COMPUTERS AND THE VISUAL ARTS: A RETROSPECTIVE VIEW

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While working as a research scientist at Bell Telephone Laboratories, Murray Hill, NJ, A. Michael Noll helped to pioneer the creation of computer-assisted art work during the 1960s. He exhibited his work in the first American and international expositions of computer graphics. He has published proposals for and critiques of the new aesthetic dimensions offered by computer graphics in many visual, art, dance, aesthetics, and technical journals. He is currently planning the development of videotex and other telecommunications services for AT&T.

"In the computer, man has created not just an inanimate tool but an intellectual and active creative partner that, when fully exploited, could be used to produce wholly new art forms and possibly new aesthetic experiences."

Fifteen years ago I wrote these words; they represented my view then of the potential for the use of the digital computer in the visual arts.[1] However, these "new art forms" and "aesthetic experiences" have yet to evolve, thereby possibly supporting the conclusion that the use of the new technologies in the arts has been a "panacea that failed."[2] This estrangement between promise and reality could lead to a disillusionment with the use of computers in the visual arts, but in my judgment this would be a premature conclusion given the relative infancy of this application of computer technology.

In the early 1960's, a number of computer researchers began investigations of the use of computers in the visual arts. My own work in this area at Bell Labs touched upon computer choreography, computer-generated stereoscopic movies (a form of kinetic sculpture), and "random" patterns, all produced by a computer-controlled microfilm plotter.[3] Others in the same time frame, like Ken Knowlton and Ed Zajac at Bell Labs, were also investigating the use of digital computers in animation for artistic and educational purposes.[4,5]

Computer art grew slowly but steadily during the 1960's, and a number of international exhibitions were held, most notably *Cybernetic Serendipity* in London in 1968.[6] More and more computer specialists joined the ranks of the "computer artist."

After utilizing a four-dimensional perspective-projection technique to create the computer-animated main title sequence for a network television special,[7] I became somewhat disillusioned with computer art and "retired" from the field. My last written thoughts on the subject were that ". . . the use of computers in the arts has yet to produce anything approaching entirely new aesthetic experiences."[8] I also wrote that ". . . little has actually been accomplished in computer art. . ." in its first decade.

This disillusionment is not surprising. A similar thing happened in computer music. I remember about fifteen years ago when the accomplished conductor Maestro Hermann Scherchen remarked to me that the effects produced then by computers in music could be as easily duplicated with a few audio oscillators in his studio in Gravesano. However, the technology of electronic and computer music has progressed greatly over the last decade.

The early pioneers in computer and electronic music where technologists whose major contributions were in the development and fostering of the technology. One particularly laudible pioneer was Max Mathews at Bell Labs who also created an environment in which musicians had access to the computer music technology.[9] These pioneers and musicians were personally interested in classical music and hence naturally applied their investigations to that area. However, it was not the serious classical music field that ultimately exploited the new electronic technology but rather the mass-market pop and rock fields. Musicians appeared who were thoroughly familiar with using the new technology as musical instruments. The artistic emphasis was on the effects and the quality of the sounds produced and not on the technology itself.

This view of the development of computer music supports the conclusion that the pioneers of technology are often not the ultimate exploiters of their technological inventions. Furthermore, the utilization of the technology is frequently in areas not envisioned by the pioneers. And lastly, the ultimate exploitation usually takes much longer than envisioned at the invention of the technology.

Something similar has occurred concerning the use of computers in the visual arts. It is in the field of graphics and graphic design — and not the more-classical visual arts — where the use of digital computers has achieved success. Computer graphics systems are widely and routinely used to produce slides for graphic presentations in the corporate world. The production of masks and designs for integrated circuits has been greatly facilitated by the use of computer-graphic systems. The world of commercial television and advertising has increasingly turned to computer graphics, and the design of textiles and wallpaper are already being facilitated by computer graphics.

The technology for using digital computers to create visual images has advanced steadily over the years. I can remember a time when the use of color was quite novel requiring complex color separations produced from black-and-white display tubes. Now, color display and high resolution are the rule, and costs continue to decline. Developments in software have solved the hidden-line problem and facilitated the use of shading for depicting surfaces.

It is in its use as a serious artistic medium in the visual arts where the digital computer has not yet achieved its anticipated potential. Digital computers are being used to create visual imagery, but many people feel that something is missing.

The images sometimes appear to be attempts to mimic other media. Many are cold and sterile and are somewhat devoid of human expression. Randomness combines with geometric structure to create designs that are frequently interesting but that are little more. One is frequently left with the impression that many patterns are simply experiments in learning the new medium.

Can it be that, as Jack Burnham believes, there is some fundamental dissimilarity between art and technology as systems of "human semiosis."[2]

Or is there something inherent in the computer that makes it particularly well suited to producing geometric designs but poorly suited to expressing stimuli from reality and nature.

Or is it, as I believe, far too soon to judge the true impact of the digital computer in the visual arts. After all, many decades had to pass before photography moved beyond being only a technology and became recognized as an artistic medium, and video is only now beginning to achieve that status.

I am optimistic and hopeful for the future of computers in the visual arts. I do not believe the future lies in using the computer to mimic what can be done better with other, conventional media, even though the computer can eliminate drudgery and perform with lightening speed. Perhaps the future will evolve in ways that are difficult now to envision as potentially totally new art forms evolve from the computer technology.

One thing that is clear though is that the future will have truly arrived when the emphasis is on *what* has been produced as opposed to *how* it was produced. Far too much of the computer art produced thus far places too great an emphasis on the *computer* and far too little on the *art.* It is as if the medium has become the art!

Also much computer art does not utilize the interactive and dynamic potential of the computer. Static images are programmed that do not relate to the individual viewer. The potential for the computer to sense the viewer's state of being and change the imagery accordingly has not been thoroughly explored. The man-machine communication problem is still challenging; the computer is a difficult medium for artists to control; and the technology remains mostly inaccessible.

At one time, I parroted Allon Schoener's belief that a form of "citizen-artist" could emerge from the use of the new technologies.[10]

The increasing growth in home computers with color graphics capabilities would seem to be bringing us closer to that day. However, I believe that the aesthetic sensitivities and training of the artist are and will continue to be unique in the use of the computer, or any artistic medium for that matter. What might happen from the growing popularity of home computers is the gradual growth of a body of people who are keenly literate in computer graphics and who later become artists bringing the computer medium along with them and contributing to its development.

Creative persons from the artistic community — not technologists — must continue to appear who are expert in the use of the computer medium. The computer as the medium must surrender to the artistic effects produced. Presently, the two continue to be too intertwined. In conventional art it is rare that one would criticize the medium in general, for example water colors, if one did not like a particular work utilizing that medium. Unfortunately this is not the case in computer art which remains tied to the computer community and has yet to find its home in the artistic world.

In final conclusion, I am indeed optimistic about the future of computer art and have come full circle to again believe in the great promises of the paragraph quoted at the beginning of this essay. I have no doubt that it will occur — the key question is when.

Footnotes

1. "The Digital Computer As A Creative Medium," A. Michael Noll, *IEEE Spectrum,* October 1967, pp. 89-95.
2. "Art and Technology: The Panacea That Failed," Jack Burnham, *The Myths of Information,* Edited by Kathleen Woodward, Coda Press, Inc. (Madison, Wisconsin), 1980, pp. 200-215.
3. "Computers And The Visual Arts," A. Michael Noll, *Design and Planning Number 2,* Edited by Martin Krampen and Peter Seitz, Hastings House, Publishers, Inc. (New York), 1967, pp. 65-79.
4. "A Computer Technique For Producing Animated Movies," Kenneth C. Knowlton, *AFIPS Conference Proceedings,* Vol. 25, 1964, pp. 67-87.
5. "Computer Animation: A New Scientific And Educational Tool," Edward E. Zajac, *Journal Society Motion Picture and Television Engineers,* Vol. 74, November 1965, pp. 1006-1008.
6. *Cybernetic Serendipity,* Edited by Jasia Reichardt, Studio International (London), 1968.
7. "Computer Animation And The Fourth Dimension," A. Michael Noll, *AFIPS Conference Proceedings,* Vol. 33, 1968, pp. 1279-1283.
8. "Art Ex Machina," A. Michael Noll, *IEEE Student Journal,* September 1970, pp.10-14.
9. "Inteview With Max Mathews," C. Roads, *Computer Music Journal,* Vol. 4, No. 4, 1980, pp. 15-22.
10. "2066 And All That," Allon Schoener, *Art in America,* Vol. 54, March-April 1966, pp. 40-43.