How do you judge computer art? How do you judge artists' software?

As I am writing this essay, the microcomputer is barely ten years old. Its development has been explosive, extending into a variety of fields that its originators--Steve Jobs, Steve Wozniak and Lee Felsenstein, among others--never imagined, such as expert medical systems. The field of art has often been mentioned as a natural for the micro, but most commentators would agree that computer art, except for graphics used on TV and in film, has not realized the promise they believe it to hold.

Complicating this question is the issue of programming--does a computer artist have to be a programmer in order to be a real computer artist? Those who say no point to the obvious successes of an artist like David Em, who does not program, but creates his futuristic visions for films like Star Wars by drawing on the digital tablet. At this time, those who feel the artist should program don't have a whole lot to point to, but my feeling is that this is because the proposition has not been sufficiently discussed to create an environment in which artists will WANT to program.

There is an obvious reason for artists to program: the artist in charge, defining what the machine, and to a certain extent, what the user, will do. That is to say, the artist can then assume command of a wider range of the possibilities the computer presents.

What are these possibilities? In my view, the best way to approach the computer is from the Universal Machine concept. Charles Babbage, a 19th-Century English mathematician, worked on a machine called the Analytic Engine, which he designed to solve any conceivable mathematical problem. From this beginning, Alan Turing, the man actually credited with the Universal Machine concept, proposed the idea of a single machine that would solve any problem, mathematical or not, depending upon what set of instructions it was given. The instructions were to be stored in a memory that took the form of punched paper tape. This is, in principal, how contemporary microcomputers operate. An Apple // can be, depending on what software you have in it at the time, a game machine, a word processor, a spread sheet or a telecommunications instrument.

I believe the computer is, in and of itself, a medium every bit as serviceable to the ends of a talented artist as ink on paper, paint, bronze or stone, but unlike these traditional media, the computer can be all things to all artists, and several of these things at the same time. Here are some of the possibilities of this protean machine:

> 1) Because of its monitor, the computer is a highly visual device capable of any kind of graphic image, in black and white or color, yet it is also perfectly at home in a verbal world and can be harnessed to high-quality laser printers as part of a publishing system. Graphics can also be published this way.

2) Animation is possible, and when used in conjunction with sound, high-quality video or film can be produced. Furthermore, if use is intended for computer only, animation and sound can be used in a book or in a graphic work.

3) Computers have formidable powers of indexing and a critical art encyclopedia is possible.

4) Microcomputers, as physical devices, are rich in visual imagery, which artists can use to their own ends as a kind of conceptual sculptural object--what those comfortable with computers might call virtual sculpture, contrasted with Nam June Paik's use of the television as sculptural object.

5) A computer can serve as a form of theater for the artist, a theater rich in illusion. As Alan Kay notes, this kind of theatricality features the machine as the actor and the user as the audience, albeit an interactive audience, with the machine performing in a highly illusionistic style, hiding the mechanisms that drive it from the user, who sees only the results.

6) As a result of phone lines and modems, the micro can actually be a broadcast medium.

7) Again, because of the computer's protean nature, any of these modes can be mixed-- computer literature, computer graphics, computer film, video or sound, computer sculpture of theater--and all of them can be broadcast, some with more success than others.

Of course, it is not probable that the artist would want all these media floating around in one work. It is the set of instructions, the programmed structure underlying the software in use that limits which of these artistic experiences the user is to have. The decision should be in the hands of the artist, and while it is possible to hack together several pieces of commercial software and arrive at a satisfactory and workable solution to a given problem, even that requires some knowledge of programming. The best computer art will have power by the virtue of how the artist limits what the computer is doing at any given moment, and how all possibilities are orchestrated to create a particular effect.

Let us consider Memory Theatre One: An Interactive Postmodern Metaphor by Robert Edgar as one successful artistic application of the microcomputer. Edgar, a programmer by trade, programmed this work in a Forth variant called GraFORTH. The Memory Theatre comes on two 5.25_ diskettes for the popular Apple][or //e personal computers with 64 K RAM. It also requires a monochrome monitor, two disk drives and a joystick or a Koalapad attached to a game port of the computer.

After the program is loaded, you find yourself in the Memory Theatre Atrium, a room with three doors--one on the left, one on the right, and a door in the back wall. The door on the left leads to the Library, with volumes by Bruner, L. Strauss, Yates, Fleming, Army, Frampton, Quine, Barthes, Erickson, the New York Times, Fong and Ryle. The
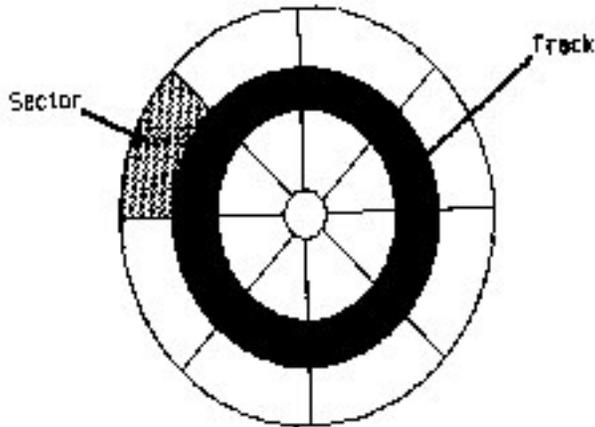
door on the right leads to the Additive Memory Room. Here is a clock-like structure with twelve stamps on it. These sections stand for the first twelve letters of the alphabet, and when the cursor is placed over each stamp, a text is revealed. The concept of the stamp is important to understand. As Edgar says in his brief but excellent documentation, _The twelve 'stamps' arranged on the clock face are the result of exmode overprinting of all of the room icons except the one it represents. The resulting stamp exhibits the differential pattern of all the overprinted icons...somewhat analogous to the differential pattern on an exposed holographic film._ The door in the back of the Memory Atrium leads to a top ring of rooms. The double decker ring of rooms rotates about the Memory Theatre Atrium, the Library and the Additive Memory Room. The top rooms have different images in them, one per room, and at the bottom of the screen, the user can cause a text to appear. The texts of the top ring of rooms have short autobiographical notes and memories that are connected with the images, sometimes in amusing ways. These rooms also have three doors. The left and right doors lead to adjacent rooms in the top ring. Instead of finding a third door in the back wall, that door is found in the floor. The rooms in the bottom ring contain two pedestals, each with an icon. Like the top rooms, these also have short texts, but they are drawn from books and newspapers, that is to say, _objective_ sources as compared to the more personal and subjective memories from the top ring. The left and right doors go to adjacent rooms, while the door in the ceiling takes the user back to the top ring.

One of the most wonderful effects of The Memory Theatre occurs when the user goes from one room to another. Through an interesting series of animated changes, the rooms compress, rotate and expand. This adds a predictable rhythm that punctuates the irregular spans the user creates when exploring the various rooms.

The user navigates his or her way around The Memory Theatre using a cursor that Edgar terms the Ego. The Ego changes from room to room, but each shape can be found in each of the sections of the Architecture--the Top Ring, the Bottom Ring, the Additive Memory Room and the Library. This allows Edgar to exploit a unique quality available to computer artists--he deploys user-operated visual imagery to structure verbal meaning. For example, one Ego (cursor) shape is the moon. In the Additive Memory Room, the text revealed is: _B is beheaded, she now moons at me_. In the library, the moon ego shape corresponds to the volume L. Strauss, in which a rather long story is told. Briefly, a young woman swears to an older woman that she will never marry. The older woman beheads her, and the young woman's head eventually becomes the moon. In conclusion, the story attempts to explain the creation of the various races. In the top ring, this interesting autobiographical memory is related through the moon shape: _My father was an engineer at Cape Canaveral. My mother was an art teacher. Artists often have the highest respect for technology, whereas engineers often do not believe that culture exists.

Robert Edgar's Memory Theatre uses the interplay of the verbal and visual, animation and a compute version of theater to achieve its unique effects, yet it could also be compared to various open-ended works of 20th-Century poetry. Specifically, one might think of the Cantos of Ezra Pound and the Songs of Maximus by Charles Olson on this basis: all these works use a non-linear structure. But because Edgar's work is designed for

the computer, while the poets labored in the book form, his is the only work to truly incorporate random access. Furthermore, while Pound used ideograms as a tool for conveying meaning, and Olson carefully shaped his poems, placing them map-like on the page, Edgar is able to animate visual images, change their shapes as he needs to and use this visual structure to add clarity and specificity to his verbal texts, a clarity that the poets often lack.

Computer-generated image by Fred Truck

Finally, Robert Edgar's Memory Theatre is a computerized work of virtual sculpture. Pictured is a schematic drawing of the way computer engineers divide a floppy disk into tracks and sectors so that the central processing unit of the machine will be able to remember where it has stored information. Compare that to the architecture of the Memory Theatre.

With his Memory Theatre One, Robert Edgar has achieved a remarkable feat. Because he is a programmer and a fine artist, he has been able to unite the verbal and visual and animate the sculptural in a work of computer art that will be a standard for years to come.

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