

TOWARD AUTONOMOUS REALITY COMMUNITIES: A Future For Computer Graphics

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It may live in a vacuum tube (for a few more years at least), but to hear the Mercantile Masters talk you'd think computer graphics lives in a political vacuum as well. For electronics, however, the last quarter-century has been equivalent to pulling back the string on a bow the storing of enormous technological potential. Now the string is about to be released in the universal application of that technology: the next 25 years will be the flight of the arrow, propelling us into the Electronic Age and precipitating an historically unprecedented revolution in communications. And in the shadow of the Communications Revolution we begin to understand the awesome cultural and political implications of that protean force we refer to so feebly today as computer graphics.

Autonomy and Heteronomy

The practice of the moving-image arts can be divided into five technical categories: (1) production or acquisition of image and sound' (2) recording this information in some storage medium, (3) processing

or post-production, (4) distribution of the material to its target address or marketplace, and (5) the display or presentation of it in one or more formats. Today autonomous individuals have access to tools for the recording, storage and display of audiovisual information but very few of us have processing technology and only the Mercantile Masters control national distribution. The result is cultural heteronomy ("other-law"), a hierarchical structure of authority and reality.

However, I suggest that within ten years the Communications Revolution will give every household the technical capability to engage in all five fields of moving-image practice. That's because the computer is a universal machine that can contain and become all media, and because VLSI technology will increase computing power by a factor of a thousand in a decade. Thus the computer, on line to user-controlled networks, will become the tools we need to practice the construction of social reality. The result will be cultural autonomy ("self-Law"), a nonhierarchical structure of authority and reality, characterized by the proliferation of "autonomous reality-communities." I shall speak more of this momentarily; meanwhile, consider the following:

The Moving-Image Arts

In ten years the video camera will be a tubeless 1 DO-percent solid-state handheld computer with image resolution greater than 35mm film. It will contain no internal optics; will focus automatically by sonar or Fourier analysis, and microprocessors for image deconvolution or image enhancement will obviate the need for expensive lenses. Lens less zooming will be accomplished by computer operations on the signal rather than mechanical manipulation of the lens. Recording will be digital, on metal tape (later in semiconductor or bubble memory), and the entire

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camera/recorder unit, resembling a super-8 system, will sell for less than \$1000.

That's the computer as camera; what about the computer as source of the image? We know all about that, don't we? Taking seriously the predictions about VLSI, and remembering that software trails hardware by about five years, we can safely assume that the personal computer of a decade hence will be a 32-bit "geometry engine" pipeline processor capable of addressing at least a gigabyte of virtual memory, with throughput rates adequate for real time shaded 3-D graphics with a resolution of at least 1000 x 1000 pixels. It will also function as an image processor which, with add-on cards, will perform all the post-production "effects" today requiring \$200,000 industrial tools or custom user-built devices like Dan Sandin's Digital Image Processor or Woody Vasulka's Digital Image Articulator. And it'll control a read-write optical disc for video editing.

Of course the personal geometry engine with its flight-simulator capability will be on line to broadband cable and switched optical fiber networks providing custom distribution and access to "telegraphic" and "network reality synthesis." At the amateur level thousands of young warriors will live in labyrinthine networked adventure games and computer clubs will operate dedicated cable-TV channels, showing their simulations and sharing their programs in video as the non-member cable audience looks on and learns. At the venture-capital level, commercial Image Utilities with pictorial data bases will offer real-time interactive simulation: just punch up the right cable channel, turn on your Apple IX and shake hands with the animated output of Cray-5 or the latest Josephson-junction superbrain. The data bases, like visual hypertexts, will consist of morphological, anatomical and physiological algorithms for the synthesis of

environments, figures and behaviors specified and controlled by the subscribers who could, of course, download the results in their own local memory for future metaconstructions.

Amateurs and Professionals

One consequence of all this will be a loss of distinction between who's a professional and who's an amateur insofar as that's determined by the tools to which we have access. No motivation is as pure, no achievement more dignified than that of the amateur who does it for love. Yet in our professionalized society this most noble aspiration has been reduced to a sneering joke - the amateur as some kind of bozo - as though doing it for love were synonymous with ineptitude, an absence of quality and value. As a matter of fact, by far the most interesting computer graphics I've seen have been produced by skilled amateurs in their living rooms using tools they designed and built. They aren't "hobbyists," they are artists; but please excuse them; they can't afford a Cray-1 - yet. But just give us quality tools and see what happens.

By the end of this decade millions of amateurs will be evolving new computer graphics routines, constructing private visual languages over conversational networks like some thousand-headed Hydra, dwarfing the "contribution" of military-industrial professionals and reducing them to a rather embarrassing historical footnote. As a matter of fact, military-industrial domination of computer graphics signifies its immaturity as a medium. A tool is "mature" insofar as it's easy to use, accessible to everyone, offering high quality at low cost, and characterized by a pluralistic rather than singular practice, serving a multitude of values. Professionalism is an archaic model that's fading in the twilight of the Industrial Age; the Simulators of the Apocalypse should be honored to share the SIGGRAPH spotlight with noble

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amateurs heroic warriors of the Electronic Age - who shall inherit the world of simulation by living in the worlds they simulate.

Communication and Conversation

The migration to alternative reality communities will not be achieved through communication. Communication (from the Latin "a shared space") is interaction in a common context ("to weave together"), which makes communication possible and determines the meaning of all that's said: the control of context is the control of language is the control of reality. To create new realities, therefore, we must create new contexts, new domains of consensus. That can't be done through communication. You can't step out of the context that defines communication by communicating: it will lead only to trivial permutations within the same consensus, repeatedly validating the same reality. Rather, we need a creative conversation (from the Latin, "to turn around together") that might lead to new consensus and hence new realities, but which is not itself a process of communication. "Do you mean this or this?" "No, I mean thus and such ... " During this non-trivial process we gradually approximate the possibility of communication, which will follow as a trivial necessary consequence once we've constructed a new consensus and woven together in a new context. Communication, as a domain of stabilized noncreative relations, can occur only after the creative (but non-communicative) conversation that makes it possible: communication is always non-creative and creativity is always non-communicative. Conversation, the prerequisite for all creativity, requires a two-way channel of interaction. That doesn't guarantee creativity, but without it there'll be no conversation and no creativity at all. That's why the worst thing we can say about the mass media is that they can only communicate - at a time when creative conversations on a massive scale

are essential for human dignity and perhaps even our very survival.

Simulation and Desire

What's important to realize is that in our conversations we create the realities we will talk about by talking about them: we become an autonomous reality-community. To be conscious observers we need language (verbal or visual), and to have language we need each other: the individual observer, standing alone, is an impossibility; there is only the observer-community or reality-community that can talk about things (like religion, art, science) because it creates the things it talks about by talking about them.

The Electronics Revolution, bringing conversational machines and networks, will give rise to autonomous reality-communities of politically significant magnitude, defined not by geography but by consciousness, ideology and desire. As constituents of these communities we shall hold continuously before ourselves alternative models of possible realities. We shall learn to desire the realities we simulate by simulating the realities we desire, specifying, through our control of context, what's real and what's not, what's right and wrong, good and bad, what's related to what, and how. This is the profound significance of simulation: it is not fiction; it is the future of politics, reality and desire. The purpose of fiction is to mirror the world and amuse the observer; the purpose of simulation is to create a world and transform the observer. Behold: armies of amateurs gather even now, preparing for the Image Wars, conspiring to abolish once and for all the ancient dichotomies between art and life, destiny and desire.

COMPUTERS AND THE VISUAL ARTS:A RETROSPECTIVE VIEW

A. Michael Noll

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. 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.” 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.” 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 laudable pioneer was Max Mathews at Bell Labs who also created an environment in

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which musicians had access to the computer music technology.” 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. 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 semiotics.”

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.

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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.