik imagined that it could be made available for the individual to use in their own home as a participation/creation instrument,

> *using his increased leisure to transform his TV set from passive pastime to active creation.*25

A new multi-media system developed by Phillips Electronics, called CD-I, gives the home television viewer powers which radically alter the normal viewer-television relationship.

CD-I, or compact disc interactive, evolved out of the tremendous success of the digital compact audio disc which was introduced by Philips in 1982. Convinced that viewers should control their own viewing experiences, Harry Lakerveld, leader of the Philips CD-I development team, says CD-I was the logical next step. The CD-I unit resembles typical home audio CD player and the discs are identical in size and appearance to standard five-inch audio CD's. Hooked up to the television set, the CD-I player generates full-color digital video, animation sequences, graphics, detailed still images and volumes of text. Maneuvering through CD-I program discs with a small joystick and simple point and click controls, the use makes selections with an onscreen cursor. Using digital data compression, Philips is able to offer wealth choices on a single disc, including interactive games, sports reference, self-enrichment, how-to, and children's programs.[26]

Presently, Philips Electronics and GTE ImagiTrek are developing a technology that would enable the CD-I system to interact with broadcast television. Sending data and trigger signals along with the video signal, the system will allow viewers to simultaneously display related information such as sports statistics from a CD-I disc onscreen.[27]

Paik once stated his goal as:

To create not cybernated art...but art for cybernated life.[28]

As the many innovations discussed above illustrate, we now live in a global cyber-culture. Douglas Davis wrote in his 1973 book Art and the Future, "Time and time again [Paik] has grasped the implication of this or that technological breakthrough long before his colleagues. The more time passes the more this side of Paik will be seen."[29] Paik, for his part hoped,

When I am old, I will be happy if I'm given the title of being the guy who game meaning to technological progress.[30]

At age sixty, it can be debated as to whether or not Paik is now "old." Certainly there is no question that he deserves his "title." And according to Paik, what can we look forward to next?

I am tired of TV now, TV is passe. Next comes the direct contact of electrodes to the brain cells, leading to electronic Zen.[31]

Notes

[2v1 Paik, 1968-1970, Judson Rosebush, ed., Nam June Paik: Videa 'n' Videology 1959-1973 (Syracuse, NY: Everson Museum of Art, 1973) n.p.

2 Nam June Paik, "Electronic Video Synthesizer", 1965, Rosebush n.p.

3 Hilton Kramer, quoted in D.C Denison, "Video Art's Guru," New York Times Magazine 25 April, 1982: 54.

4 John Webster, "A Multiple-Monitor, Audio/Visual Monster," SIGGRAPH 92, Thursday, July 30, 1992: 1.

5 Unleashing the Power of Television Discover, October, 1992: 50.

6 New Media, July/August 1991: n.p.

7 Paik in Gene Youngblood, Expanded Cinema. New York: E.P Dutton, 1970: 308.

8 Rosebush n.p.

9 Rosebush n.p

10 Rosebush n.p.

11 Nancy Miller, The Color of Time: Video Sculpture by Nam June Paik (Waltham, MA: Rose Art Museum, Brandeis University, 1984: n.p.

12 Rosebush n.p.

13 International Painting Interactive, A Program of Vietnam Veterans Video and The S.L.A.D.E Corp. (S.L.A.D.E.--"Special logos, Animations and Digital Effects")

14 Sonsbeek (catalogue), 1971, in Rosebush n.p.

15 Paik, "Electronic Video Synthesizer", 1965, Rosebush n.p.

16 Webster 2-3.

17 Douglas Davis, Art and the Future (New York: E.P. Dutton, 1973) 152.

18 Beth Anderson, "Conversation with Stephanie Slade," Videography, July 1988: 122- 127.

19 Miller n.p.

20 Michael Gilmore, "New Sharp TVs Aim for Museumlike Ambience," New Media, July/August 1991: 16.

21 Nam June Paik, "Random Access Information, Artforum, June 1976: 5.

22 Jud Yalkut, "Art and Technology of Nam June Paik," Arts Magazine April 1968: 51.

23 Yalkut 51.

24 Youngblood 302.

25 "Projects for Electronic Television," a letter written to the New School of Social Research, published in Rosebush n.p.

26 "Unleashing the Power of Television," Discover, October, 1992: 51.

27 Simon Loe. " Two Pair TV with CD-I," Electronic Engineering Times, 4 May 1992: 16.

28 Davis 152.

29 Davis 147.

30 Debra Weiner, "Test-Tube Television," American Film, March 1979: 33.

31 John S. Margolies, "TV-- The Next Medium," Art in America Sept./Oct. 1969: 49.

Bibliography

Anderson, Beth. "Conversation with Stephanie Slade," Videography July 1988: 122- 127.

Davis, Douglas. Art and the Future New York: E.P. Dutton, 1973.

Denison, D.C. "Video Art's Guru," New York Times Magazine 25 April, 1982: 54-63.

Duda Design, Inc. International Painting Interactive catalogue, 1992.

Gilmore, Michael. "New Sharp TVs Aim for Museumlike Ambience," New Media July/August 1991: 16.

Loe, Simon. " Two Pair TV with CD-I," Electronic Engineering Times 4 May 1992: 16.

Margolies, John S. "TV-- The Next Medium," Art in America Sept./Oct. 1969: 49.

Miller, Nancy. The Color of Time: Video Sculpture by Nam June Paik Waltham, MA: Rose Art Museum, Brandeis University, 1984.

Paik, Nam June. "Random Access Information, Artforum June 1976: 5.

Rohrbough, Linda. "CES: AT&T color picture Videophone an Instant Hit," Newsbytes 13 January 1992: n,p..

Rosebush, Judson, ed. Nam June Paik: Videa 'n' Videology 1959-1973 Syracuse, NY: Everson Museum of Art, 1973.

Tarn, Monroe. "Hear me, see me," Desktop Communications March-April 1992: 28.

"Unleashing the Power of Television Discover October, 1992: 50-51.

"The Videophone, Finally," Discover October, 1992: 42- 43

Webster,John. "A Multiple-Monitor, Audio/Visual Monster," SIGGRAPH 92 Thursday, July 30, 1992: 1,3,26.

Weiner, Debra. "Test-Tube Television," American Film March 1979: 33.

Yalkut, Jud. "Art and Technology of Nam June Paik," Arts Magazine April 1968: 50-51.

Youngblood, Gene. Expanded Cinema New York: E.P Dutton, 1970.

SCAN '92
ART SHOW
CATALOG

November 5th - November 20th, 1992

The Franklin Institute Science Museum

Omniverse Theater Exit Hall, Third Floor

Allen Cosgrove, Curator

1
Tim Anderson
Cambridge, MA
"Anthromorph"
Acrylic on linen
VanGogo, Mac, PC
Max, Doodler
$750

2
H. Lind Babcock
W. Lafayette, IN
"Myths of the Southeastern Indians: A Visual Telling of Tales"
Book Arts
Mac II, Colorscript Too, Canon Color Copier
Photoshop, Freehand, Pagemaker
NFS

3
Les Barta
Incline Village, NV
"Service Station Flower"
Cibachrome print, Photoconstruction
Mac IIci
Adobe Photoshop 2.0
$430

4
Paul Berube
Pelham, MA
"L.A. Law"
Graphite, Acrylic, Wax Pencil, Gold Leaf on Computer Print
Atari Mega 4
Degas Elite, Spectrum
$200

5
Steve Bradley
New Rochelle, NY
"Live"
Laser Print on Rives BFK Paper, Hand Colored
Mac IIsi, ProViz, VCR
Adobe Photoshop
$200

6
Ronald R. Brown
Upper Black Eddy, PA
"Tour de Four I"
Wood
IBM Compatible 386, VGA
Splash (for 2D design)
$300

7
Allen Cosgrove
Belle Mead, NJ
"Listen to my Heartbeat"
Thermal Transfer Print
IBM 486, ATVISTA
TOPAS, QFX, Sable
$250

8
Roger Dade
Bournemouth Dorset, United Kingman
"The Call of the Piper (2)"
Silkscreen
Quantel Classic Digital Paintbox
$2000

9
Andy Deck
New York, NY
"Mercifully Cheesier"
Laser Print
Mac FX
Aldus Superpaint
$75

10
Stewart Dickson
Represented by the Williams Gallery
Princeton, NJ
"Enneper's Minimal Surface"
Inkjet on Arches Paper
Sun 3-160, Iris inkjet Printer
Mathematica

11
Diane Fenster
Pacifica, CA
"Day Eight/Hour of the Wolf"
Fujichrome Print
Mac fx, Quickimage frame grabber, Applescanner, Canon Xapshot Camera, Solitaire Film Recorder
Adobe Photoshop 2.01
$1200

12
Kevin Gallup, Norfolk, VA;
Koos Verhoff,Netherlands;
Anton Baker, France
"Brother (1,6 Path about a Torus)"
Bronze
Apple
Pascal
$5,000

13
Rachel Gellman
New York, NY
"Bulls for Goya III"
Photo
Mac
Photoshop
$200

14
Darcy Gerbarg
Grahamsville, NY
"Icefloat"
Mac II, Nuvista, Dunn Camera
Photoshop
$3,000

15
Bob Hall
Los Gatos, CA
"Teletree"
Mixed Media, Electronics

16
K. Nelson Harper
Philadelphia, PA
"Volkswagon Trilogy"
Thermal Transfer Print
Zenith 286
Lumena
NFS

17
Kathleen Hastings-D'Amico
Philadelphia, PA
"Transcendental"
Inkjet Print
Mac IIci, Microtek Scanner, Deskwriter
Digital Darkroom 2.0 Aldus Super Paint
$225

18
Richard Helmick
Columbia, MO
"Dead Roach"
Digital Plotter Drawing
Mac II
BASIC Program by the Artist
NFS

19
Pat Hill-Cresson
Franklin Park, NJ
Arizona Landscape
Lumena and TIPS
IBM 386, TARGA
$250

20
Chris Holzer
Randolph, NJ
"#38, 1991"
Phototransparency on Lightbox
Mac IIcx
Pixel Paint Professional
$2000

21
Robert Kendall
Cranford, NJ
"Softpoetry"
386, VGA, MIDI Interface, Synthesizer
Custom Software

22
William W. Leete
Wakefield, RI
"4192HR (Untitled)"
Inkjet Print
Amiga 2000, Xerox 4020 Inkjet Printer
Analytic Art, Deluxe Paint IV, Deluxe Photolab
$400

23
John Meza
Grand Rapids, MI
"Ellan at the Peabody"

24
Mike Mosher
Mountainview, CA
"Jr. High Series"
Cibachrome

25
Patrick Murphey
Williamsport, PA
"Pens & Snails"
Computer image transferred to drawing paper, gesso, airbrush, color pencils, graphite, collage
$450

26
Barbara Nessim
New York, NY
"How to Separate an Egg/Who is My Mother?"
Mac II
Macpaint, Quark
$2,000

27
Carrie Nixon-Wood
Cincinnati, OH
"The Resurrection of Aunt Carol II"
Thermal Transfer Print, Caravaggio Reproduction, Birch Plywood, Acrylic
IBM 286, TARGA 16, Mitsubishi G650
TIPS, RIO

28
Jeffery Otto
Glenside, PA
"Claude"
Inkjet Print
286, Artist Realvision 16E, TARGA 16,
TIPS, RIO
NFS

29
Jane Petrillo
Williston, VT
"Resonance II"
Inkjet Print
Microdynamics
Lumena
NFS

30
Lynn Pocock-Williams
Clifton, NJ
"A Certain Uncertainty"
Video
Amiga 500
Software written by the artist

31
Richard G. Ramsdell
Sarasota, FL
"Eve"
Photographic print
Mac
Photoshop
NFS

32
Tony Robbin
Represented by the Williams Gallery
Princeton, NJ
"Q-Sphere"
Sterling Silver model
IBM AT
Software written by the artist
$4,000

33
Jeri Robinson
Lancaster, PA
Offset Lithographic Artist's Book
Mac
Aldus Freehand

34
Karin Schminke
Woodland Hills, CA
"Sycamore"
Inkjet Print
Amiga Digiview, Mac II
Digiview, Photoshop
$250

35
George K. Shortess
Bethlehem, PA
"Edges Eyes"
Compaq 386, TARGA 16
TIPS
$139.95

36
Brian Taylor
San Jose, CA
"Then and Now #1"
Print
Nikon Slide scanner, Mac FX, Kodak XL 7700 Printer
Photoshop
$100

37
Joan Truckenbrod
Represented by the Williams Gallery
Princeton, NJ
"Sociotecture".
Cibachrome
IBM PC & Mac
Lumena
$450

38
Anna Ursyn
Laramie, WY
"Two Moons"
Photoprint
VAX 8800
IGL
$250

39
Kathleen Van Voorst
St. Clairsville, OH
"3-4-7 in Polychrome"
Photo of Quilted Cotton
Design output by HP Plotter
Software written by the artist

40
Eleanore Welles
Princeton, NJ
"Kaleidoscope"
Tandy 1000-TX
Software written in "C" by the Artist
$1225

41
Kulruedee Wongpakdee
Brooklyn, NY
"An Unchanging Step"
Photographic Print
Silicon Graphics
Alias
$300

42
Richard Wright
Cherry Hill, NJ
"Irreal van Gogh"
Photoprint
Mac IIci
Infini-D 2.0
$285

43
Walter Wright
Indianapolis, IN
Untitled
Cibachrome
IBM, ATVISTA
Beelzebrush
$250

44
Judith Yourman
St. Paul, MN
"Leona Descending a Staircase" series
Color Laser Print
Mac IIsi, NuVISTA
Macromind Director, Photoshop
$500

AUTHOR INDEX