

Computers and Art

The art of interactivity: from Gallery to Street

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Introduction

In this chapter, although I intend to concentrate on examples of haptic or physically responsive interactive art in "real" space and time, I recognise here a fascinating problem of definitions. For space in the late 20th century also means the infinitely expanding region of cyberspace and the web. The philosopher Paul Virilio's term for this advent of virtual technologies, or bifurcation of our realities was the "accident". I do not give these two realities equal status, but recognise that they now co-exist. The same syntax and grammar of experience applies to both types of digital art. What Virilio also makes clear is that the new technologies are progressively diminishing and even finally eliminating a fundamental condition of human perception : Spatial distance, and the conceptual distance between subject and the object. In his reading "distance" is a positive quality of vital importance to the development of meaningful art. For Paul Virilio an evolutionary 'accident' has occurred and the universe is henceforth split into two competing, but equal realities: the virtual resulting from an accident of the 'real', asserting that a 'substitution', rather than a "simulation", has occurred. [1] The artists in this discourse are living with and examining the contradictions embodied in this "substitution" of realities.

At the end of the 20th Century, the question for artists has become not the authenticity of the image and its relationship to a set "reality", but who controls the generation of simulations or substitutions and the contexts of their presentation. New practice in digital art is intent on exploring these issues of that control creatively. The gap between non-digital practice and technological art is finally closing after many years in which form supplanted content.

This leads us to the question of interactivity. Is this the defining feature of new media installation? In most cases on-screen interactivity of the point and click, variety is almost invariably put to trivial uses. While interactive games give immediate feedback in terms of action and reaction, they clearly do not engage the whole person in the same way as a novel or painting, usually leaving no imaginative space to do so. 'Interactivity' on the Internet, even in Net art often seems to most resemble the use of a glorified encyclopaedia (indeed we still talk of web pages and bookmarks); CD-rom looks like a dying technology relegated to the 'edutainment' sector; Interactive Television offers home shopping as its level of audience involvement and Virtual Reality has become an entertainment fairground ride. Wherein then lies the promised potential of Digital media as an artistic vehicle? The truth is that old forms of media habitually graft on to new forms in a highly unimaginative manner, until they mature by stages into unanticipated means of expression. Photography in its early days mimicked the forms and appearance of oil painting. It was only through the recognition of its unique response to framing, time and motion that a new language could be created. Luc Courchesne is a media artist whose long engagement with interactive narratives and expanded cinematic interfaces has led him to the same conclusion:

"A formula that perfectly integrates medium, content and participants has still to be invented and developed. Once it is found we will have the basis of an industry of new media turning the spectator into a visitor and the storyteller into an author of worlds in which the visitor is invited to behave and bears the consequences of his or her actions." [2]

Certainly public understanding of interactive forms is severely limited. Throughout the 1990s, institutions like ZKM in Germany, Banff Centre for the Arts in Canada, NTICC in Japan and Festivals such as Ars Electronica led the way in developing new media installation art. Technology was central to the early interactive artworks of the 1990s, but content was often an afterthought to a cleverness of interface and a largely uncritical techno-fetishism on the part of some artists.

"Media technology is now often seen as the leitmotif from which all social, cultural and economic changes shall emanate. Today, for instance, the meaning of "interactivity" is essentially defined through the electronic media. Interface and software designs specify the framework of this technologically determined interaction from human to human via a machine, or solely between human and machine."

Media Art Interaction: Strategies of Interactivity Dieter Daniels [3]

Later in the decade, this began to change. However, this experimental work has been largely ignored by mainstream art galleries. At a recent conference session at the Tate Modern, discussing the role of new media in the gallery, the majority of the audience clearly had no knowledge of the recent history of interactive installation. [4] Although Galleries showing video installations playing from DVD are now commonplace, galleries supporting truly interactive work are still relatively few.

Haptic Interfaces

This brings us to the principle subject of this paper, the nature of physical interaction. Two strategies: Intimacy or collaboration are both legitimate modes for the experience of interactive art. One of the pioneers of such interactive artworks was Jeffrey Shaw, now visual research director at ZKM. Perhaps because of his background in architecture, Shaw has always included strong physical elements for interaction in all his works.

His famous piece **The Legible City 1989** combines a highly physical interface with virtual reality. The City is a computer controlled and projected virtual urban landscape made up of solid three-dimensional letters that form words and sentences instead of buildings, along the sides of the streets. The architecture of text replaces exactly the positions of buildings in a plan of the real cities (New York and Amsterdam). This spatial transformation of narrative is literal in every sense. Bicycling through this city of words is a journey of reading, choosing a direction is a choice of text and meaning. The image of the city is projected on a large video screen in front of the bicycle, which is fixed like an exercise-bike. [5] His **"Revolution" 1990** was an interactive videodisk installation which allowed the user to turn the mill of history, tracing 200 years of turbulent history from 1789 to 1989, The considerable physical effort required to turn the installation on its own sufficient to give "gravitas" to the content, demonstrating a perfect synchronisation of metaphor and interface. [6]

In **The Golden Calf**, a flat screen with gravity sensors altered a 3D image of the calf to orientate to the viewer's physical manipulation of the device in 3D space. In later work Shaw has developed work with viewing systems that interact with the audiences gaze in the round, extending the 19th Century panorama experience into the computer age.

While Shaw's works required a single user, Perry Hoberman created another experimental interface, which prefigures multi-participatory public works, at the Banff Centre in Canada. **Bar Code Hotel** [7] was an interactive environment for multiple participants. An entire room is covered with printed bar code symbols, an installation was created in which every surface can become a responsive object, making up an immersive interface that can be used simultaneously by a number of people to control and respond to a projected real-time computer-generated three-dimensional world.

Each "guest", who checks into the Bar Code Hotel is given a bar code wand, Because each wand can be distinguished by the system as a separate input device, each guest could have their own consistent identity and personality in the computer-generated world. In addition, since the interface was the room itself, guests could interact not only with the computer-generated world, but with each other as well. The objects in Bar Code Hotel were based on a variety of familiar and inanimate things from everyday experience: eyeglasses, hats, suitcases, paperclips, boots, teddy bears, paper clips, cheese wedges, bread loaves etc. move around the virtual space, under the control of the bar code wands of the users in the room. The artist anticipates the objects' behaviours,

defining the limits of the space, determining what happens when they collide, etc, etc, so that all possibilities are accounted for. After such choreography whatever happens within the space whilst algorithmically determined is still quite unpredictable. Thus, the co-dependence of our two universes (virtual/real) was established through the simplest piece of supermarket technology.

In 1995, through the direct physical control of breathing, Char Davies's "**Osmose**" [8] allowed the participant to explore a poetic virtual universe. In the form of a vest, this interface provided real-time motion tracking based on breathing and balance. This meant that viewers could inhale to rise and exhale to descend and could move forward or backward in the virtual space by leaning forward or backward in the physical world. Viewers navigated a complex world made of natural forms, such as trees, and synthetic elements, such as three-dimensional Cartesian wire frame grids. Because of the unusual interface, many participants found it parallel to near death experiences, particularly as the virtual world throws you out at the end of your timeslot, by shrinking to a bubble in infinite space.

The public installation of **Osmose** included large-scale stereoscopic video and audio projection of imagery and interactive sound transmitted in real-time from the point-of-view of the "immersant". This projection enabled an audience, wearing polarizing glasses, to witness each immersive journey as it unfolded. Although immersion took place in a private area, a translucent screen equal in size to the video screen enabled the audience to observe the body gestures of the immersant as a silhouette.

Her most recent work, entitled **Ephemere** (ephemeral in French), was also created with a team of designers and programmers and premiered in 1998 at the National Gallery of Canada in Ottawa. Whereas in **Osmose** the immersant could move through a forested glade populated by static objects, in **Ephemere** every object is in a state of flux. Organized in three levels, this new work also makes use of organic and natural metaphors, except that this time an analogy is suggested between nature and the human body. As in **Osmose**, **Ephemere** uses the breathing and balance vest interface to propel the viewer in space, makes creative use of three-dimension sound, and can only be fully experienced with a virtual- reality headset.

VR: Spatial analogues and multi-user environments

In Virtual Reality (VR) the spatialisation of audience, experience is naturally derived from the need for a participatory spatial environment. While the spatial mapping of audience, experience is common in multimedia all the imagery is pre-created. Uniquely in VR, only the model is generated. The audience creates its own individual journey on each engagement. Although the spatial metaphor is a prevalent form in many interactive work, as Andy Cameron points out this is:

More than just the change from a simple line to a more complex diagram or space, it involves moving from one kind of representation to another. [9]

The role of the artist is challenged in the construction of such immersive environments. The action of the artist/ author begins to resemble the designer of a model and, although the artist may describe its properties in great detail, s/he is no longer author of the events set in motion by the audience.

In VR installation Bill Seaman's *Recombinant Poetics* engage virtual reality with audience-directed modes of acco coining the phrase 'vuser' to describe the active participant in virtual space:

"The technologies of virtual environments point to a cinema that is an immersive narrative space wherein the inte viewer assumes the role of both cameraperson and editor." [10]

His **The World Generator / The Engine of Desire** is a generative virtual environment. The virtual interface is comprised of a series of spinning container-wheels and is physically interfaced through a table, track-ball, positioning-ball, and two selection buttons. This interface enables the participant to generate and navigate virtual worlds in real time. One spins the container-wheels and selects from a vast collection of media-elements and digital processes. The media-elements that can be positioned and repositioned in this mutable world include 3D objects, sound objects, digital video stills, digital video loops, and an elaborate poetic text. [11]

The participatory aspect of audience as performer displayed in **Osmose** is also evident in the work of Brenda Laurel, who explored this in her **Place holder** [12] experiments at Banff Centre in the early 1990s, where local Canadian Native Indian myths were incorporated into a multi-user “performance”.

Participants could create their own stories within the broad boundaries set by the artist. Laurel’s work fused improvised theatre with the cutting edge of VR simulation, combining sensor feedback for arms and torso as well as hands and head. The participants could alter their voices electronically to match the mythic characters whose identity they assume, and can swim or fly through the recorded video landscape mapped onto a computer 3D model. The result may in its experimental form have relied solely on the improvisation skills of trained actors, but could potentially allow any user to convincingly construct their own personas. Her extension of drama into Virtual Reality marked an important step in the development of haptic immersive art.

Laurel developed the Placeholder scenario with Interval researcher Rachel Strickland after she noticed that kindergarten children played make-believe roles and switched among them almost at random. Two people at a time can participate in the Placeholder universe. They don white helmets and stand on green circles of indoor-outdoor carpeting in an unobstructed space. Wires run from their headgear to an overhead gantry, leaving them free to move as they view a virtual world populated by whimsical creatures such as a snake, a spider, and a crow. Each person can "inhabit" one of the creatures merely by pushing into the virtual space that the creature occupies.

Seen from the outside, the helmeted figures look absurd, ducking, turning, and flapping their arms as they fly through a computer-generated landscape. "In our experiment", says Laurel, "the main thing we proved is that it takes about 15 seconds to make grown people act silly." But this is a measure of how subjectively real the experience feels, despite relatively crude sound and graphics and a relatively slow frame rate. The images inside the helmets make the players feel as if they're in a huge amusement park where they can soar, perch, and even dive underwater, swapping identities like suits of clothes [13].

In speaking of the pleasures and engagement within VR environments, Janet Murray of MIT Media Lab identified "three key pleasures" that are uniquely intensified in virtual media: immersion, rapture, and agency. *Immersion, she says, is "the sense of being transported to another reality", such as a game world. Rapture is the "entranced attachment to the objects in that reality" - in other words, the addictive trance that gamers fall into for hours at a time. And agency is "the player's delight in having an effect on the electronic world," which is possible because the player is a free agent who can make choices. While these certainly identify the pleasures of the medium, they do not of themselves create the complexity of meaning found in the fixed structures of traditional forms. [14]*

This stripping away of personality is experienced as a liberation by the audience, but, as Sally Anne Norman points out, this is not a new condition, but one endemic to revels, carnival, ecstatic religious ritual and early theatrical models:

Virtual space frees us from social commerce based on face value, enabling us to assume guises and disguises at will. Insofar as behaviour means "how one conducts oneself," this raises a burning question: how can "one" be defined in a situation of free floating identity, i.e. what are the minimum prerequisites for the existence of a perceptible entity, someone who "behaves"? Casting one's cyberself into the virtual ocean means creating a quantum persona recognizable not just for one's virtual counterparts, triggering and enabling cyber intercourse, but moreover recognizable for oneself as prime mover. Hanging onto a kernel of identity fixed enough to uphold exchange, while sounding the mutability favored by cyberspace, calls for a delicate balance.

Many spectacular traditions derive their strength from precisely this balance, where seminal affinities with a mask or persona allow players to fully invest their roles [15]

Telematics and the collapse of distance .

While philosophers such as Paul Virilio imply certain unease with the 20th century collapse of conceptual "distance", many artists greet the physical telescoping of experiential distance with wonder and utopian enthusiasm. The confounding of immediate presence and art is a questionable mental manoeuvre, if the context and content do little more than embarrass or confound the public. Galloway and Rabinowitz[16] created **Hole in Space** in 1980 using a direct video live link installed between LA and NY streets allowing direct dialogue between public in the two locations. People turned out in droves to speak and to and wave at distant friends and relations.

In a lighter frame, Paul Sermon's experiments with telepresence such as **Telematic Dreaming** 1992[17]- an interactive bed where through an aligned projection of a similar bed two people displaced by distance could indulge in interactive foreplay with each other's video ghost. The variety of human behaviours is endlessly fascinating to audiences, but remains close to a 60s Happening. Sermon makes use of an open network structure to offer direct real-time interactive coexistence of multiple participants in a visual/virtual environment. The user actively takes part in initiating as well as processing a story, within a sensory meeting space. His later works have all elaborated on this theme, for example **Water**[18], 1999, commissioned by the Wilhelm Lehmbruck Museum Duisburg for the exhibition *Connected Processes of Art in The Urban Network*. It integrated the telematic interactive communication into a water-based interactive installation and projection screen, within a very site specific narrative, questioning the influence digital technology has on the industrial coal mining area in Germany. The audience could see images of historical footage of miners showering projected onto one side of a curtain of water and on the other side of the curtain, distant gallery visitors pretending to shower -telematically displaced from the actual physical space of the installation, which was sited in an old mine shaft room. [

Other media artists have not been content to transmit mere images of telematic presence. Stelarc started out as a performance artist, who famously suspended his body on meat-hooks in Sydney and New York. From this use of the body as a sculptural object, he extended his performance work to include synergy between prosthetic machinery and his own body, living with an artificial third hand wired to secondary muscles in his arm, actuated with EMG signals, he went on to develop technology inserted into the body (the Stomach Sculpture- a self-illuminating, sound-emitting, opening/closing, extending and retracting mechanism operating in the stomach cavity) and Net-connected (the body becoming accessed and remotely activated by people in other places), allowing his body to be a host- not only for technology, but also for remote agents. Seeing the Internet now as a way of accessing, interfacing, and uploading the body itself, Stelarc maintains that

" Instead of seeing the Internet as a means of fulfilling out-moded metaphysical desires of disembodiment, it offers on the contrary, powerful individual and collective strategies for projecting body presence and extruding body awareness. The Internet does not hasten the disappearance of the body and the dissolution of the self- rather it generates new collective physical couplings and a telematic scaling of subjectivity. What becomes important is not merely the body's identity, but its connectivity- not its mobility or location, but its interface...." [19]

He developed this idea further in 1995 at Telepolis with **Fractal Flesh** event, Paris (the Pompidou Centre), Helsinki (The Media Lab) and Amsterdam (for the Doors of Perception Conference) were electronically linked through a performance website allowing the audience to remotely access, view and actuate Stelarc's body via a computer-interfaced muscle-stimulation system based at the main performance site in Luxembourg.

Although the body's movements were involuntary, it could respond by activating its robotic Third Hand and also trigger the upload of images to a website so that the performance could be monitored live on the Net. During so called **Ping Body** performances,

"What is being considered is a body moving not to the promptings of another body in another place, but rather to Internet activity itself - the body's proprioception and musculature stimulated not by its internal nervous system but by the external ebb and flow of data. By random pingging (or measuring the echo times) to Internet domains it is possible to map spatial distance and transmission time to body motion. Ping values from 0-2000 milliseconds (indicative of both distance and density levels of Internet activity) are used to activate a multiple muscle stimulator directing 0-60 volts to the body. Thus ping values that indicate spatial and time parameters of the Internet choreograph and compose the performances. A graphical interface of limb motions simulates and initiates the physical body's movements. This, in turn, generates sounds mapped to proximity, positioning and

bending of the arms and legs. " [20]

The Body

Stelarc has extended his relationship to the body in numerous other ways. His **Walking Machine (1999)** was a six-legged, pneumatically powered walking machine constructed for the body. The locomotor, with either ripple or tripod gait, moved forwards, backwards, sideways and turned on the spot. It had an exoskeleton on its upper body and arms. It had individual flexion of the mechanical fingers, with thumb and wrist rotation. Stelarc actuated the walking machine by moving his arms. Different gestures made different motions- a translation of limb to leg motion. Stelarc's arms guided the choreography of the locomotor's movements and composed the *"terrifying cacophony of pneumatic and mechanical and sensor modulated sounds...."* [21]

He currently is considering the possibility of constructing an extra ear, positioned next to the real ear. A balloon would be inserted under the skin and then gradually inflated over a period of months until a bubble of stretched skin formed. The balloon would then be removed and a cartilage ear shape inserted and pinned inside the bag of excess skin. A cosmetic surgeon would then cut and sew the skin over the cartilage structure. The ear could not hear but would rather emit noises. Implanted with a sound chip and a proximity sensor, the ear would speak to anyone who came close to it. It would also act as an Internet antennae to amplify RealAudio sounds to augment the local sounds heard by the actual ears. The only barrier to completion seems to be the unwillingness of any plastic surgeon to flout the law.

Orlan is a French performance artist whose use of technology is to broadcast video of her operations where she alters her face by surgically attaching organic prosthetic additions such as horns or a strange nose shapes. Unlike Stelarc, hers is an avowedly feminist stance, resisting the body images promoted by the mass media:

"Carnal Art is self-portraiture in the classical sense, but realised through the possibility of technology. It swings between defiguration and refiguration. Its inscription in the flesh is a function of our age. The body has become a "modified ready-made", no longer seen as the ideal it once represented ;the body is not anymore this ideal ready-made it was satisfying to sign, As distinct from "Body Art", Carnal Art does not conceive of pain as redemptive or as a source of purification. Carnal Art is not interested in the plastic-surgery result, but in the process of surgery, the spectacle and discourse of the modified body which has become the place of a public debate. Carnal Art is not against aesthetic surgery, but against the standards that pervade it, particularly, in relation to the female body, but also to the male body. Carnal Art must be feminist, it is necessary. Carnal Art is not only engages in aesthetic surgery, but also in developments in medicine and biology questioning the status of the body and posing ethical problems." [22]

Agency, independence, and the role of AI.

In the search for narratives and artworks without predetermined scripting, the use of artificial life algorithms is increasingly leading towards the granting of autonomous agency to individual characters. Ken Perlin and

Athomas Goldberg's **Improv** system at New York University; The **Oz project** [23] and Barbara Hayes-Roth's **Virtual Theatre** project at Stamford University have engaged for many years with the problems of "interactive drama" and "liquid narrative". **Oz** is a computer system developed to allow authors to create and present interactive dramas (Bates 92). The architecture includes a simulated physical world, several characters, an interactor, a theory of presentation, and a drama manager. A model of each character's body and of the interactor's body are in the physical world. Outside the physical world, a model of mind controls each character's actions. The interactor's actions are controlled by the interactor. Sensory information is passed from the physical world to the interactor through an interface controlled by a theory of presentation. The drama manager influences the characters' minds, the physical world, and the presentation theory. The goal of the **Oz** project at CMU was to build dramatically interesting virtual worlds inhabited by believable agents - autonomous characters exhibiting rich personalities, emotions and social interactions. In many of these worlds, the player is

himself a character in the story, experiencing the world from a first person perspective. Typically, the player's representation within the world – the avatar - is passive. The avatar performs actions as fully specified by the player and reports events (by, for example, rendering a 3D scene or generating descriptive text)

More recently Naoko Tosa and Ryhohei Nakatsu [24] at ATR research Labs in Tokyo have created Play Cinema, where controllable avatars act under the audience's direction, creating new scenes from *Romeo and Juliet (in Hades)* as the characters journey through the underworld. The dialogue and plot are unconvincing and by no means free-form. At least here gesture recognition and speech synthesis, as well as facial and emotional state recognition software has been fused to create a variety of responses and variations on the basic plot. The neural net software is about as adept as a human observer at detecting emotional nuance in audience response. In an earlier experiment *Muse*, a software agent talked poetry to which the audience responded in set phrases or in their own words. The animated *Muse* responded in turn with emotional expressions controlled through a neural network that also recognised emotional nuances in the audience's own phrases. The responsive nature of such systems opens up a potential new craft for the playwright, where the encoding of mood, emotion, and their syntax takes precedence over plot and traditional forms of narrative technique.

"Interaction based on emotion recognition

The main plot of the story is as follows. After their tragic suicide the lovers' souls are sent to Hades, where they find they have totally lost their memory. The two start a journey to rediscover who they are and what their relationship was. They gradually find themselves again through various kinds of experiences and with the help and guidance of characters in Hades and finally go back to the real world.

(2) Interaction

There are two participants, one plays the role of Romeo and the other Juliet. The participants stand in front of the screen wearing specially designed clothes with attached magnetic sensors and microphones. Their avatars are on the screen and move according to their actions. Basically, the system controls the progress of the story with character animations and character dialogues. The story moves on depending on the voice and gesture reactions of the participants and as described before, interaction is possible at any time. When the participants utter spontaneous phrases or sentences, the characters react according to the emotion recognition results. Consequently, this system can go anywhere between story-dominant operation and impromptu interaction-dominant operation depending on the frequency of the participants' interaction.." [25]

Artificial Life

In the mid-eighties, a lighthearted computer program called **Little Computer People** allowed users to watch and poke at a tiny animated person living in a simple computer house. Ten years later, once the power of computer hardware had advanced by several orders of magnitude, the world's first virtual pets, **Dogz and Catz**, were released. Subsequent versions of **Virtual Petz** offered increasingly sophisticated animation and AI, allowing them to grow into a popular and successful product line that has sold over two million copies worldwide. Since then artificial life creatures have become commonplace, from the dreadfully primitive **Tamaguchi** key chain toy from Japan which became a hugely successful fad, truly making "virtual pets" a household word. Creatures soon followed this, the first full-blown commercial entertainment application of Artificial Life and genetic algorithms. In **Creatures** users are able to train and breed fantasy-like mammals

whose behaviour is controlled by the integration of a neural network, a model of biochemistry and an artificial genome with crossover and mutation

Only a few years ago, the state of the art in artificial life seemed to be at the level of MIT's attempts at programmed behaviours, exemplified by Bruce Blumberg's virtual dog in the **Artificial life Interactive Video Environment** developed at MIT under the direction of Pattie Maes and Alex Pentland, where a computer generated ball-fetching creature was mapped onto a mirror image of the real user's environment.

Norns were even more sophisticated entities, evolving and breeding in virtual environments through genetic coding embedded in software, they have even been known to evolve independently patterned behaviours such as playing collaborative ball games. The artistic exploration of such forms has not been slow to follow the scientific and the commercial versions

Sommerer and Minnoneau have consistently worked with artificial life environments, often controlled through highly physical interfacing. From their **interactive Plant Growing** 1993 where virtual plants grew by the electrostatic reaction of plants to human touch, through to the water-covered interface of **A-Volve** in 1994. A survival of the fittest virtual aquarium where creatures created by the audience struggle to swim, eat and die. Audience attention through touch prolongs the life of the creatures. The advent of a biological interface between real and virtual space had arrived.

In their interactive installation entitled "A-Volve", the Austrian Christa Sommerer, and the French Laurent Mignonneau created a unique metaphor of artificial life by merging tangible and intangible elements. The work premiered at the international electronic arts festival Ars Electronica, in Linz, Austria, in 1994. In "A-Volve" the European duo, currently residing in Japan, allowed digital images generated in real time by anonymous viewers to acquire life-like behaviors and to interact among themselves in a 15-cm-deep water-filled glass pool measuring 180 x 135 cm. Viewers accustomed to traditional computer animation discovered that these animated organisms were unpredictable in their motions and acquired idiosyncratic behavioural patterns in this real-time interactive environment. As viewers approached the installation, in addition to the water pool they saw a pedestal with an embedded touch-screen monitor. Asked to draw freely on this monitor with their fingers, viewers improvised and sketched both the profile and the top view of an artificial organism. Moments later they saw this creature emerge from the depths of the water pool and start to swim with its own unique behaviour and motion pattern. The creature also interacted with other artificial organisms already in the pool in complex ways, following survival rules that included mating and predatory patterns. Viewers could look into the pool and observe the creatures "in the water" because a projection screen formed the floor of the water pool, and the real-time images were projected upward from a video projector embedded in the base of the water pool. [26]

Narrative and Interactive Cinema

It is not surprising that interactivity in multimedia tends to involve trivial 'point and click' actions on the part of the audience. The elevation of interface over content and meaning has rightly been identified by Grahame Wienbren as a product of software dominating narrative form:

"However the structure that appears to have become established is based on the viewer's choosing what he or she wants to see next and in most computer programs this is determined by where on the screen the viewer has clicked or which key has been depressed. The underlying program is organised in a tree structure of image segments with branches at selection points. The main reason for the adoption of this model in my view, is that someone who has invested substantial time in learning a program that takes a specific approach to interactivity, may begin to believe that it is the only, the right, or the best approach"[27]

It is my contention that so-called "interactive" media contain the potential to liberate writers and artists from the illusion of authorial control in much the same way as photography broke the naturalist illusion in art. exposing it not as an inevitable form, but as another set of conventions. It is perhaps more inertia in artistic practice and commission that is ensuring that, although interactive narratives will soon become commonplace through broadcast on cable, satellite, network or CD-rom; such forms as exist often remain unoriginal extensions of spectator modes such as video, or cinema. They can only becoming truly interactive when authors attempt to transcend the established syntax of earlier forms and the platitudes of multimedia and invents a coherent artistic language for interaction.

Grahame Weinbren also proposes an alternative model, a two-way transaction, only partially achieved in his own interactive cinema piece “Sonata”

“The ideal is a responsive representation machine, responsive in its capacity to change according to how the viewer responds to it. With such a machine, a new language of cinematic communication will be possible and a different type of narrative can unfold.” [28]

In Grahame Weinbren’s **Sonata** [29] the viewer can only control aspects of the narration - moving from the murderer of Tolstoy’s Kreutzer Sonata telling his story in the railway carriage, to the events themselves, which can in turn be overlaid with the mouth of Tolstoy’s wife berating the author, references to Freud’s wolf man case, Judith and Holfernes etc. In one sense, Sonata is linear, with time’s arrow pointing forward, but it never reads the same way twice:

For Sonata I provide all the audiovisual materials, and plot a network of potential montage paths through them. Viewers navigate through the piece along these montage paths. However, it is important to understand that there is always a sense of continuity as the image changes, achieved by the same kinds of technique that are used in film editing. My system of equipment allows me to treat sound and image as separate elements, so that sound can change while video continues, or (more commonly) vice versa. The sound (music or dialogue) often continues while the image changes because of viewer input, giving a sense of fluidity to the experience and continuity to the narrative. Relying exclusively on random access does not imply that one must move through a piece in clunky quickstep. [30]

In Jon Dovey’s piece on **The Toybox** CD ROM, ‘The Desktop Theatre of Amnesia’ [30] these techniques of parallelism were tested. The emotional transformations of an unhappy love affair and its visually equivalent symbolic analogues are mapped in front of a matrix of Quicktime mini-movies. A simple click reveals the underlying talking heads, each one narrating a separate epiphany. Like multiple personalities locked inside one mind, but still aware of the others’ presence, they reinforce poetic resonance by proximity and association. This approach has been also employed by practitioners such as and Bill Seaman [31] as a way of neatly side-stepping the strait-jacket of articulated narrative, allowing the audience to set the selection criteria of matching components: thereby creating a form of associative narrative flow. As in a card game, turning up a particular image forces the computer to turn up a matching narrative fragment. Here we begin to approach Weinbren’s responsive “representation machine”.

In 'Database as Symbolic Form' [32] Lev Manovich argues that in the same way cinema privileged narrative as a form of cultural expression, the computer age has privileged what he refers to as 'database form'. As he points out, many new media objects do not tell stories; nor do they have a beginning or end. Instead, they are collections of individual items that have the same significance as any other. Manovich argues that there is a connection between the computer's ontology and the new forms privileged by computer culture. By considering the works of such filmmakers as Peter Greenaway and Dziga Vertov within a tradition he calls 'database cinema', Manovich argues that databases and narratives have merged into a new form that anticipates one of the key problems of new media art.

A brief history of technology, Public Art and performance

In its applications to public art, interactive work often attempts to gain critical purchase through a tension between its electronic space and its physical and mechanical one. Consistent themes and uses for electronic art in public contexts were established early in the century and threads of similar practice may be traced through from Dada, Futurism and Constructivism and the Bauhaus to the present day. Tatlin was playing with motorised architecture in his monument to the Third international in 1920. The distant relationship between artist and architect has also created problems in the proper integration of public art in cities, let alone that of digital art into public spaces. It is no accident that some of the more successful examples of actual or potential public art works using new technology have been produced by architecturally trained artists, most notably Shaw, Moller and Diller & Scofidio.

In researching the origins of interactive work of this nature I was profoundly embarrassed to discover a common tendency (including my own) to repeat the experiments achieved nearly 70 years ago. Worse still much of the technology evident today in public installation works is largely unchanged since the mid-60s! So much of what we think of as innovative was explored in some way during that period. EAT -Experiments in Art and Technology was founded in 1966. By 1969 it boasted a worldwide membership of 3000 artists and 3000 engineers.

EAT's seduction by technology was to culminate in the Expo 70 Pavilion in Osaka. Sponsored by Pepsi it was an attempt to create a "living responsive environment", a non-hierarchical theatre space. It was a reprogrammable space with a giant "mirror room" full of interactive sound areas, a giant fog sculpture and motorised exterior sculptural elements or "floats" by Robert Breer. Innovative work was done with individual wireless hand sets and programmed laser displays. Visitors were responsible for their own experiences. The world of Fluxus and the Happening governed what was little more artistically than "son et lumiere"[33].

One of the most successful works of computer art of the late sixties and early seventies in terms of a fully realised interactive installation was produced by Edward Ichnatowicz. The giant public piece which performed a seminal role in the realisation of what was artistically possible with computing and robotics was the **Senster**. [34] It was an active metaphor playing on an audience's techno-fear and its simultaneous ability to control the products of nightmare remotely. Installed at the Phillips' industrial exhibition Evoluon at Eindhoven in 1971, it represented an extremely ambitious technical and artistic feat. About fifteen feet long and 8 feet high, the Senster consisted of six independent electro-hydraulic servo systems based on the articulation of a lobster's claw, allowing six degrees of freedom. The Senster had a "head" with four sensitive microphones, which enabled the direction of the sound to be computed, and a close range radar device, which detected movement. The whole was controlled in real-time by a digital computer which sent feedback from the movement and sounds of visitors to the Evoluon, so that the servos could reposition the head anywhere within 1,000 cubic feet within a couple of seconds.

Using a predictor, the programme put the machine through a complex series of accelerations and decelerations for the maximum efficiency of motion. The net result was convincingly lifelike in its movements and would shy away from loud noises. Unlike the automata of earlier ages the **Senster** did not try to conceal its inner workings, never the less the public's response was to treat it as if it were a wild animal. The **Senster**, which works on so many levels of meaning and has never been surpassed in a robotic piece.

Contemporary work

This sense of play, curiosity, and inventiveness is reminiscent too of the fairground attraction and in many ways his approach mirrored that of Toshio Iwai whose entire oeuvre including his public art is based on play. In **Another Time, Another Space** created in Antwerp central station in 1993. Toshio Iwai made an electronic hall of mirrors using a tree structure of video screens. The installation featured 15 video cameras, 30 computers, 30 video monitors, and a videodisk recorder. The comings and goings of people through the station were filmed by the cameras, and manipulated in real-time by the computer to deform shape, time reference, and showing a different time-space environment in each movement. Video processing software reflected back crowds like fields of wheat where algorithms interpreted successive layers of crowd as wave-like motions. Sober-suited businessmen leapt and cavorted in front of these magic mirrors.

"I used the "Another Time, Another Space" system to create an experimental event as part of an NHK television program. People passing in front of Shinjuku Station were photographed by a video camera and the images were altered and projected onto the giant Alta Vision screen across the street. It caused a much larger commotion than we expected. The moment the image appeared on the screen, hundreds of people started gathering in front of the station and waving their hands and moving their bodies as they watched their images on the screen. In that moment the big screen that everyone had been taking for granted suddenly became a giant interactive event." [35]

In contrast to this rather formal and monumental project, there have been a number of attempts to create interactive architectural spaces by British artists. For example Simon Biggs with his installation "**Heaven**", commissioned by the European Media Art Festival 1993 for a projection onto the ceiling of the

Dominikanerkirch, Osnabruck, Germany, 18 metres above the viewers heads. The Cathedral uses remote visual sensing techniques to track the viewer. Each viewer was allocated an angel (or demon, depending on location), which followed the position of the viewer on the floor analogously on the ceiling. The viewers actions control not only the behaviour of the angels/demons but also a large range of other images, which are dynamically composed on the ceiling used audience movement to alter virtual architectural features such as angels and gargoyles projected onto the roof space. In the 1993 River Crossings public art project, Susan Collin's **Tunnel**, similarly mapped responsive soundscapes, and video projections into a pedestrian tunnel under the Thames.

Interactive Art and Architecture

If we look next at the possible fusion of physical architecture and public art works, we see another discrepancy. Materials technology in the 1990s is beginning to deliver the means for artist-architect collaborations, which might finally realise some of the 1960s dreams of adaptive or "liquid" architecture. Dreams of groups like Cedric Price's Archigram and later visionaries like John Fraser [36]. The development of electro-heliological fluids which transform from liquid to solid state at the passing of a current, piezo-electrical ceramic which can change colour to order, SMA-shape memory alloys which act like muscles and liquid crystal glass, paint and inks that respond to tiny electrical or temperature changes allow a building or artwork to behave in a biological manner. New research in nanotechnology combined with artificial life programming implies self-repairing and "living" systems grown around human needs.

However, realistically, even at the basic level of combining existing architectural materials with digital artwork, very little has been achieved, although the techniques are already in place, more permanent integration of such work in public contexts remains elusive. An exception to this curious reluctance to engage with new materials is Christian Moller. [37] His pioneering work points the way, with buildings such as the ZeilGalerie in Frankfurt (1992) which changes colour at night according to wind direction and speed, while a sine wave of light ripples its length governed by ambient noise from the street. People gather at night to clap and create sounds that alter the wave. How seriously one should take such interaction as art is another question.

Moller's more thoughtful gallery piece **Electronic Mirror** confounds our narcissism with a distance sensor and electroresponsive LC glass, clouding-over our image on close approach so we are literally swallowed by the glass like digital prisoners-shadowing the original myth. In **Space Balance** (Ars Electronica 1992) a virtual interior architecture mirrors the hydraulic tipping of the viewing platform. The participants can roll virtual balls, which click as they collide by the movement of their bodyweight on the platform. A similar device was used in **The Virtual cage** in Frankfurt in 1993. The viewer dances on the platform in relation to a virtual swarm that interacts with the viewer's movements. This use of a tilting floor is being developed by Grahame Weinbren as a way of allowing audience participation in his interactive films and by Miroslaw Rogola in his 1994 ZKM installation **Lover's Leap**. [38]

It sometimes seems there are as many types of interactive digital art as there are artists. As we have seen successful, practice must place content and meaning above technology. It must achieve "distance" in its true sense of all elements in clear relationship. However, if it fails to engage with the full potential of those technologies, it fails to find the new form and meaning for which all art ultimately strives. The old voices may be saying the same things, but, as always, only the new voices can be heard by the tired ears of the "Public". To quote Regina Cornwell:

"These explorations are crucial to how the world can be re-drawn and viewed in an art whose power is in its open-endedness and polyphony. And for the participant the installation too is hard work. To be meaningfully experienced demands time and serious attention." [39]