# Artificial Reality II

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# Artificial Reality: A New Aesthetic Medium

## Introduction

Artificial reality is better understood as an aesthetic medium like film than as a technology like computers. As a new medium, artificial realities are particularly timely in light of the current state of the arts. For some time, artists have lamented the diminishing effectiveness of their traditional tools. People often say that painting is dead. In his book, *Beyond Modern Sculpture*, art historian Jack Burnham suggested that art itself is dead [1]. To these obituaries, I would like to add my own hyperbolic statement, and then to examine the extent to which it is true.

The static image is dead! We are constantly bombarded with static images in magazines and dynamic images on television and in the movies. Most of the images we see are carefully crafted for maximum effect, and many are beautiful. The result is that we cannot take in all that we see. Numbed by the onslaught of visual information, insulated by categories and filters, vision, our most heavily trafficked sense, is no longer capable of reacting to paintings or graphics as art. Sending a static message through vision alone is like sending it through channels; you can be sure that it will be processed correctly, but also that it will be treated as routine. To touch people today, you have to slip past their defenses and involve them in an unfamiliar way.

## Beyond Interpretation

Oddly, art history, art criticism, and art appreciation are among the deterrents to experiencing art. Repeatedly, people leaving GLOWFLOW, METAPLAY, and PSYCHIC SPACE said "I really liked it, but what did it mean?" For some reason, they thought that what had happened should be reduced immediately to words. In fact, people have a tendency to accept events in terms of the words that they will use to describe them. Therefore, there is a place for a medium that can resist interpretation. An artificial reality can take steps to individualize responses and to thwart analysis. If each person has a different experience, each will experience less pressure to arrive at the "right" interpretation. Since each person moves about the space differently, each will receive different feedback, even if the controlling program is exactly the same. If there are many programs alternating control of the environments, each participant's





adventure will be unique. Thus, two people can exchange experiences, but since they have had no common experience, they cannot analyze what happened to death.

Another reason for emphasizing variety is to resist the pressure on artists to find a single, saleable style. Once she discovers that style, the artist simply repeats it, afraid that, if she tries anything new, it will not be as successful. There is no need to sign the work—it is identifiable at a hundred paces. The work itself is a signature, the aesthetic equivalent of a corporate logo. Joan and Russell Kirsch developed a computer program that creates new works in the style of painter Richard Diebenkorn [2]. They argue that, if a computer can duplicate the style of an artist and use that style to create original work, then artistic skills are not of any higher order than are more prosaic skills, such as writing a program. However, Diebenkorn's achievement was to invent the style. Only if an artist continues to quote himself after developing a distinctive style are the Kirsches correct.

## Active Versus Passive Art

All our traditional art forms have one thing in common: They assume a passive audience. Passivity was appropriate when most humans toiled physically. After centuries of effort, however, we have all but eliminated the necessity for physical exertion. Ironically, since our bodies require a certain amount of exercise for health, we face a new problem—how to make our lives more active. Sports fulfill this need for some people, but there is a place for new forms of art and entertainment that involve our bodies rather than deny them.

## Response Is the Medium!

Artificial realities suggest a new art medium based on a commitment to real-time interaction between people and machines. The medium comprises perception, display, and control systems. It accepts inputs from or about participants, and then responds in ways those people can recognize as corresponding to their behavior. The relationship between inputs and outputs is variable, allowing the artist to intervene between

the participants' actions and the results perceived. Thus, for example, participants' physical movements can cause sounds, or their voices can be used to navigate a computer-defined visual space. It is the composition of the relationships between action and response that is important. The beauty of the visual and aural response is secondary. Response is the medium!

In principle, the perceptual system could allow the system to respond to your voice, location, posture, movement, or gestures. It could respond to the time elapsed since the last movement, the time since you entered the environment, or your general rate of movement. It could respond to your height, clothing, hair color, or facial expression. If there were several people in an artificial reality, it could respond to them individually or to some relationship among them. It could also respond to relationships between an individual's image and objects in the graphic world. The perceptual system defines the limits of meaningful interaction; the exhibit cannot respond to what it cannot perceive.

The purpose of the displays is to provide a context within which the interaction occurs and to define relationships between the participants' actions and their perceived consequences. This context is an artificial reality in which the laws of cause and effect are composed by the artist. The beauty of the displays is not as important in this medium as it would be if the form were conceived as solely visual or auditory. Artists are fully capable of producing effective displays in a number of media. This fact is well known, and to duplicate that feat produces nothing new. What is unknown and remains to be tested is the validity of a responsive aesthetic.

The control system determines the appropriate response to the participant's action and initiates the generation of that response. While the simplest responses are little more than direct feedback of a participant's behavior, allowing the system to show off its perpetual ability, far more sophisticated results are possible. In fact, a given aggregation of hardware sensors, displays, and processors can be viewed as an instrument that can be programmed by artists with differing sensitivities to create completely different kinds of experiences. These artists must balance their desire for interesting relationships against the commitment to respond in real time.

We can think of an artificial reality in the following ways:

1. It is an entity that engages participants in dialog. An artificial reality expresses itself through light and sound, whereas the





participant communicates with physical action. Since the experience is an encounter between individuals (human and machine), it might legitimately include greetings, introductions, and farewells—all abstract, rather than literal. The artist's task, in this case, is to imbue reality itself with a distinctive personality. This idea is not an obscure one; simply imagine the feedback relationships that you might employ to create a haunted house or an enchanted garden;

2. It is a personal amplifier. In Dorothy's initial encounter with the Wizard of Oz, the Wizard uses technology to enhance his ability to interact with those around him. An artificial reality can be used in the same way. Currently, the person at the VIDEODESK is the Wizard in the two-way exhibit between the VIDEODESK and VIDEOPLACE;

3. It is a space that the participant can explore, where he can interact with graphic creatures or become involved in a graphic adventure;

4. It is a setting for human-to-human interaction. Two or more people can interact with one another in the interactive medium. Since the computer defines and can change the relationships that exist between participants, it is a third party in the dialog;

5. It is an instrument that participants play by moving about the space. In PSYCHIC SPACE, the floor was used as the keyboard of a simple musical instrument. In an artificial reality, musical objects and creatures can respond to a participant's touch;

6. It is a means of turning the participant's body into an instrument. An individual's limbs and fingers can be used to control images and sounds;

7. It is a game between the computer and the participant. This variation is an extension of the pinball machine or the video game, the most commercially successful interactive environments;

8. It is an experiential parable in which the theme is illustrated by the events that happen to the protagonist—you. Viewed from this perspective, the MAZE in PSYCHIC SPACE became pregnant with meaning. It was impossible to succeed, to solve the MAZE. The MAZE

could be a frustrating experience if you were trying to reach that goal. If, on the other hand, you maintained an active curiosity about how the MAZE would thwart you next, the experience proved amusing and thought provoking. Such poetic composition of experience is one of the most promising lines of development to be pursued within artificial realities.

## Implications of the Art Form

An interactive exhibit augurs new relationships for artists with their audience and with their art. The artist operates at a metalevel. The participant provides the direct performance of the experience. The artificial reality hardware is the instrument. The computer acts much as an orchestra conductor, controlling broad relationships, whereas the artist provides the score to which both performer and conductor are bound. This relationship might be a familiar one for musical composers, although even they are accustomed to being able to recognize one of their pieces, no matter who is interpreting it. But here the artist's responsibilities become even broader than those of a composer, who typically defines a detailed sequence of events. The interactive artist is composing a network of possibilities, most of which will not be realized by a given participant.

Since the artist is not dedicated to the idea that the entire piece be experienced each time by each participant, the concept of a *piece* is no longer appropriate. The artist can deal with contingencies that arise during an interaction. She can take into account the differences among people. Her job is to define a rich context within which interesting momentary interactions can be defined and altered in compelling ways. At the least, this context will include a visual setting and causal laws.

In the past, art has often been a one-shot, hit-or-miss proposition. Paintings, hanging in rows in galleries or museums, have the same problem as do boxes of detergent at the supermarket: somehow, each work must distinguish itself from its competitors. (In fact, people often consume art in what I think of as "supermarket" mode. They typically intend to see 100 works of art per hour.)

My preference for exhibiting a large variety of interactions is partly based on this issue. If "shoppers" glance in and see one interaction and leave, they will be surprised if they compare notes with someone else





who saw the exhibit. They will discover that they saw different work, and they may return for the purpose of really seeing the piece. This is my "second-strike" capability. It has been a conscious strategy since METAPLAY, and it has worked. People often tell me that they have returned for this reason.

An interactive exhibit can deal in novel ways with the problem of attracting and maintaining attention. It can perceive and respond to people who are not within its confines, attempting to lure them in. Or, it can refuse to compete with other pieces by offering nothing to the casual observer, demanding a commitment from the viewer by responding only when its space has been entered. Note that this issue is different for artificial realities created with data goggles, which cannot entice you to put them on. It is less clear whether the greater commitment you must have to enter such a reality makes it less likely that you will leave prematurely.

With both technologies, once you enter, the exhibit can judge your level of involvement, and can modify its behavior if your interest begins to wane. It can learn to improve its performance, responding not only to the moment, but also to the entire history of its experience with other participants. The piece becomes an aesthetic entity whose behavior matures through experience. It may take paths unanticipated by the artist. Indeed, one of the strong motivations guiding this work is the desire to compose works that surprise their creator.

In VIDEOPLACE, you are confronted with a completely new kind of experience, stripped of informed expectations and forced to deal with the moment on its own terms. You are actively involved, discovering that your limbs have been given new meaning and that they can express themselves in new ways. Your experience will be unique to your movements and may go beyond the intentions of the artist, or beyond what the artist had thought were the possibilities of the piece.

McLuhan called attention to the medium's effect on the message; in that vein, we can ask what is communicated by artificial realities and what they can be used to communicate [3]. First, the medium presents some unavoidable facts about current technology. For better or worse, our technology will perceive us. It will communicate with us. Our relationship with it will become cozier and more intimate as time passes. The artificial reality introduces some of the most up-to-date technology in a way that makes the technology's implications palpable. The experi-

ence can serve as an early-warning system for people who seek to know what they may be called on to adapt to.

## Technology for Fun

More important than the specific knowledge a person may gain about technology is the attitude toward technology that is conveyed by an artificial-reality exhibit. The interactive exhibit is technology for fun. Americans are incredibly attuned to the idea that the sole purpose of technology is to solve problems. We seem unable to grasp that only by completely integrating our technology with the whole of our lives can we understand its implications sufficiently to use it with confidence. In 1982, well before the collapse of the video-game industry or its resurgence led by Nintendo, I wrote "Consequently, with the recent and probably temporary exception of video games, we buy entertainment equipment almost exclusively from other countries which are better able to see the implications of our inventions in terms of day-to-day life." [4] This sentence reflected my awareness that American businesspeople have a distaste for technology products that are used by individuals, as opposed to those used by organizations.

Artificial realities also illustrate ways that technology can be personalized and humanized. It is possible to program an interactive environment so that each person has a dramatically different experience, not only because each acts differently, but also because the relationships that govern the interaction are different.

Finally, in an exciting and frightening way, interactive exhibits dramatize the extent to which we are savages in the world that our technology creates. Contemporary laypeople are probably more ignorant of their culture's technology than have been any people in human history. The layperson has extremely little ability to define the limits of what is possible with current technology, and so will accept all sorts of cues as representing relationships that do not in fact exist. The constant birth of such superstitions indicates how much we have already accomplished in mastering our natural environment, and how difficult the initial discoveries must have been.

Interactive art also stands as a serious indictment of our cultural style. It offers nothing to the passive audience. A passive individual can





enter and—ignoring the invitation to become involved—leave, having experienced nothing. Although some interactions may cajole the participant into a conversation, others might not bother. The way the exhibit treats its participants will reflect the attitudes of the artist.

## Aesthetic Issues

Is the interactive exhibit art, or is it just a passing social statement—an aesthetic one-liner? Or, does it contain the seeds of a new branch of aesthetic endeavor? If it does, which dimensions of the interactive medium have the greatest aesthetic potential?

Interactive art shares concerns with existing art forms. VIDEOPLACE is about the human image, one of the most consistent features of Western art. The focus of most of the interactions is how the participant's image is displayed and what happens to the image. People have always been fascinated with their own images. An art form that challenges a person's self-perceptions will continue to be of interest.

Artificial realities are fundamentally conceptual. Since the system's response to an action need not be the expected result of that action, participants are forced to think. They must constantly conceptualize theories that explain the experiences that they are having. As the relationships change, participants must update their theories or create metatheories that tie together the patterns of change.

An artist's actions have also become an accepted subject of art. Willem de Kooning painted in a way that reveals the physical act of painting. Jackson Pollock made his physical acts the subject of his painting. In an artificial reality, the artist is again observing and commenting on movement. In this case, however, the action of the participant, rather than that of the artist, is the subject of the work.

### Active Participation

Making movement a subject of the artificial reality relates the latter to traditional art. Switching the focus from artist to participant, however, constitutes a radical departure. True, we can move about and admire a sculpture and, to a minimal degree, we can interact physically with a painting. However, in its attempt to involve the audience, the

artificial reality has closer ties with the Happenings of the early 1960s than it does with these more conventional modes of art. When participation becomes the subject of the aesthetic work, the viewer's critical faculties are given new responsibilities. The viewers are no longer judging the finished work of the artist. Their own actions complete the piece. Thus, within the framework of the artist's exhibit, the participants also become creators.

From this perspective, participation must be seen in a different light. Usually, artists are allowed to act, and the audience is not. Dancers are strenuously involved in their work and feel aesthetic pleasure from their own performance. Indeed, one can argue that the passive appreciation of any art form is enhanced by having once created within it. The graceful movements of a dancer take on new meaning to a member of the audience who has learned to dance, just as a painter can identify with the sensuality of another artist's painting experience as revealed by the brushstrokes.

This proprioceptive sense can be addressed directly in an artificial reality. Awareness of your body is a vital part of experiencing the medium. When you find that bending an elbow has one effect and tilting your head has another, you discover a new way of relating to your body. Your body becomes a set of transformations that operate on reality. Although this model is always valid, changing the consequences of mundane actions drives home the point. Similarly, as the relationship between your actions and their effect on your perception changes, you are led to ponder your relationship to reality itself. In the real world, the relationship between immediate cause and effect is usually predictable. A consistent set of physical laws mediates our everyday experience. Our feet are held to the ground by gravity. An object that is released above the ground will fall. Bricks are heavy and feathers are light. We do experience surprises—when we trip over a rug or when an apple falls on our head—but these usually occur because we are unaware of the presence of particular objects, persons, or forces, not because the laws governing their behavior are unexpected. Thus, by creating an interaction in which the laws controlling the relationship between action and response are composed rather than immutable, an artificial reality offers a way to comment on experience itself at a philosophical level.

Just as music addresses the intellectual machinery with which we understand sounds—particularly speech sounds—artificial realities can





touch the primitive mechanisms through which we apprehend physical reality. The environmental experience can be composed in terms of our abstract sense of spaces and objects and the expectations we have for the effects of our actions on the world. If the pattern of confirmed and broken expectations has a coherent and satisfying structure, the result should be an aesthetic experience. As the innate and culturally learned rules of human expectation are understood, artists will be able to create a great variety of compositions that explore this part of our makeup.

Artificial realities have another aspect that distances them from the traditional museum arts. A painting or a sculpture defines a single set of perceptions that are bounded in space and time. On the other hand, artificial realities are not static works to be admired by a passive observer. Artificial realities are experiential—a radical departure from the traditional museum arts. By providing experience, they may be closer to literature, theater, or film—all of which relate a sequence of events that are experienced by a cast of characters. However, the narrative art forms define a linear sequence of events with a beginning, middle, and end that are presented identically to all members of the audience. Artificial realities, on the other hand, allow the artist to define a universe of possible experiences, so each participant can create a unique experience. Thus, an interactive composition defines a new category that demands its own criteria.

Traditional art is created by an artist and appreciated by a viewer. In an artificial reality, the relationship between the artist and the viewer is only one of several possible relationships. The relationship of one viewer to another can also be the explicit subject of the work. Thus, for the first time, the artist can compose relationships between friends and strangers where the very nature of the interaction can be changed as casually as we change the subject in a conversation. The importance of this opportunity is one lesson I have learned from my work. For most people, interacting with computers is a distinct activity, whereas interacting with other people is life itself. Rather than isolating people further from one another, the challenge for artificial realities is inventing new ways to bring people together.

The interactive exhibit has the potential to endure as an art form. It shares traditional art's concerns about perception, the human image, and the representation of human experience. However, the interactive version of beauty will stimulate conceptual insight as well as perceptual

pleasure. The intellectual opportunity to discover an entirely new aesthetic makes traditional media, which have been explored for centuries, seem impoverished by comparison.

## Design Considerations

In designing these experiences, we have a host of concerns. Some of these concerns relate to interactivity itself; others are related to production values.

### Clarity

One of the key design issues is the clarity of the participant's experience. It is important that participants perceive that the environment is responding to them. Various issues bear on that certainty.

The first of these is the sense of awareness that the environment projects. If the environment can correctly perceive every action you perform, it can respond in appropriate ways and make you feel connected to what is going on. If you move your hand and CRITTER chases it instantly, you feel that the creature is responding to your behavior. If you jump and the system is unable to perceive that behavior, you will feel some dissatisfaction every time that jumping fails to elicit a response. It is not necessary that the system's perception be perfect, as long as interactions are designed with the perceptual limitations in mind.

In VIDEOPLACE, the environment's awareness can be affected by the number of people present. It is more difficult to perceive the actions of several individuals, because the people's silhouettes may overlap. In addition, when several people are present, the system should consider the relationships among them. These relationships start competing with those between each individual and the environment. We have said that response is the medium—and response is clearest when one person is alone with the exhibit. If there are numerous people in the space, there must be a way for each to associate his actions with a corresponding response; otherwise, the responsiveness becomes meaningless.

Clarity also requires consistency of response. If each response is unique, the participant will not see a connection between his actions and the environment's responses. Thus, feedback relationships have to be





repeated long enough to establish a pattern. Unique responses can occur, but they are events, deviations from the pattern. Similarly, it is acceptable to change the pattern, but the change itself should occur in a way that seems appropriate, rather than arbitrary. For instance, there are interactive systems now that have several feedback modes, and that switch from one mode to another with no regard for what the participant is doing. I prefer to have people leave the environment to quit one interaction, and to reenter to start the next.

In longer interactive compositions, there are moments that can be established as punctuation marks, separating one part of an interaction from what preceded it. These are moments when the participant expects something to happen. In PSYCHIC SPACE, events such as moving your symbol to the new symbol or crossing a MAZE boundary were used to trigger transitions. Today, when people capture CRITTER, it explodes. But, if it were captured a second time and a new interaction ensued after the explosion, participants would not be offended, because change is a believable consequence of a dramatic event. Similarly, if you are flying around an artificial reality and see a graphic doorway, you expect to be in a different environment after you have gone through it. The artful composition of such transitions will be an important aspect of the medium in the future.

### Control

Control is another important design issue. Most of the time, the participant is in direct control of the interaction. However, there are occasions when the artist wants to make something happen to the participant. For instance, in MAN-IPULATE, the operator at the VIDEODESK uses the image of her hands to push the participant's image. For that moment, the participant is not in control of the image of his own body and this lack of control is amusing. If the participant loses control for too long, however, he becomes frustrated. It is important that these moments be brief, and be justified dramatically.

This concern is particularly important when there are two participants. Currently, the person at the desk is knowledgeable about the system and she is carefully coached in her role, which is to facilitate the experience of the other participant. If there were two unprepared participants, the problem of control would be challenging. There have to be

moments when one participant can affect the other. However, these moments—during which a participant loses control—have to be budgeted. They have to be divided fairly and, like wild cards, they have to be played at the most opportune moments.

### Self-Explanatory Experience

It is important that participants understand the experience. They must know or be able to figure out how they are influencing events in the artificial reality. Times when they are confused about how they are participating or what they must do to proceed should be minimized, for such moments are never pleasant. Nevertheless, I think it is desirable to avoid giving explicit instructions. New relationships should be introduced by discovery, rather than through explanation. Since the discovery process must proceed at its own pace, this requirement is not always consistent with the needs of galleries that must allow large numbers of people to pass through an exhibit. However, reliance on explicit explanation is not worth the time saved; unexpectedly, the most obtrusive presence is that of an authoritative human.

One situation where explanation is difficult to avoid is at the end of an experience. The problem of ending a piece exists in any temporal medium. The ending should be self-explanatory, and should be consistent with the rest of the piece. One elegant solution used in PSYCHIC SPACE was to respond only to movements toward the exit. This strategy invariably resulted in people moving in the desired direction. The experience was over when the person found that he was no longer in the gallery.

Another strategy was used in an early CRITTER interaction. Each time CRITTER reached the top of the participant's head, a new set of relationships was introduced. After several such transitions, participants came to expect them. On what was to be the last time, when CRITTER reached the top of the participant's head, it jumped up and down, causing the participant's image to disappear. CRITTER then floated gently down to the bottom of the screen. You could see people look down to see whether their real bodies were still there.

Although these techniques work, it seems a little arrogant for the exhibit to dispatch the participant. My model of a personal encounter does not really require a fixed endpoint. However, there are occasions when one participant thoughtlessly occupies the environment for a long





time when other people are waiting to enter. A discreet means of asking him to leave would be appropriate.

### Randomness

Random processes have often been used in computer art to create complexity. This use of randomness has been necessary because it is difficult to create complex stimuli with computer programming alone. In an interactive medium, the participants are a source of unpredictability. Furthermore, perception is uncertain and the idea of physical interactivity is unfamiliar, so complexity is inherent in the medium and no random processes are needed to make the experiences interesting. On the other hand, with both sound and graphic patterns, it is possible for the artist to describe the general texture desired, and then to use random functions to generate low-level details. The advantage of this approach is that it is easy to create a large number of variations around a single theme.

### The Space

The environments that I have implemented so far have been housed in darkened, empty, rectangular rooms. If a shaped space were substituted, the compositions would reflect ideas suggested by the shape. Shape would determine content. The empty rectangle has the advantage of being so familiar that physical space is eliminated as a concern and response is the only focus. The walled space is much like a frame for a picture or a pedestal for a sculpture; it separates the composition from the rest of the world. By blocking all distraction, it allows the artist to control the experience. In a darkened space, the participant can perceive only what the artist chooses to show. The darkness also helps to free people from inhibitions, making them less self-conscious and more playful. Turning down the lights in theaters similarly separates people from the real world and focuses their attention on the performance.

### Location

There are situations where it would be desirable to bring responsiveness into the everyday environment, such as a shopping mall, to create a Happening or an active space that is delineated only by its effects.

Such responsive interactions would be most effective if done for short periods or only at particular times in special places. Two or three people walking down a street late at night would notice if each person's footsteps were accompanied by a distinctive sound. On the other hand, when hordes of preoccupied people walk through an environment, there would be no way for it to respond meaningfully to them as individuals or as a group. In general, this new medium requires people's focused attention, so that it cannot be relegated to the status of responsive muzak.

### Production Values

In addition to the issues that are unique to responsive media, the fact that the latter are experiential means that their creators may ultimately share some of the same design concerns as film directors. Production values such as the quality of the graphic scenery, the smoothness of the animation, the credibility of the physics, the depth of characterization of the synthetic creatures, the pacing of the interaction, and the tightness of the writing will all become more important as artificial reality becomes an established medium.

### Interactivity

An artificial reality is created for participants. Therefore, any aspect of the exhibit that is designed for passive spectators at the expense of the active participants is a violation of the medium. Likewise, any documentation of interactive capabilities that the exhibit does not have or that would be absolutely meaningless to a participant is a misrepresentation. This issue is significant because far more people will experience the medium passively through magazine pictures, videotape broadcasts, and presentations than will interact with it first hand. Since there is a tradeoff between the static visual quality and the dynamic quality of the interaction, there is a temptation to focus on documentation rather than interaction, on the passive audience rather than the participants. The Disney films "Song of the South" and "Who Framed Roger Rabbit" demonstrated that animated characters could be made to interact with human actors in any way imaginable. Now, we must show that what is mere illusion to the the passive observer can be compelling experience to the participant.





## Conclusion

Artificial reality opens a new dimension for the arts just at the moment when the power of existing forms seems to be on the decline. The focus on live interaction allows the artist to compose a rich variety of alternatives, rather than a set of final decisions. The freedom from finality allows a piece to grow and the computer to learn. The artist starts the process and each participant may contribute. The interactions take participants into an exploration of their own senses and of their own mental processes. Ultimately, however, the artificial realities are more than an art medium; they constitute a whole new realm of human experience.

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