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MOISTMEDIA, TECHNOETICS AND THE THREE VRS

BY ROY ASCOTT

Abstract

The dry world of computational virtuality and the wet world of biological systems are converging to produce a new substrate for creative work, moistmedia, consisting of bits, atoms, neurons, and genes. There is also a convergence of three VRs

- *Virtual Reality (interactive digital technology): elematic, immersive.*
- *Validated Reality (reactive mechanical technology): prosaic, Newtonian.*
- *Vegetal Reality (psychoactive plant technology): entheogenic, spiritual.*

At this interspace lies the great challenge to both science and art: the nature of consciousness. A technoetic aesthetic is needed which, in consort with moistmedia, may enable us as artists to address the key questions of our time:

- *what is it to be human in the post-biological culture?*
- *what is the ontology of mind and body distributed in cyberspace?*
- *how to deal with the responsibility of redefining nature and even life itself ?*
- *what aspects of the immaterial can contribute the re-materialisation of art?*

Whilst the world at large is only just coming to terms with the Net and the computerisation of society, another media shift is occurring, whose consequences are likely to be even greater. The silicon dry digital domain of computers is converging with the wet biological world of living systems. The *moist* media emerging from this convergence will be the substrate of the art of this century, as telematics, biotechnology and nano-engineering together enter the working process of artists, designers, performers and architects. Just as globalisation means that not only are we are all connected, but that our ideas, institutions, even our own identities are constantly in flux, so too will *moistmedia* bridge the artificial and natural domains, transforming the relationship between consciousness and the material world. We move fast not only across the face of the earth but across the reach of our minds. Our cyberception zooms in on the smallest atomic detail of matter and pans out to scan the whole universe. Our double consciousness allows us to perceive simultaneously the inward dynamic of things and their outward show. This Zen of cyberception is the consequence of a technoetic aesthetic in which consciousness in all its forms, at all levels, and in all things, is both the subject and object of art. Just as in the past, evolution of mind has always involved the evolution of the body; distributed mind will seek a distributed body. To assist in the embodiment of this connectivity of mind is part of the artist's task, to navigate the fields of consciousness that new material systems will generate, is part of art's prospectus.

What precisely is moistmedia and what is its potential for art? Does this mean placing the horizon of art beyond our sight lines? We may understand these questions best if we see the cultural shift, which they imply, as providing a kind of wormhole into another universe. I think the metaphor is appropriate to the immense cultural changes that I foresee. Let me extend the metaphor by likening the creation of this new universe to the Big Bang at the origin of the universe in which we have been created. The Big B.A.N.G. of this emergent, new media universe is so-named to reflect the combination of **B**its **A**toms **N**eurons and **G**enes which together, in all sorts of relationships, will provide the substrate - the moistmedia - upon which our art and architecture, and indeed or tools and products, will be based.

This Big Bang implies a transition to a much more complex level of human identity, forcing us to look deeply at what is it to live at the edge of the net, half in cyberspace and half in a world which increasingly will be nano-engineered from the bottom up. In this universe the old concept of nature is seen as a set of metaphors which have outlived their usefulness; a

representation of reality, whether poetic or prosaic, which has lost its appeal to our sensibility. Similarly, Dolly the lamb and Alba the rabbit will inform the nursery tales of the new generation, rather than Toad, Mole or Peter Rabbit. Nature is no longer something 'over there' which is to be viewed in the middle distance with a kind of passive objectivity, or abused as an aggressive alien, or treated with dreamy sentimentality. In as much as we are a part of nature, we wish now to be consciously involved in its co –evolution, which is to say in our own self definition and reconstruction. In this sense, technology, often depicted as the enemy of nature, will bring us closer to it, but it will be a nature entirely re-described, and re-aligned to our post-biological sensibilities. This is the territory of the artist; the domain in which reality is to be constructed rather than simply reflected or represented.

The legacy of behavioural, performative, conceptual, and process -based art of the last fifty years has led us to the present condition of artistic action and potential. Amongst the many technological, ethical and aesthetic challenges which we must address, there is the overarching requirement to balance the possibilities for life in the Net with the new forms and relationships afforded by our genetic, molecular and nano-technological engineering.

We are looking at a culture in which intelligence is spilling out of our brains to fill every nook and cranny of the world, every environment, every tool, every product. Pervasive and ubiquitous, the flood of intelligence both human and artificial is unstoppable. At the same time we are coming to recognise that the whole of the natural world is in some sense conscious. The sentience of Gaia is not in doubt. In seeking to create artificial life and artificial intelligence, we have come in turn to understand how consciousness pervades every part of the planet. Moreover, the richness of its bio-diversity need not be threatened by technology, when that technology serves artistic creativity. Instead, it should be seen as a challenge to the cyber-diversity that we might generate as artists in the interspace between virtual and material worlds. This *natrificial* space, product of the merging of the natural and artificial process, is the domain of moistmedia.

But just as we are using new technology to investigate matter and its relationship to mind, so I believe we shall increasingly use an old technology to navigate consciousness and transcendence of the material state. This ancient technology, has been used by shamans for millennia, is the technology of plants, specifically psychoactive plants. I believe that as it becomes more widely understood and experienced, this plant technology will join with computer technology to effect radically our way of being. Together, these two technologies may produce ontology of remarkable dimensions. It will be the point at which engineering becomes ontology. In order to advance an understanding of this hybrid technology, I need to bring a third element to the binary opposition, or parallel positioning, of the virtual and actual in our culture. I am going to call this the triangulation of Three VRs: Virtual Reality, Vegetal Reality and Validated Reality. Now, what do I mean by these three terms?

By Virtual Reality I am referring to much more than a singular technology. Apart from Augmented Reality technology which allows the viewer to see simultaneously both the internal dynamics and the external features of an object of study, VR encompasses a whole ontology of telepresence, of sensory immersion, and immaterial connectivity, which affords the construction of new worlds completely liberated from the constrains of mundane physics. While at first unfamiliar and exotic, 3Dcyberspace is now a common feature of Western culture, and leads to expectations in daily life of completely new forms of entertainment, education, commerce, social gathering, and eventually no doubt, political organisation and democratic representation. Whatever is or will become the case, VR changes the way we view ourselves, the manner of our comportation, and environments we wish to inhabit.

Validated Reality, our daily experience, is familiar to us all. It is what William Blake described as Single Vision, The Dream of Reason and Newton's sleep. It is the orthodox universe of causal "common sense", a reality whose consensus is achieved early in our lives by the constant repetition of its axioms. Validated Reality finds it hard to accept the world views of quantum physics, eastern mysticism, or the many conflicting models of consciousness generated by contemporary scientists, across a wide range of disciplines, in their attempts to bridge the explanatory gap that prevents our understanding of this ultimate mysterium. Those whose minds have been conditioned to accept Validated Reality as the only reality balk at the implications of nano-technology, and have great difficulty in coming to terms with genetic modelling and the scope of biotechnics in redefining Nature. In short, Validated Reality is authorised reality, whose narrow confines delimit the sense of what we are or what we could be. Nevertheless it controls the co-ordinates of our daily life, dictates the protocols of our behaviour, and provides an illusion of coherence in a contingent universe. It has been Validated Reality, which has created Nature as an array of objects set in Euclidean space, rather than a dynamic network of processes and relationships. You need it to catch a bus, but you leave it behind to create teleportation.

Vegetal Reality, the third axis of reality following the Big Bang, is quite unfamiliar to Western praxis, despite the extensive researches of Richard Evans Schultes of Harvard, for example, or the proselytising of the late Terence McKenna. Vegetal Reality can be understood in the context of technoetics, as the transformation of consciousness by technology. In this case, the plant technology involved supports a canon of practice and insight which is archaic in its human application, known to us principally through the work of shamans, largely visionary and often operating in a context of healing which is distant in the extreme from the Validated Reality of western medicine.

It will be through Vegetal Reality, conferred particularly by such plants as the ayahuasca, in consort with telematic systems, that we shall navigate, and perhaps transform, the field of consciousness of which we are a part. Ayahuasca is a Quechuan word referring to the vine *Banisteriopsis caapi*, which consists of the beta-carboline alkaloids harmine, harmoline, and tetrahydroharmine. Combined with plants such as *psychotria viridis*, which contains tryptamine, it is brewed as a tea, which properly consumed brings about visionary states of awareness. The process is described as entheogenic, which means searching for the God within. The god is that repository of knowledge and energy, often described as pure light, which links us on the psychic or spiritual plane to the other worlds and other planes of existence from which are separated by our ordinary state of awareness. It parallels our technological probing for knowledge deep into matter, and our voyages into outer space. I am convinced that the technology of psychoactive plants, aligned with the technology of interactive media, will come to constitute a cyberbotany which will largely be articulated and defined by moistmedia. Entheogenics will guide much of the future development of moistmedia art. Encounters with that which is unknown within us, linking to our design of the new and unknown beyond us, will give interactive art its primary role. Cyberbotany will cover a wide spectrum of activity and investigation into artificial life forms within the cyber and nano ecologies, on one hand, and into the technoetic dimensions of consciousness and cognition on the other.

To stand at the confluence of these three VRs (the Three Graces of our culture) is to take a more participative and formative place in the stream of evolution. We are all familiar with the dialectic between the actual and the virtual, or the real and the artificial as we persist in calling it, even though any real differentiation between these states is fast disappearing. We address nature in terms of artifice and treat the artificial quite naturally. The interplay of natural and artificial systems is becoming quite seamless, just as our mental and physical prosthesis are integral to our being. We are familiar with the notion of interspace, the place at the edge of the net where these two realities come together. We know that it constitutes

a domain, which presents enormous problems and wonderful opportunities, for example to architects and urban planners. We know too the questions of identity which are raised when we find that we can be distributed across the Net. Now, with cyberbotany, we have to bring to these issues the technology of mind, which will induce new, technoetic states of consciousness. This leads us to consider a scenario of being which is non-ordinary, non-local, and non-linear, thereby fusing the three principle features of 21st century culture: consciousness, quantum physics, and interactive/psychoactive media.

Telematic space makes actors of us all. There can be no outside observer. You are either in the space and actively engaged or you are no where at all. The consequence of the Net, even at the popular level, in fact especially at the popular level, is to encourage us to redefine ourselves, to re-invent ourselves, to create multiple identities operating at many locations, distributed throughout cyberspace. There we can play with gender, physical characteristics, and a multiplicity of roles. Similarly, 3D worlds enable us constantly to design the environment in which we can engage through our avatars and agents with others in the game of self-invention. The game is in the full seriousness of understanding how to manage reality, the many realities that cyberspace allows us to create. But our behaviour in cyberspace is both real and a phase transition, a preparation for life in the world of moistmedia. What we once called 'virtual' has now become actual for us, and what was thought to be a immutably 'actual' is treated by us as transient and virtual. The artificial is now part of our nature, and nature is in large part artificial.

Just as the scanning tunnelling microscope (STM) lets us view individual atoms and also move them around at the same time, so too our brains will focus both on material events and trigger their transformation at the same time. In this context, to envisage is to create. The interface is moving into the brain; we see how electronic sensors can utilise biological elements, and semiconductor devices use living micro-organisms. We are approaching that point in our evolution where artificial neural networks will join with our own biological neural networks into a seamless cognitive whole: this will mean a marriage of the immaterial and the material leading to transcendence over the simple materiality of 'natural', unmediated life. Self aware systems invested in self-replicating, self-defining structures will raise questions about the nature and purpose of art, just as artificial life technology, complexity and algorithmic process have already raised questions about authorship. It will be the role of research centres and media art centres to bring these issues, through the vision of artists invested in moistmedia, to the public arena.

Artists working with technology are already bringing matters of mind and consciousness to the top of their agenda. And in the sciences the pursuit of knowledge in the attempt to understand consciousness is intense. For example, in Tucson Arizona, every two years, nearly a thousand leading scientists, technologists and philosophers from all over the world assemble to present their research and discuss the issues raised in the attempt to build a science of consciousness. At my research centre CAiiA-STAR we convene the conference Consciousness Reframed every year, which has over one hundred presentations by artists and scientists from over 25 countries. The issues in every case are: how does technology affect consciousness, how does our understanding of the mind influence the technological and artistic goals we set ourselves. But the "explanatory gap" between mind and matter remains. While scientists seek to analyse, dissect and explain consciousness, artists attempt to navigate consciousness and create new structures, images and experiences within it. Consciousness is a field where art and science can co-mingle, where together we face what is perhaps the final frontier of knowledge - consciousness, the ultimate mysterium. It is also of course precisely what shamanic culture has been immersed in for millennia

Though the shift from a predominantly immaterial, screen-based culture to the re-materialisation of art in moistmedia and nanotechnological construction will be radical,

the cannon of interactive art is not changed intrinsically. Even though art practice will move from pixels to molecules, from fly-through itineraries to bottom-up design, the five-fold path of *Connectivity, Immersion, Interaction, Transformation, Emergence* will not change. Our media may now become moist, our environment will reflect the fall-out of the Big B.A.N.G., but the artistic process will continue to follow the pathway that leads from connectivity (between minds and systems) to immersion in the data/nano-fields. We shall still plan interactive scenarios that lead to the transformation of matter and mind, and the reframing of consciousness. We shall continue to plant artistic seeds that can lead to the emergence of images, structures, and relationships that provide us with new insights, experiences and meaning.

In the moistmedia environment, the artist will continue to be concerned to create the context within which meaning and experience can be generated by the interactivity of the viewer. Work with pixels and telematic networks will interact with work with molecules and biological structures. Process will still be valued over product. Reception (from the artist to the viewer) will continue to give way to Negotiation (between artist and viewer) in the theory of communication. We shall continue to celebrate the contingency of the world over and above the killing cosiness of unfounded certainties. Working with moistmedia will reinforce our understanding that reality is to be actively constructed rather than passively observed. The classical model of the Autonomous Brain gives way to that of the Distributed Mind. Telenoia will remain as the defining emotion of our time, just as paranoia so succinctly describes the dominant attitude of industrial life in the twentieth century. Finally, in reviewing the continuity of the aesthetic in art from the digital to moistmedia, we shall continue to be concerned with forms of behaviour rather than with the behaviour of forms. The historic shift from the culture of the objet d'art and the composition of meaning to that invested in process, performance and the emergence of meaning will be maintained and enriched in the moist ecology of art. So this radical shift does not mean rupture or loss of those aesthetic assets and insights built up in art over the past fifty years; instead it means a development which can be enriched by recognising its links back into the practices and purposes of quite ancient cultures, indeed to aesthetic and spiritual values found in early societies throughout the world.

Research into these values and the societies which still uphold them, means immersing oneself in their practices. For my part, I have spent time over the past six years, in various parts of Brazil in search of that kind of experience and for an understanding that will allow me to make a connection between the non-ordinary states of consciousness of early cultures and states of consciousness that new technologies might engender. I have pursued this research on the basis that it might provide useful insights into the ways we might proceed with computer applications designed to extend, transform or emulate the human mind. Three years ago, I flew into the remote Xingu River region of the Matto Grosso, where I stayed with a group of Indians known as the Kuikuru. While their shamans (or pajés) played different roles - medical, social, or spiritual - they all had in common the need to navigate psychic space, to communicate with other worlds, both within themselves and out in the external world of plants and animals.

I wanted to share my experience of navigating cyberspace with them, to see if there were any commonalties, anything either of us could learn from the other. I knew nothing then of their most formative technology just as they knew nothing of mine. While mine was invested in the interactivity and connectivity of telematic, computer technology, theirs was invested in the psychoactive and telepathic technology of plants. It was the first intimation of the correspondences and perhaps co-ordinations I was later to theorise between the two VRs, virtual reality technology and vegetal reality technology. I should hasten to add that the prescient pajés of the Kuikuru quickly saw the implications and promises of cyberspace, and on a purely pragmatic level quickly came to the conclusion that the Web could help save their culture, avoiding the contagion of tourists and speculators, by

restricting visitors to a website, to visiting their village in cyberspace, thereby protecting them physically from the transmission of disease and their culture from invasive ideologies. They saw quickly saw how it could also function as the market place for trading their artefacts and craftwork, making them more independent of FUNAI, and government interference more generally, and removing the need of the bi-monthly airlift to trade in the city.

What I learned from them was particularly significant for interactive art. I believe it is a lesson we could learn also from many other non-westernised or aboriginal groups in Asia, Africa, and Australia. All the activity of the pajés, and of those who interact with them in painting, dancing, chanting, making music, is performative but is not intended as a public performance. It is never played to an audience, actual or implicit. No one is watching or will be expected to watch what is being enacted. It is not a public performance but a spiritual enactment, which entails the structuring or re-structuring of psychic forces. To paint the body elaborately, to stamp the ground repeatedly, to shake the rattle, to beat the drum, to circle round, pace back and forth in unison, is to invoke these forces, to conjure hidden energies. This is an enactment of psychic power not a performance or cultural entertainment. This perspective, although seen at a distance from our current hypermediated culture, may be of value in our consideration of the function of works of interactive art. Art as an enactment of mind implies an intimate level of human interaction within the system, which constitutes the work of art, an art without audience in its inactive mode. Eschewing the passive voyeur, the traditional gallery viewer, this technoetic aesthetic speaks to a kind of widespread intimacy, closeness on the planetary scale. It is the question of intimacy in the relationship between the individual and cyberspace, which must be at the heart of any research into technologically assisted constructions of reality. The quality of intimacy in the relationship between artist, system and viewer is of the greatest importance if a technologically based practice is to engage or transform our field of consciousness.

So much early promise of art at the interface (be it a screen or a prepared environment or intelligent space) has been lost: that direct mind-to-mind experience of subtle intimacy, has been wrecked by an indulgence in spectacle, mere special effects. While the art of special effects is in some ways the glory of our technical achievements, it can be disastrous for the artist, just as hyperbole and inflated rhetoric can be for the writer. Progressively we have seen intimacy and delicacy in technological art being replaced publicly by heavy-handed spectacle. Why? I think in part the museums have been to blame. In their haste to appear contemporary and up to date, they have simply rejigged the partitioning of their endless white cubes, as if all interactive art needs for its proper installation is more wall sockets to plug into, and lower light levels to show up the screens. So the user of these one to one interactive installations simply becomes part of an “interactive” performance that other viewers passing by can observe….as a spectacle. There has been little re-thinking of what the museum might be in the wake of digitalisation and the rise of connectivity and interactivity in the arts. The advent of Vegetal Reality as a constituent technology of interactive art will compound the complexity and increase the need to preserve intimacy in the manipulation and experience of the work. There is a challenge here to all new art centres and museums, for which answers are not readily available, and for which no quick-fix solutions will be suitable. Only careful negotiation between curators and artists, designers and technologists in a truly transdisciplinary research and collaboration, is likely to move in the right direction.

The key to understanding this new state of being is language: the understanding that language is not merely a device for communicating ideas about the world but rather a tool for bringing the world into existence. Art is a form of world building, of mind construction, of self-creation, whether through interactive or psychoactive systems, molecular modelling or nano-engineering. Art is the search for new language embodied in forms and

behaviours, texts and structures. When it is embodied in Moistmedia, it is language involving all the senses, going perhaps beyond the senses, calling both on our newly evolved cyberception and our re-discovered psi-perception. As this language develops we shall see that it can speak to individuals in all kinds of social settings, notwithstanding their political complexion or cultural constraints. These individuals in turn will contribute to the construction of this planetary language through their interactivity with the new scenarios and constructions that new media artists will create. The art of the 21st century will constitute a language, which builds the world as it defines the desire of those who articulate it. If 20th century art was about self-expression and response to experience, the art of our century will be about self-construction and the creation of experience, with no clear distinction between the maker and the viewer.

Moistmedia is transformative media; moist systems are the agencies of change. Western art has been through what its many theorists and commentators have chosen to see as an extended period of materialism, attaching no significance to the spiritual ambitions of its featured artists, and ignoring the everyday intuitions and psychic sensibilities of those hundreds of thousands of artists who have found no place in the history books. Art in reality has always been a spiritual exercise no matter what gloss prevailing political attitudes or cultural ideologies have forced upon it. The role of technology, virtual, validated and vegetal, is to provide the tools and media – moistmedia – by which these spiritual and cultural ambitions can be realised.

NEW LABYRINTHS AND MAPS: THE CHALLENGE OF CYBERSPACE'S ART

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Theme: New arenas of revelation

In this multidisciplinary article I explore some particular aspects of cyberspace's aesthetics. My claim is that the ancient studies of maps and labyrinths could help us to better understand and deeper interact with the complex virtual spaces of our digital era. The concept of cyberspace, usually conceived only as an informational network, sustained by computers and telecommunication technologies, must be reviewed. We must enlarge the notion and foreshadow the cyberspace as a space in which people interact, inhabit and transform themselves. The old labyrinthine wisdom tells us that the one who makes the labyrinth isn't the architect, but the walker who ventures himself inside it. The same point is fundamental in the studies of maps. A map is just a representation of a territory and we need a lot of different maps to start to glimpse a place. Besides, we should distinguish the map conceived just as an elaborated diagram of a philosophic and conceptual map. Since Deleuze e Guatarri, in *Rhizome*, map is something much more dynamic, that is always in transformation. In this sense, we should say that the conceptual map is created after a personal and subjective journey. Because, as we know from our personal experience, even when we have an excellent graphic, other geographies, other spaces emerge from our activity. The great challenge is: how could the net artists create new maps and labyrinths?

This article was born from the urge to find an answer to the following questions: can we map the cyberspace? What kinds of maps are being created? Do these maps have any use? Do they rescue their old function, which was to help the navigator? At first sight, the task of making a map of cyberspace's changing labyrinths seems very difficult. We will see many examples where cartography's target is the creation of visualizations that help the user in their locomotion within informational space. Other maps only show Web data flux. There are maps whose function is to situate the number of machines that are connected to the networks. And what about navigation? Is it possible to record it? Several projects try to represent the labyrinths created during the course; in other words, they supply us with the maps of visited sites thinking about future revisiting. Moreover, there are diagrams that map the infrastructures behind WWW, such as satellites and submarines networks. These maps, as they reveal how cyberspace actually functions, are like X Ray images of what gives structural support to the Big Web. To start our discussion about cyberspace's maps, it is necessary to first go back to the past, in search of the origins of cartography's art. We will then discuss about cyberspace's labyrinthine nature as a short introduction to these magic and complex spaces. Therefore, I invite you to follow me on a sinuous, funny and seductive route: the study of labyrinths and their maps.

An introduction to cartography

One of human oldest necessities has always been the visual representation of questions that touch deep and complex feelings. As do attest the many paintings of flocks found in caves, human beings have recorded into drawings what they consider important since the prehistoric ages. Cartography, the science and art of elaborating maps, charts and plans, is one of the oldest manifestations of culture. Some authors consider that the development

of making maps is older than the ability of writing. Among the oldest known examples, the Babylon's maps, dated of approximately 2.300 BC. On the specimen that belongs to the British Museum of London, we have on a clay tablet the representation of a river flowing out through a delta and flanked by mountains.

Through their historical development, maps have appeared on stones, papyrus, metal, skins, etc. The ancient Egyptians have created beautiful maps 4.000 years ago. We owe the true foundations of scientific cartography to the Greeks. We inherited from them: the spherical conception of the earth, the existence of the poles, the Equator line and the first system of latitude and longitude. The greatest Greek geographer was Claudius Ptolemy (AD 90 to 168), author of the classic treatise *Geographia*, a collection of several maps and a map of the world.

Figure 1: Ptolomy map.

Inexplicably, during the Roman Empire, there are no great advances in the cartographic area. In the Middle Ages, we can find wonderful maps. From this period, we have many illustrative drawings and allegories. The famous maps known as T-O come from this period. The name T-O has been given to these maps because they are composed of two circumferences, one external in the shape of an O and the other internal, divided in the middle, composing the letter T. These maps are circular, Jerusalem being their center. The T-O maps are oriented to the east: Asia is thus represented on the upper part of the T, Europe is situated to the left and Africa to the right. With the crusades and the advances of maritime commerce, the maps became more sophisticated. One of the oldest cartography's schools, created during the reign of Charles V, the Wise, in Spain, has produced the Catalan Atlas, in the year of 1375. In the 14th century, a great period for navigation, Sagres School appears in Portugal, that produces beautiful charts.

The invention of printing will revolutionize the art of mapmaking. With the printing, maps became available to a great number of people. We must keep in mind that, before this invention, it was necessary to copy maps by hand, a very laborious and sluggish work. Copied maps were first taken from wood blocks and then, from copper plates. At this time, maps were colored by hand[1].

The oldest convention adopted, the circle, belongs to the 16th century. This convention designate urban agglomerates. Until them, the medieval cartographers had been using bulwarks. When Holland becomes a commercial and naval center, in the late 16th century, we meet the figure of a famous geographer, Gerard Kramer, known as Mercator[2]. His maps are notable especially because of his creative calligraphy. Another distinguished

[1] The ancient maps were always printed on black and white. Colors only started to be used in the end of 19th century. Nevertheless, many of the maps were colored by hand. There even was the colorist trade, because of the importance of the color to the signalizing.

[2] Gerard Mercator, the father, published a chart collection – *Atlas sive cosmographicae meditations de fabrica mundi et fabricata figura* (1585-95) where we see the illustration of the titan Atlas, that mythological figure that was condemned to carry the world on his back. This image became the synonym of this kind of publication. Nowadays, there is um software developing Internet maps that is called *Mercator*.

cartographer appears in the 18th century, the German Humboldt. His main contributions were maps of distant regions, such as New Zealand and Australia. During the next centuries, cartography keeps on evolving, in search of a greater accuracy, and technological development has allowed many new processes of obtaining data.
Nowadays, maps are classified according to their destination, their subject, the level of details and the size of the represented area. We can therefore examine the following points:

1. Area
The first fact to be analyzed is the represented area. Maps are usually divided into:
1.1. Terrestrial maps
1.1.1.World Maps: make possible the visualization of the whole Earth.
1.1.2.Specific Maps: represent a delimited slice of territory.
1.2. Astronomic or Sky Maps
1.3. Marine Maps (among others)

2. Scale
Maps use different scales that are normally indicated on the bottom part of the representation.

3. Size
The size of the map in variable according to the intended purpose and level of details.

4. Purpose
This is the topic where cartography classification becomes more complex:
4.1. Topographical Charts
Topographical charts include data gathered through field research, planmetry, altimetry and aerophotography. They are extremely precise and governments mainly use them on strategies and military logistics.
4.2. Geographical Cartographies
They are created by private companies and they are available to the public in general. Their charts normally come into reduced scale; the contents are simplified and generalized.
4.3. Thematic Chart
We have here the case of the diagram, with a conceptual and informational purpose. The thematic charts represent specific facts or phenomena – political, biological, statistics, physical, etc.
They can approach concepts and subjects that are in constant and continuous transformation, as migration fluxes, forest destruction, etc. Generally, the diagrams that support the information contained on the thematic chart are extracted from the geographic cartography. They are also denominated cartograms.

A labyrinth typology

Labyrinths are images that have persisted in the history of humanity since millenniums. This long, continuous and mutant permanence unveils to us deep questions of human thought. More than the common sense is used to define; the labyrinths are signs of complexity. The greatest allure of labyrinths may reside in the fact that they are paradoxical and propose, each one in its own way, opposite and varied logics.

When one speaks about labyrinths, it is good to remember that besides human constructions, there are also natural labyrinths. Among them, the caverns and the caves that, with their narrow passages, propose us trace difficulties. The shells, exemplar image of the spiral theme, are other fecund source of daydream and reverie. The flowers, and their mandalic constructions, the leaves, the roots and the rhizomes are also natural

labyrinths. Labyrinth is present in our own body, in many of our organs such as the brain, the inner ear, and even at the fingerprint, unique sign of our identity.

The labyrinthine imaginary is present in several periods of mankind. One of the oldest graphical representations dated from the neoliptic age and is found in the cave of Valcamonia, Italy. Among antiquity's labyrinths, there are the Egyptian (totally destroyed, whose original plan was reconstructed by the English archeologist Flindres Petrie, in 1888) and the Cretan (immortalized by the mythical narratives of Theseus, Ariadne and Minotaur).[3]

The sense of labyrinth has been transformed throughout time. In the Egyptian case, we have a magnificent and majestic construction, as space dedicated to the protection of the sacred. The Egyptian labyrinth was, at the same time, sanctuary and monumental representation of the power of pharaoh and sacerdotal class.

On the other hand, the Cretan labyrinth is a prison and a shelter for the monstrous. We find this thematic in nightmares producing dark and tortuous corridors, facing a double challenge: to find the right path and kill the beast.

The labyrinths built in gardens' spaces however propose another question, and another logic. In the case of Versailles' labyrinth, for example, the idea was not to question, to puzzle or to confuse visitors.[4] The propelling purpose, that led the architect to plan garden alleys, was to provide people with fun. To emphasize this character of delight, he placed among the flowerbeds many sculptures featuring scenes of Aesop's fables.

It is therefore impossible to think of a general concept that would define the labyrinth in a single word. The classic definition of a labyrinth being such a difficult and intricate construction that the walker often loses his sense of direction and meet difficulties to reach the center, corresponds to one type of labyrinth only, and reduces the complexity involved in this theme.

Let's examine a case where the pilgrim does not have to face any doubts or question which path he should take: the labyrinths built on the ground of medieval churches, such as Chartres and Amiens cathedrals. We can say that these labyrinths do not present any problem about decision taking, as they offer one-option paths only, without any branches. Different from problematizing mazes, this kind of drawing does not present any division throughout its course. Therefore, *one-course* labyrinths do not offer the visitor any free choice. As there is no path to be chosen, there is no possibility to get lost, and the visitor only has to follow the circumvolutions, in and out, as they have been conceived by the architect. However, these beautiful diagrams had a deep spiritual meaning to the faithful. There were more than mere ornamental drawings: the novice who walked through these labyrinths while he was praying, tried to reach a supreme state of mental concentration. To walk through these labyrinths was a quest for a sacred space, a substitution to a pilgrimage to Holy Land.

According to our proposition of elaborating a labyrinthine typology, this kind of labyrinth would be the first: without any forks, also called *one-course* labyrinth.

The second type of labyrinth, maybe the most frequent in stories and legends, corresponds to a labyrinth with crossroads. I will not spend much time on this type, as the

[3] For a detailed study about these labyrinths see Leão, 1999.
[4] The Versailles Labyrinth was constructed by J. Hardouin-Mansart for Louis XIV, in the latter part of 17th century.

latter has been the object of thorough research in my previous book. We will however examine some points of interest for our current discussion. In labyrinths with crossroads, the use of schemes to pave the path, such as *Hop o' my thumb's* pebbles or a leading thread (Ariadne's thread), are extremely useful to whom does not want to become lost. However, we have to remember that many artistic works in hypermedia consider the art of getting lost as a poetic stimulus (see web art works of *Jodi*[5] and *Landsbeyond*[6]).

Cyberspace labyrinth belongs to another class, another typology. It maintains characteristics of the first kind as well as of the second kind, but it goes beyond. We are here facing a rhizome-type labyrinth. A rhizome can be connected in different directions and from each of its points - so does WWW. A rhizome does not have one center only, we have got a center in all its points. Some authors refer to the very mind as an example of rhizome-type labyrinth.

Reflections about the concept of maps

In the studies about labyrinths, the concept of maps is a quite important topic. When we think about labyrinths, different possible maps do exist. The first one, the easiest to conceive, is about the plan, the project of the labyrinth constructed at the moment of its conception. When a labyrinth is rationally thought in order to be built, it is reasonable that a map, or a project for its realization, would exist. But, as we have already seen, thousands of labyrinths have been created spontaneously and in these cases, no pre-drawn maps do, a priori, exist. A second possible category is about maps created from the discovery of a space that is being walked over. These diagrams, these travelers' maps, are registers of the wandering into the unknown, into what has been met by chance, through search and observation. We thus can start this reflection with the statement that two possible map categories may exist: the first about the ones that are created and elaborated within imagination, by a thinking mind that has got a panoramic and global view on the ground where the labyrinth is going to be realized. The second category includes a kind of map that is being created by the one who enters the labyrinth, the *penetralias*, the one who walks over an unknown space and records his/her observations.

In common sense, we usually mix up the concepts of maps and visual representation of labyrinthine space. Deleuze e Guattari (1995:22-23), in an attempt to differentiate the two concepts, gave to the representation the name *decalque*. Most of the time, the labyrinth traveler does not even know the decalque, that is to say, he has no panoramic and global vision of the whole space to be walked over. Therefore, during the wandering, he can only count on information that will be locally collected. The great challenge of this labyrinth is try to re-build mentally the walked-over space, in an attempt to extract from apparent chaos some sense of order and coherence (Leão, 1999:133). However, even when the pilgrim can count on the help of a graphic representation of space, we know that other geographies, other characteristics and peculiarities are not present in the diagram. These geographies, despite being included in the represented space, go further and multiply spaces and unfold during the walking. The fact is, beyond the represented spaces, other spaces exist and coexist, that are impossible to be reproduced in their complexity.

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[5] http://www.jodi.org

[6] www.distopia.com/LandsBeyond.html

We can thus conclude that maps, as constructions in constant metamorphosis, belong to the sphere of acquired knowledge, incorporated in lived experience. Maps, as cognitive hyperspace, is very different from fix visual diagrams /sketches, because they belong to the universe of transformations and interconnections. Maps can only be apprehended through the walking and the oscillating movements between local order and global order, going in and out, perceiving and rationalizing. Let's observe now a cope of the most recent attempts to represent and visualize cyberspace.

Maps and conventions: a glance on ancient maps

My research on cyberspace started in the early 90s. But I have always had a passion for ancient maps. What I think most charming about these maps is the reflection on how they have been conceived and created, so different from the conventions we are used to find during geography classes. It is unbelievable to think that, with the progress of naval art, courageous men would venture into unknown oceans, sometimes with the only help of hand-drawn maps, beautiful ones, however partially or totally deprived of information about where to go... On these ancient maps, it is common to find practical information, such as bays and mountains, as well as imaginary elements, such as sirens and dragons. Besides, the vast ocean spaces were often occupied by elaborated and sophisticated calligraphies. These elements seem to tell us how much the unknown could be scaring, enigmatic and a ground for the most incredible fantasies. The evolution in boat construction occurred in parallel to cartography evolution. In order to be possible to move forward to unknown territories, the already visited ones needed to be registered. Ancient maps signaling reveals this purpose and theses concerns. In cartography evolution, we can see the appearance of scales, colors, sea topographic details, mountains, hills, lakes, rivers, titles and legends, among other signaling elements.

The marking of cardinal points, for example, is fundamental for orientation. Even if we are now used to draw maps locating north in the upper part, there is no logical reason to do so. Ancient medieval maps used to put east on the top of the drawing, as homage to sacred places of the Orient. The very word *orientation* originates from this sacrosanct positioning. The procedure of using north to orient maps has been established in Italy, but, by the beginning of 19th century, examples using other orientation are still frequent (Hodgkin, 1971:9). These and other examples make us aware that our cartography, the one we are so much used to, is the result of conventions that have evolved throughout history.

One of the visions that had the strongest impact on my life has been that of the gallery of ancient maps during my visit to Vatican. The famous Vatican maps were painted at the time of Pope Gregory XII, 1572-85, in the heart of the Renaissance. The author of the paintings was Egnizio Danti, cosmographer and a Dominican friar. In the Galleries, we can see 40 maps of Italian harbors, two walls facing each other, composing the largest cycle of cartography images of Europe. According to Lucio Gambi, geographer of Milano University and author of the book *The gallery of maps in Vatican*, the series painted by Danti shows supreme geographical accuracy. Even if I was not aware of this technical information at the first moment, the observation of these maps made me thoughtful. It was as if they were in front of me the ample proof that men use conventions in order to try to represent the world in the most accurate way. Besides, the gallery of maps was an obvious demonstration of how conventions become obsolete. In spite of Danti's efforts to register in a clear way the data of the portrayed cities, his work was rambling, submerging in minor details, in stylized landscapes that did not make any sense, however beautiful they were.

I could thus look at Danti's paintings seeking aesthetic delight, as improved paintings, as pieces of sophisticated transparences**,** however, I could not grasp any sense of map, of cartography. Over the years, my attraction to ancient maps have not vanished, on the

contrary. I started to understand something more. Obviously, the Vatican maps were still disturbing me, but they were now telling me other stories. I was more controlled and calm, and therefore able to listen to their message. Although and because the sense of strangeness produced by these maps has been deafening, they teach us that our cartography conventions are not the only ones. It is maybe time for us, as we venture through the exploration of new and unknown territories such as cyberspace, to think and seek other kinds of representation, other maps.

Maps and representation of cyberspace

History

When we think in cartographing cyberspace, the great challenge seems to be: how to represent this large and changing territory, that transforms itself continuously? This challenge has been a stimulus to many people, among them, scientists, engineers, and obviously, artists.

The oldest cyberspace maps are now an important source of information and their data reveal surprising aspects of Big Web's evolution and developing. *Internet History* (1962-92)[7], timeline that shows a collection of old Net maps, is a classic reference for people who investigate historical aspects of the WWW. Other maps, curious and fundamental to the comprehension of the Internet chronological development, can be found in ARPANET[8] files.

An excellent starting point to check what has been done about this topic is the site *An atlas of Cyberspace*[9] by Martin Dodge, a researcher for the Center for Advanced Spatial Analysis - CASA -at the *University College of London*. This site shows a collection of different kinds of maps - with comments and respective links, lists of discussion and articles about the topic. Another interesting address, with maps and articles, is Omnizone[10], developed by Yu Yeon Kim and Stephen Pusey. Intending to show maps of digital culture from individual perspectives, Omnizone counted on the participation of artists, curators, scientists, programmers, etc. Many of the maps that I will comment have been found in these two sites, although others have appeared as a result of the search engines.

The research on cyberspace maps developed into three phases. I first listed all the sites and programs that aimed the visualization of the Internet. The second step included visits to the sites, downloads of software and practical experimentation. I confess that it has been a hard work, but there was no other way to find and understand these maps and their functioning. The final phase was the classification of the maps into categories, that is to explain their basic differences, regarding not only their purpose but also, and mainly, the contents to be cartographed. It is clear to me that the most important criterion for the

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[7] http://www.computerhistory.org/exhibits/internet_history/index.page

[8] http://som.csudh.edu/cis/lpress/history/arpamaps/

[9] www.cybergeography.com

[10] http://www.plexus.org/omnizone/omnizone.html

differentiation of the many cyberspace maps is the observation and the analysis of what each of them intend to represent.

A classification of cyberspace maps

1. Infrastructure maps

This category includes the representation of the structural webs that turn possible the emergence of cyberspace. They are unbelievable, splendid and surprising. Among the most fantastic ones, are maps of satellite webs and submarine communication cables. I also discovered maps of the planning for future optical fibers webs. Besides, I have to mention the *Maps of Internet Service Providers, ISP*, that show diagrams of the providers, the links between them and the users of the web.

2. Traceroutes maps

The *traceroutes* explore the directions followed by the data between the place they are filed and their arrival to their destination computer. It is quite interesting to see the paths information walks on before it reaches us. Trace routes unveil the hidden world of Internet.

2.1. NetBird [11] : this program provides us maps that originate from commands of traceroutes realized by different computers of volunteers connected to the web. These paths create a dynamic and self-organized diagram.

2.2. Skitter[12]: software em JAVA from CAIDA – Cooperative Association for Internet Data Analysis, at the Center of Super Computers of California University in San Diego. The Skitter measures and visualizes the paths followed by the data when they leave their source until they reach they many destinations. In spite of its abstract shape, it is a very useful map for the identification of critical paths, being thus a fundamental tool to web engineers.

2.3. SCAN[13] :this is another program that produces maps of the traceroutes. The Scan emphasizes the topological relationships. It addresses to big, dynamic and homogenic webs. It is a useful tool to isolate problems on traffic routes.

Figure 2: Map created by Skitter software.

Figure 3: Map generated by SCAN.

3.Websites Maps

Websites maps are quite useful and frequently used in the case of vast and complex sites. Among these maps, some have been created to help internauts' navigation on the site and others in order to help the administrator of the site and the Webmaster. Paul Jahn wrote an interesting and profound article about this topic. Some examples:

[11] http://home.sol.no/~ggunners/NetBird.html

[12] www.caida.org/Tools/Skitter

[13] www.isi.edu/scan/scan.html

3.1.Dynamics Diagrams, or *Z-diagram*,[14] : are interactive maps written in Java. They use the metaphor of files archiving and can be visualized in a projection.

3.2.Site Lens[15]: developed by the group of Research for Information visualization of Xerox, PARC. These maps indicate the main knots and the respective links of large Websites. The differential of these maps is the visual composition that reminds of the images we obtain using fisheye lens.

3.3.User Interface Research Group[16]: also from Xerox, PARC, approaches the structures and the contents of large websites from the angle of evolving ecology. Without any doubt, the research led by Ed H. Chi and Stuart K. Card is extremely revolutionary and innovating and suggest interesting paths. Their ideas can be checked in the article *Visualizing the evolution of web ecologies* [17].

Figure 4: H. Chi e Stuart Card's Maps, from User Interface Research Group.
They reveal the development of webs.

4. Surf Maps

These maps are very curious and useful, as they allow internauts visualize their paths, rescue parts of the navigated route, or even go straight to sites of direct interest.

4.1. WebMap[18] : developed by Peter Dömel in 1994, reminds of old hypertext visual diagrams. WebMap uses numbers to indicate the sequence followed in navigation. It has been presented during II WWW International Conference.

4.2. WWW Graphic History Browser[19] : created by the pair Eric Ayers and John Statsko in 1995, organizes the trajectory created throughout navigation into a conventionally structured diagram with one advantage however: the sketch is made of little rectangles that reproduce the image of the accessed pages. It has been presented during IV WWW International Conference.

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[14] http://www.dynamicdiagrams.com/

[15] http://www.inxight.com/Demos/SLS_Demos/Site_Lens_Studio_Demos.html

[16] http://www.parc.xerox.com/istl/projects/uir/default.html

[17] http://www-users.cs.umn.edu/~echi/papers/chi98/1997-09-WWW-Vizualization4.pdf

[18] http://www.tm.informatik.uni-frankfurt.de/~doemel/Papers/WWWFall94/www-fall94.html

[19] http://www.cc.gatech.edu/gvu/internet/MosaicG/MosaicG_1.0_about.html

4.3. Eastgate Web Squirre[20]: program developed by Mark Bernstein from Eastgate Systems that allows to organize visually different cyberspace sources of research such as URLs, emails, newsgroups, etc. Squirrel works with the metaphor of the *farm*. Each *farm* is a file used by the program to map informational spaces. The *farms* allow many different kinds of data structuration. The main idea is that the user keeps on filing, *cultivating* and organizing *farm* elements. Besides, the *farms*, being registers, can be shared with other users. To summarize, Squirrel is software that helps organize visually information obtained during navigation.

4.4.Internet Carthographer[21]: from *Inventix Software* company is a software that works together with the browser. It classifies and maps all visited page. The visual aspect of the map is abstract, showing different points scattered on the screen and crossing lines. At the side of the visual map, there is a summary of informative data.

4.5.Natto View[22]: by H. Shiozawa and Y. Matsushita, from University of Science and Technology of Keio, Japan, allows a three-dimensional visualization of navigation.

4.6.WebPath[23: developed] by Emmanuel Frécon and Gareth Smith from Lancaster University. It presents a three-dimensional visualization. They are complex and sophisticated maps. More information in the authors' article "WebPath - A three-dimensional Web History"[24], presented in 1998, during *IEEE Symposium on Information Visualization (InfoVis '98)* in Chapel Hill, EUA.

Figure 5: WebPath Map. It presents three-dimensional visualization.

5. Internet Visualization Maps as a whole.

5.1. Visualization Studies - NSFNET[25] - by Donna Cox and Robert Patterson, 1992. These maps use geographical metaphors and try to identify the presence of hardware connected to WWW.

Figure 6: Map by Donna Cox and Robert Patterson.

5.2.Matrix Information Directory Services[26] - MIDS - by John Quarterman, one of the first scientists to face the challenge of mapping Internet. *Matrix*, located in Austin, Texas, developed different softwares that measure, analyze and cartograph the Net. Among the maps of the web, the most recent, called Internet Weather Report[27] - IWR: it is a dynamic representation with animated maps. The mapping method is based upon the locating of web knots and applies these data to a representation of classic geography, the map of the world. In 1990, Quarterman published the book, *The Matrix: Computer Networks and Conferencing Systems Worldwide*, today a class in the discussion of problematical aspects in computer webs mapping. The title of the book, *Matrix*, in the meaning used by Quarterman, is the set of all computers interconnected webs.

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[20] http://www.eastgate.com/squirrel/Introduction.html
[21] http://www.inventix.com/
[22] http://www.mos.ics.keio.ac.jp/NattoView/
[23] http://www.comp.lancs.ac.uk/computing/users/gbs/webpath/
[24] http://www.comp.lancs.ac.uk/computing/users/gbs/webpath/webpath.html

[25] http://www.ncsa.uiuc.edu/SCMS/DigLib/text/technology/Visualization-Study-NSFNET-Cox.html
[26] http://www.mids.org/
[27] http://www.mids.org/weather/

Figure 7: MIDS Map. The use of geographical metaphor is clearly perceived.

5.3. Information visualization: research group of Bell Lucent Technologies Laboratories, Naperville, Illinois, EUA, formed by Ken Cox, Taosong He, Graham Wills, and supervision of Stephen G. Eick. This map showing three-dimensional arcs is perhaps the most famous image of what Internet is. Actually, this image is a visualization of traffic flows between 50 countries. The data of this map have been measured by backbone NSFNET, in 1993.

Figure 8: Map of fluxes in Internet, developed by Stephen G. Eick's group from Bell Laboratories.

5.4.Internet Mapping Project[28] : by Bill Cheswich e Hal Burch. The purpose of this mapping approach is to signal web data as a whole. The big difference with MIDS project is that this one does not use traditional geography. On the contrary, data maps are created into an abstract space. According to the authors article *Mapping the Internet Project*[29] their project does not use old conventions, as concepts such as places, countries and territories are challenged. The produced image reminds of the structure of a tree, showing the paths to most of the webs. The paths change throughout times. The traffic routes are reconfigured and Internet expands. The authors keep the created images and intend to realize a movie about this expansion. The algorithm of image processing is simple and currently consumes about 20 hours. In a second phase, the produced map is painted to show different data. One of theses beautiful maps was published on the coverpage of Wired magazine in December 1998. When the authors are asked about the place we are on the map, they say that this would be impossible today, because of the complexity of the portrayed web: about 100.000 knots.

Figure 9: Map produced by Internet Mapping Project.

6.Conceptual or Topographical Maps

Topographical maps are a classic in WWW and can be found not only at a macroscopic level, that is during a mapping search of the web as a whole, but also at a microscopic level, regarding the orientation of a user of a specific site.

Yahoo site' home page, although it does not visually look as a map - the way we are used to conceive it - could be considered as belonging to this category, as it organizes different Websites into topics.

Many other sites, called portals, also organize Web information into topics. Besides, it is frequent to find on the Web personal pages that display lists with indications of links.

6.1.MESH[30]: by Tim Berners-Lee, 1989. This mapping shows in hypertext WWW original propositions.

6.2.Cybermaps Landmarks[31] : a project developed by John December during the years 1994-5. The idea behind this mapping is to emphasize visually the domains of information.

[28] http://www.cs.bell-labs.com/~ches/map/db.gz
[29] http://www.cs.bell-labs.com/who/ches/map/index.html

[30] http://www.w3.org/History/1989/proposal.html

[31] http://www.december.com/web/text/cyberatlas.html

December organizes data spaces graphically, and emphasizes the connections/relationships between the subjects.

6.3.Newsmaps [32]: the proposition of the site is to collect news from different sources and organize them visually, or, as the site itself names it, to present information interactive landscapes. The visual composition is structured into topics. What is behind Newsmaps is a software system that accesses Web documents - not only news agencies but also online groups of discussion[33] - and organizes them into a sort of landscape of interconnected topics. The maps tell us where to access a big concentration of documents, messages and discussions about a specific theme. The appearance of the green maps that can be accessed on the site *Newsmaps* reminds of mountains, peaks and valleys. Peaks indicate a big concentration of documents about a specific subject. The higher the peaks, the larger the quantity of similar documents. Besides this topographical organization, the site offers tools for search, that locate a specific subject in relation to existing topics. The navigator still counts on the resource of using flags to mark the most interesting points.

Figure 10: Image of a Newsmaps information map

6.4.Web Map about teenagers' happiness[34]: map of interconnected topics, generated from an initial question and other subjects that appeared from this questioning. According to the author, cinema teacher Lee Boot, this map is a "personal and global exploration of themes that disturb adolescents". Following this line, "while incorporating personal and global thinking, some point should appear where consciousness is expanded"[35][35]. Its interface reminds of a sketched exercise book and each word designed in print letters corresponds to a link of a WWW site. The map is organized into concepts and is a mirror of the choices of the author himself and the paths he walked over on the Web. What is most interesting, in a work that looks quite simple, is that the construction of the page not only organizes the author's thinking but also allows a quick visualization of the topics and their interconnections. In Lee Boot's words:

I like to think of this website as the node, and the Internet itself as a huge morass of connections and real choices. This model echoes that of the human brain. A website is to the Internet as a neuron is to the brain. This is a form I present often in this work.[36]

Figure 11: First page of the Web Map about teenagers' happiness

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[32] www.newsmaps.com

[33] For example, on the map that presents Global News, are collected information from Associated Press, Reuters, Fox News, The Washington Post and ABC News. Another map, called *Technological News*, we can find TechWeb, PC Week, C/NET

[34] www.bcpl.net/lboot/webmap2

[35] http://www.plexus.org/WebForm/notes.html

[36] http://www.plexus.org/WebForm/notes.html

6.5.OOHAY – The object oriented hierarchical automatic yellowpage [37] : a project developed by Hsinchun Chen, director of Artificial Intelligence Laboratory of Arizona University. OOHAY belongs to the second phase of an important project regarding a Digital Library. The aim of the first phase, DLI-1, was to develop techniques to find and rescue information contained in big data banks and then to create nets of semantic connections between them. Phase 2 intends to develop techniques and methodologies for analysis and automatic visualization of large collections of documents. The method includes human classification systems and Artificial Intelligence systems. The visual effect reminds of a colorful mosaic being transformed by internauts' interaction.

6.6.Some of my favorite web sites are art[38] : this site has organized a web art exhibition, using the idea of gallery as a metaphor. It functions as a map with web artists works while it organizes and contextualizes the exhibited works. There are some curatorial texts by Rachel Baker and Alex Galloway.

Artists and maps

In this final group, we will see poetical propositions that have been developed by artists and groups of people interested in creating cyberspace visualizations. Different from the maps that we have already commented, the artistic approaches are much more free from technical concerns about data acquisition and organization. Generally, although they use technological resources, the latters must not be considered as scientific tools for the analysis of WWW structures or the functioning of the nets. Artistic maps never tell us - almost never - where we are or even the indication of the page on URL. Besides, the aim of these projects is not to help in the orientation through the sea of data. They are not precise, they are disturbing and they corrupt many of our pre-established ideas about cyberspace. The next projects that I will comment offer hidden beauties, cause a feeling of strangeness and make us incapable to answer questions, which we had never dreamed of.

WebStalker[39] is a *metabrowser* developed by British net-artists, Matthew Fuller, Simon Pope and Colin Green, from I/O/D group. WebStalker subverts one of WWW conventions that have been less questioned: the browser. As you know, the traditional browsers[40] pick up the data that are written in HTML [41] and translate the code into the shape we are used to look at. What actually happens when we load a WWW page on our computer screen using a navigator, is a translation of HTML elements. I/O/D group's work challenge this kind of translation. Realized in Director, WebStalker also allows the reading of HTML data and files. The difference is that WebStalker does not display on screen the information about these files; instead, it offers a graphical translation of the code structure.

The maps produced by WebStalker have a great aesthetic power. Each link turns into a line, each page is represented by circles. A small HTML excerpt can produce fantastic images that remind of mandalas.

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[37] http://ai.bpa.arizona.edu/go/oohayviz/index_introduction.html#publications
[38] www.alberta.com/unfamiliarart

[39] *WebStalker* is a *freeware* program. Download can be made on the site:
http://bak.spc.org/iod/iod4.html

[40] The most popular browsers are *Microsoft Internet Explorer* and *Netscape Navigator*.

[41] HTML: *Hypertext Markeup Language*, hypertext language used in Internet pages publication.

Sensorium[42], a group composed of twenty people living in Tokyo, winner of *Golden Nica* Award of the important exhibition Prix Ars Electronica[43], Linz, Austria, 1997, net category. The projects created by Sensorium are intriguing propositions for discussions about Internet and stimulate our perception. Among the most significant, we can mention Web Hopper, 1996 and BeWare ½:Satéllite, 1997. Web Hopper is a software in Java that allows the visualization of WWW internauts' trips. The map allows the visualization of the personal journey in red and the trajectory of other people, interacting within the net, in blue. The representation is dynamic and poetic. As for BeWare, it is a *live object* that reflects the conditions of the Earth from the angle of NOAA, a satellite in polar orbit, located at an altitude of 800km. The photographic images of the surface of Earth produced by NOAA are analyzed and converted into temperature data. During the exhibition of BeWare, people could touch and feel the different temperatures. The most interesting point in this sensory map is that it uses data transmission through Internet as a tool of statement. Quite in the same line as Brazilian artist Lygia Clark's sensory objects, BeWare stimulates our senses and our perception of the world.

Figure 12: Map of Web Hopper, showing internauts' movements.

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[42] http://www.Sensorium.org/all.html

[43] http://www.aec.at/

POUR UNE NOUVELLE ESTHETIQUE

PAR MARIO COSTA

Les signes d'un changement dans le domaine de la production esthétique, qui à présent sont évidents, commencent en réalité à apparaître dans quelques composantes fondamentales des avant-gardes des premières décennies du XX^{ème} siècle.

Je n'en donnerai que quelques exemples qui ont une importance particulière :

- en 1920 Naum Gabo écrit un " manifeste " où se produit un défoncement de la dimension artistique, dans laquelle on demande explicitement d'introduire l'esprit scientifique : " Le fil à plomb dans nos mains […] nous construisons notre œuvre […] – écrit-il – comme l'ingénieur construit les ponts, comme le mathématicien élabore les formules des orbites " (*Manifeste du réalisme*, 1920) ;

- chez Moholy-Nagy, dont le rôle dans la recherche esthétique devrait être reconsidéré et attentivement évalué, la tendance vers le savoir scientifique est précisée comme la conscience du caractère de fondement des matériaux et des technologies, et de leur activation esthétique expérimentale épurée de tout contenu symbolique ou imaginaire ; l'expulsion de Itten du Bauhaus en 1923, avec la conséquente élimination de toutes les inclinaisons mystiques et expressionnistes de l'école, et la nomination de Moholy comme directeur du Cours Préliminaire sont des évènements qui marquent l'histoire de l'expérimentation esthétique occidentale ;

- le travail de Moholy, interrompu en Europe par le nazisme, reprend aux Etats-unis et est poursuivi par György Kepes, son élève et grand ami : le *New Bauhaus*, le *Chicago Institute of Design*, le *Center for Advanced Visual Studies*, prennent racines et répandent universellement un nouveau mode de concevoir et de procéder dans lequel la techno-science et l'expérimentation esthétique commencent à confluer et à se confondre donnant vie à un type de production substantiellement différent de toutes les productions attribuées au domaine traditionnel de l'artistique.

Ces produits ont été repris et assimilés à l'art pour des raisons absolument extra-esthétiques. En réalité des mouvements profondément différents ont été unifiés dans le terme d'" avant-garde ", à savoir :

1) les mouvements qui de plusieurs façons ont poursuivi et tenté de renouveler la tradition,

2) les mouvements qui ont manifesté une intention explicite de rompre avec l'art et de le détruire, et

3) les mouvements qui ont travaillé pour le dépassement de l'art et pour une reconstitution de l'esthétique sur la base de l'avènement incontestable de la techno-science.

Tout a été exposé de la même manière dans les musées et considéré comme une œuvre d'art même si tout cela ne voulait avoir plus rien à faire avec l'art.

Apparemment il semble que cela a eu lieu pour la manière de fonctionner de la moderne " conscience esthétique ", très bien décrite par Gadamer[i], qui consiste dans le fait d'abstraire, d'uniformiser et d'abolir les différences ; Gadamer en attribue la responsabilité au musée, mais il oublie de dire que, au moins à partir de la modernité, même le musée est sollicité par des pressions extra-esthétiques et que la véritable force unificatrice est

celle du marché et de l'équivalence des marchandises qui ont, dans tous les cas, la même essence abstraite que l'argent.

Mais si l'histoire de l'art et celle de la réflexion esthétique correspondante, avec tout son ensemble de catégories fait de "intuition-expression", "personnalité artistique", "génialité", "apparition de l'absolu", "sentiment qui se fait image", "mise en œuvre de la vérité", "liberté de l'imaginaire" etc., doivent être considérées, à mon avis, épuisées et conclues d'un point de vue théorétique, la même chose ne peut pas être affirmée pour l'esthétique et pour ses nouveaux modes d'être.

Il faut simplement prendre acte du fait que la dimension de l'art est trop étroite, non appropriée à l'époque des ordinateurs et des réseaux, des manipulations génétiques et de l'unification de l'espèce qui est en train de se faire.

La question que Gabo pose en 1920, "Comment l'art contribue-t-il à l'époque présente de l'histoire de l'homme?" est encore extrêmement et dramatiquement actuelle, et il faut répondre qu'il n'y contribue pas du tout: depuis des décennies l'art est un domaine séparé, une grande "machine du vide" qui simule le "plein" et qui réussit à le vendre grâce au fait que chacune des composantes qui l'actionnent fait bouger, et donc justifie et légitime, toutes les autres.

La dimension esthétique de l'époque qui s'ouvre sera de moins en moins celle de l'art, et de plus en plus celle, annoncée par les faits que j'ai cités, qu'il y a vingt ans j'ai commencée à indiquer comme **sublime technologique.**

En d'autres mots, je crois que l'histoire de l'art est historiquement conclue, mais je crois aussi que l'expérience esthétique ne peut pas encore être éliminée de la configuration actuelle de l'humain et qu'il faut la rechercher dans la mise en œuvre, au moyen des technologies, d'une nouvelle espèce de sublimité.

La nouvelle dimension, telle qu'elle apparaît dans le travail des chercheurs en esthétique, se distingue ou diverge de celle de la tradition récente ou très récente de l'art dans les points suivants :

1) la production et la jouissance, s'il est encore possible de distinguer ces deux moments, abandonnent l'esprit et apparaissent comme des faits substantiellement sensoriels; la concentration intérieure, c'est-à-dire tournée vers les modifications de la conscience provoquées par l'exposition à l'art, est remplacée par une concentration tout externe et extérieure ; la sensation et les aspects sensoriels, de simple enveloppe ou moment préliminaire de l'expérience artistique, deviennent l'objet même de la recherche : les données sensibles du produit ne sont plus considérées comme un intermédiaire négligeable vers des expériences spirituelles supérieures, comme dans l'idéalisme de Croce, ne sont plus vues comme des " facteurs directs " préliminaires à dépasser en vue de la véritable expérience esthétique, comme dans les esthétiques de l'*Einfülung*[ii], et la différence phénoménologique établie par Dewey[iii] et par la phénoménologie sartrienne[iv] entre le " produit physique " et l'"objet esthétique " ne peut plus être faite, simplement parce que l'"objet esthétique" correspond au " produit physique " et se résout complètement en lui : le corps tout entier ou une de ses parties ou fonctions spécifiques est introduit technologiquement dans une situation d'expérience nouvelle qui perturbe la situation habituelle ; ce n'est que l'expérience sensorielle qui est analysée et qui intéresse l'" artiste " producteur et ce n'est que dans cette dernière que s'achève et s'épuise l'expérience esthétique du bénéficiaire ; les chercheurs en esthétique semblent alors travailler pour analyser et mettre en œuvre des états et des équilibres sensoriels de perspective ;

2) les productions ne sont plus caractérisées par le symbolique et par les suggestions nébuleuses qui en découlent, mais possèdent une essence cognitive indispensable et claire ; l'extranéité traditionnelle à l'art de la conceptualisation et des procédures techniques et scientifiques d'enquête disparaît, et le travail esthétique devient une véritable investigation intellectuelle ; la vieille notion de " personnalité artistique " est remplacée par celle d'un " sujet épistémologique à intentionnalité esthétique ", un sujet qui n'est pas nécessairement singulier et personnel et qui met en œuvre des dispositifs où toute distinction entre l' " artistique ", le " technique " et le " scientifique " devient impossibles ; les investigations esthétiques et épistémologiques peuvent donc être exercées des façons les plus diverses : les appareils, la perception, la relation son-image, l'espace-temps, la relation entre l'organique et l'inorganique, les procédures de communication … ces éléments peuvent tous être analysés ;

3) de l'expression du signifié on passe à l'activation et à la primauté des signifiants ; le "signifié", catégorie dominante de l'esthétique au moins à partir de Hegel, qui a été brisée par notre actuel mode d'être dans le monde, perd toutes attractions et on n'y adresse plus aucune attention : on reconnaît aux productions technologiques un coefficient élevé d '" aséité " et leur nature non linguistique : le travail esthétique est ainsi défini comme une volonté résiduelle de " mise en forme " de signifiants, comme esthétisation de ces derniers ou comme leur simple activation incontrôlée ;

4) on passe de la notion de " personnalité artistique " à celle de " chercheur esthétique épistémologique " ; la vie de l'artiste, ses émotions, sa vision du monde, ne sont plus des éléments indispensables de son travail et donc n'intéressent plus personne ; le style personnel devient une expression dépourvue de sens ; ailleurs j'ai écrit : " la loi d'Archimède, la lampe d'Edison, les équations d'Abel ou la courbe de Gauss n'ont rien des sujets auxquels ils appartenaient ou qui les ont conçus, elles ne savent rien de leur vie ou de leur mort, et pourtant elles appartiennent à eux pour toujours "[v]; les produits du "sublime technologique" ont le même statut théorique de ceux qu'on vient de rappeler, avec la seule différence non négligeable qu'ils ont une intentionnalité esthétique ;

5) mais c'est la notion même de sujet et d'appartenance au singulier qui, dans le sublime technologique, s'amenuise jusqu'à disparaître ; le dépassement du sujet individuel et la formation d'un hyper-sujet a lieu de deux façons fondamentales : l'Internet constitue actuellement un hyper-sujet technologique où toute subjectivité individuelle ne " surfe " plus guère mais se " noie " et se dissout, et pour cela il offre une possibilité inépuisable d'expérimentations visant à faire apparaître les nouvelles modalités du sublime ; mais l'hyper-sujet mûrit aussi à partir des réseaux : il ne s'agit guère de la banale interactivité homme/machine sur laquelle on continue de faire beaucoup de bruit, mais de cette formation qui mûrit à partir de la possibilité de " partager des projets " pour leur essence mentale et pour le fait qu'ils sont réalisés et s'achèvent par l'intermédiaire des " dispositifs technologiques de contact à distance " ;

6) dans le sublime technologique une extraversion de l'extériorité a lieu: l'expérience esthétique se déplace de l'intérieur à l'extérieur, l'intériorité assume une existence extérieure, non pas dans le sens que l'esprit s'objective, comme il est affirmé dans l'esthétique de Hartmann[vi], mais dans le sens qu'il se présente comme un état des " choses " objectif et matériel : l'essence spirituelle du produit artistique est déniée et technologiquement transférée à l'extérieur par l'intermédiaire des " interfaces corps-machine ", " machines synesthétiques ", etc. ;

7) finalement, dans le sublime technologique a lieu un affaiblissement de la " forme ": la forme, une catégorie forte de l'esthétique traditionnelle (histoire des formes, mise en forme, vie des formes…) se soustrait à la perception et s'identifie avec le concept ou le

schéma de la mise en œuvre ou, davantage, cède à l'informe, à l'aléatoire, au casuel, à l'éphémère, au transitoire, c'est-à-dire au survenir du flux et de l'évènement.

Tout cela semble être le nouveau sens que la recherche esthétique est en train d'assumer sous la poussée des technologies électroniques et numériques du son, de l'image, de la communication, de la spatialité, de la mémoire…

Mais les résistances à l'avènement accompli de ce qui est nouveau ne manquent pas. Personne, au fond, n'aime les changements : non seulement ils impliquent la remise en discussion des statuts sociaux et des rôles de pouvoir déjà acquis, mais ils troublent les équilibres profonds que les personnes ont atteints. Mais le moment que nous vivons fait époque et même ses aspects dramatiques doivent être vécus dans la conscience de leur inéluctabilité ; mais tout le monde n'y réussit pas, notamment dans le domaine de la recherche esthétique, ce qui n'est pas justifiable. Le danger est encore et toujours celui d'un " déguisement " : le système de l'art est bien disposé à accueillir les nouvelles productions, mais à condition que ces dernières s'uniformisent à sa logique vieillie et désuète. Beaucoup d' " artistes " et de " critiques " trouvent utile d'acquiescer et, au lieu de forcer les structures à se transformer et à s'adapter au nouveau en tant que tel, forcent le nouveau vers une logique qui lui est étrangère. Les dégâts, en synthèse, sont produits par deux types de procédés :

1) le procédé qui oblige les nouveaux media à faire le travail des anciens médias, et qui montre des poétiques épuisées mises en œuvre par de nouveaux instruments, et

2) le procédé qui transfère dans le domaine des pratiques artistiques traditionnellement modernistes des suggestions mimétiques tirées de la nouvelle esthétique et du sublime technologique.

Les exemples de cette double forme de déguisement, qui est d'autant plus insinuant et dangereux quand il est de type théorique, sont sous nos yeux et je ne les rapporterai pas.

Au contraire, les chercheurs esthétiques doivent réaliser un autre type de travail. Il ne s'agit pas d'assumer des attitudes anachroniques et improductives contre le marché, il faut plutôt éviter de se soumettre à ses archaïsmes et le forcer à se transformer, à acquérir plus de souplesse, à adopter des critères de mise en valeur et de vente adaptés à ce que la recherche esthétique la plus significative est en train de produire.

En Europe, et notamment dans mon pays, tout semble encore immergé dans une sorte de léthargie théorique/pratique qui, de façon un peu optimiste, on pourrait, avec Freud, appeler "dé-négation" (*Verneinung*) : on s'obstine à ne pas vouloir voir. La responsabilité de la théorie est grande : jusqu'à quand l'esthétique voudra-t-elle continuer à nous parler d'absolu et de mise en œuvre de la vérité ? Quand s'apercevra-t-elle que désormais l'art est vraiment " une chose du passé " (Hegel), que nous continuons à aimer comme un passé et que le présent est toute autre chose?

Mais le marché et les institutions de l'art ne représentent qu'un des territoires à forcer. En effet la production technologique offre aux chercheurs en esthétique l'opportunité d'intervenir à nouveau et avec force dans d'autres domaines beaucoup plus vitaux de la vie civile : la recherche esthétique et technologique peut, de ce point de vue, redevenir ce qu'était l'art à l'époque des cathédrales : l'architecture et l'urbanisme doivent apprendre à ne pas se passer du chercheur esthétique et technologique et à demander son intervention dans leurs conceptions.

L'enjeu de ce colloque, qu'il faudra mettre en évidence et discuter, est la reconfiguration générale de l'esthétique, de son utilisation et de sa destinée dans les années à venir.

WHAT ARE DREAMING YOUNG PIXELS OF?
- a pseudo quarrel on "supports" -

BY GEORGES SABAU
Translation: Livia Marinescu

What is the pixels' gender, after all? Is it possible to speak about male-pixels and female-pixels? Wouldn't be better to say they are hermaphrodites, just like angels? The question is neither rhetoric nor ironic; on the contrary, it is getting more and more imperative to answer it today, when this entity called biocomputer enjoys such a rapid development. I am certain that, despite being are not sex discriminated the young pixels, as "qualia sensibles" would rather dream of playing the part of immaterial actants, since they consider themselves to be minimal subjects to the digital process of updating programs capable of generating digital objects and fictions. Naturally, they would also like to play some parts in a "new arena of representation", seen as a "new **space** for revelation".

The complexity of this theme is so fascinating and overwhelming that I will have to narrow it down to two particular sub-themes: **enunciation medium** and **reception medium**. The former being the medium upon which the computer produced work is transferred whereas the latter is creating an interactive relation between the work and the user.

An Arts History from the exclusive perspective of media ("support") evolution would be rather interesting to write. In this respect, it is not difficult to notice the lack of a clear distinction, in all traditional arts, between media and means by which works are created. Similarly, there is no distinction between enunciation media and reception media (painting, books, etc). However, there is a general agreement on the artistic representation on a material "support", an agreement established during the Renaissance and still observed by the iconological "theory of strata in a work of art" (Panofski, 1939).

A clear separation between media ("support") and means of creation occurs at the same time with the appearance of recording means (mechanical, optical, chemical), such as photography, cinematography, discography or later video and television – all paradigmatic means of analogical expression. Media can be divided into enunciation media (films, magnetic tapes) and reception media (screen, computer display).

In Romance languages, the meanings of the terms: "means of creation" and "media" ("support") are clearly distinguished. (The same distinction appears in German: Ausdruckmittel and Unterlage). Unfortunately, the two meanings are covered by a single word in the English language, the word medium, which explains McLuhan's famous phrase: "The Medium is the Message". The polysemantic aspect of the English language makes the understanding of this essay rather difficult, as my approach relies on the distinction between **means of creation** (materials, instruments, technique) and **Medium** ("**support**" on which works are transferred).

I fully agree with those theorists who uphold the radical difference between "hypermedia configuration" and "virtual reality", the former being based on the conversion from analogical to digital while the latter refers to synthetic image generations, with no reference to reality. Both configurations can be accessed on disk (cd-rom, off-line) as well as on-line; in addition, there is a possibility to combine them. In order to simplify my exposé, I will restrict my approach to hypermedia configuration, including both disk and installation.

I conclude this introductory part with a personal remark which is also embraced by the members of my group, kinema ikon: out of the vast field of IT in full swing, we are almost

exclusively interested **in the validation of the digital system as a new means of artistic creation**. Digital works that do not fulfill this desideratum may be extraordinary or marvellous, but they do not belong to the artistic digital world. They are simply different.

An approach based on the opposition existing between "**support disk** VERSUS **support installation**" would be improper. I don't have anything against installation in general or against digital/virtual in particular. I have to admit they are both exciting and spectacular to public to such an extent that they, plus video-installations, projections, performances (analogical means) cover most of the space and time allotted to electronic art in grand international exhibitions (included ISEA). In contrast, works on "support" disk are allotted minimum space and time. Thus, installation (digital as well as virtual) tends to become an autonomous trade in contemporary art, while pixels remain mere assistants, integrated in the hybrid structure of installation "the true reic (Dingheit) support of the work" (Heidegger, 1957).

If we consider access modes, digital / virtual installation falls into the category of the "spectacular"(not in that of the "reading") since it has created a sort of holding of "supports". Thus, this hybrids device offers a combination of visual, auditive and tactile sensation as well as mental relations. Its effects are polymorphous, polysensorial and polyglot (as combination of languages). In addition, they are rather strange, reminding me of those "amateur" cabinets, of perspectives, anamorphoses and other catoptrics curiosities, which resemble Athanasius Kircher's "camera magica" – Wundercamern (1646).

If writing is the art of constructing a story and fixing it on "support" (medium), then installations (digital and virtual) can be seen as multiple writings staged by means of a proficiently computerized protocol. Digital installations can be also perceived as devices the "bricolés" type – in the sense given by Claude Lévi-Strauss: "process of pragmatic thinking during which individuals and cultures use objects in order to assimilate and develop ideas." (1962) We should also consider in this respect Sherry Turkle's proposal, which can be summarized in the phrase "object – to – think – with" (1995); hence digital / virtual objects can be stirred to develop / generate ideas.

Movie making has escaped the "pressure" of installations and film as "support" has prevailed in this domain, although there were some attempts in the past to replace it: "the magic lantern" or the "cinéma élargie". Meanwhile, video-art has been dominated from its very beginning (1963) by the structure of video installations to the detriment of magnetic tapes. It is this "legacy" which has highly influenced the development of digital and virtual installations.

I have heard (sic!) that the pixels in the structure of same digital or virtual installations, and with them the computer entity too, feel frustrated and suffer from alienation and oppressive anxiety. Schizophrenia or who knows what complex does not seem too far, either. We may find out soon about clinics offering cyber-psychiatric treatment to digital entities, hospitals built in the vicinity of MIT Media Lab, Art 3000, ZKM, a.s.o.

In order to avoid such an embarrassing situation, the best solution is in my opinion, to offer pixels the opportunity to play in a friendly environment, like, for instance that of the "support" disk. There are several substantial arguments to support this thesis, as well as the interactive reception on the monitor screen. Before mentioning these pro-disk arguments, it is proper to mention some of the arguments against it. I have to admit that I experienced moments of perplexity when I noticed that the main **impediment** in the reception of an artistic digital discourse on cd-rom could be found in the main characteristics of the digital system. First of all, it is this obsession to interact by all means, then the unpleasant manipulations on command interfaces; it is the noise produced when

pressing the keys, the “click” on the mouse, the belated reaction to orders; furthermore, there are differences in speed between the visual and the auditive discourse, which bring about gaps in the relation image – sound. Also, due to subsequent appearance of images, there is a persistence of disturbing fluency in the syntagmatic plan of the discourse. Finally, loading cd-roms on-line can be also difficult.

All these drawbacks can be felt now in December 2000 with instruments / computers which are not extremely performant. I am convinced that all these flows will be soon forgotten and, so I am going to concentrate on the **advantages** of using “support” disk (cd-rom, dvd etc.) instead of using digital installation:

1. There are fewer opportunities of negative manipulation on “support” disk than in installations or audio-visual mass media. Thus, the user acquires a more prominent status, as co-author.

2. An interactive approach is more complex for a “support” disk than in installation. The approaches also differ in nature. In traditional arts, to contemplate requires a certain immobility of the viewer, or in Louis Lavelle’s words “I must cease action if I want to contemplate” (1921). The paradigm of interactivity in digital system entails direct actions from the part of the user both physical (movements, touch) and, especially, intellectual, upon a discursive structure proposal by the author.

3. The opportunity of altering the work by recycling it as work in progress; the user enjoys the same right, if creative and competent in computers.

4. Accessing through “reading” allows, among other things, the acquisition of the disk, also, one can come back to it any he / she wishes. Furthermore, one can even swap disks, which is virtually impossible for installations.

5. There are themes, topics and creative genres which are better suited for hypermedia configuration on cd-roms, such as, **essays of digital art** or “hyper-essays”. This model is understood as commentary on the trajectory of a validated work of art or of a fragment of it, a fragment of great interest like, for instance “the yellow spot on the wall” in Vermeer’s work (View from Delft). This fragment can be approached from a multitude of perspectives, including the one which relates Proust to Elstir and Bergotte. There is an infinite potential.

6. To “digitalize enunciation” (Deleuze, 1985) is to fulfill an old dream: that of formalising artistic discourse, the way E.A. Poe conceived it: “representations of hallucinatory visions, rigorously controlled in form.” (1848)

7. A pixel as a minimal entity endowed with creative powers – the eighth “qualia sensibles” (1947) in Souriau’s system and a computer as a new “machine to produce stupefying images” (Kircher) should have **a muse**… This muse seems to be the **chimera** definited by Descartes as “an unreal being made up of parts of real beings.” In other words, the constructed digital objects (like virtually generated objects too) are perceived as “paradoxical beings” (Meinong, 1904), “beings without country” (Heimatlos), without a referential universe, which is quite relevant. It is what psychopathology applied to creation calls “agglutination” whereas associative psychology calls it “synectic”, both terms being complex synonyms of the word chimera.

8. After digital objects have been constructed, the most difficult problem follows: their display in a coherent artistic discourse, which should be both fictitious and narrative. The crisis is resolved when we apply the creative ability of the **hypertextual method** to produce non-linear narrations with multiple possibilities to combin and interchange. If a

digital installation may be compared with a Wundercamern, then a cd-rom may be seen as a sort of “Wunderblock” (Freud, 1900), whose potential to “freely associate” narrative nuclei is unlimited.

9. It is no use to panic at Nicholas Negroponte’s shocking statement according to which “interactive multimedia allows little imagination” (1995). This statement reminds me of the “brain-dozing” applied by Leroi – Gourhan to cinema and television public. Contemporary creators of hypermedia discursive works have not fallen into the narrative trap of computer games, as they have understood that less plot, fewer characters, and a more minimal scenographic cronotrop can offer more opportunities for users to put their imaginative abilities to a try.

10. All the above arguments entail a new regime of digital perception, the so – called “cyberception” (Roy Ascott, 1996) which combines Seeing and Being. It would be also possible to say that the new regime of digital creation needs a user who has already recycled his computer proficiency.

11. Last but not least, a “support” disk allows transfer to a HTML format, understood as a programming language for the Internet. The reverse transfer is also possible: a work or web pages can be transferred from the Internet to a cd-rom. The reasons may be purely informative and extensive; Timothy Murray speaks about “the extension of rhizomatic frontiers in digital art” (2000). Thus, calin man’s work, “Esoth Eric [off-line|on-line project] can be included in this reversible genre. The work is constructed by means of a delirious imagery structured in non-linear fiction / narration. It can be accessed on cd-rom, as well as on-line; its sinaesthetic effects are similar.

The advantages of cd-rom’s interactive aesthetics when compared with the spectacular aesthetics of installations are after all subjective. Artistic digital practice confirms the autonomous existence of the two creative paradigms. We may witness a sort of aesthetic compromise once **voxels** (tri-dimensional pixels) develop. The pixels, understood, as bidimensional mini-entities will continue to be attached to hypermedia on “support” disk while the voxels with their holographic dimension will become the main protagonists in the discursive structure of installations, a sort of cheerleaders. Artistic practice also reveals that some authors make parallel version of the same work – installation, cd-rom, network, plus the temptation to combine formats and “supports”. Or, the other way around, the tendency to go beyond the notion of “support”, according to which pixels and voxels are freed from the limits of their genres.

The reader / audience may have understood that I am using the term “pixel” as a metonymy of digital / virtual entities whose sex and ability to dream remain a utopian desideratum. Researchers in the domain claim the contrary: this is not utopy and these “Creatures” are endowed with DNA, with chemical receptors, neurons, temporal lobes and many other parameters specific to human brain. If these creatures are capable of reproduction, as some researchers claim, it means that they are sex discriminated and thus they can couple happily ever after… However, no matter how far things may evolve in this field of Artificial Life, there are two psychic processes which are impossible to fabricate: these Creatures cannot dream (the title of my exposé is just a metaphor), and moreover cannot have revelations in the deep meaning of the term. Because, these two processes “occur” in an non-existent place, the erogenous area of the third eye…

A QUOI REVENT LES JEUNES PIXELS ?
- PSEUDO-QUERELLE SUR LES SUPPORTS -

PAR GEORGES SABAU
Traduction: Roxana Chereches

Quel est au juste le genre des pixels ? Y a-t-il pixelmâle, y a-t-il pixelfemelle ? Ou sont-ils hermaphrodites tels les anges ? Ni ironique, ni rhétorique, au vu du développement d'une toute jeune entité nommée bio-computer, ma question aujourd'hui s'impose. J'ai la conviction intime que, plus ou moins sexués, les pixels – des "qualia sensibles" - aspirent, dans leurs rêves éveillés, à des rôles d'actants immatériels. Ainsi, dans leur rêverie, se flattent-ils peut-être, et non sans raison, de faire figure de actants, certes minimaux, des processus digitaux d'actualisation de programmes générateurs d'objets et de fictions numériques. Et de jouer ces rôles dans un "nouveau théâtre de la représentation" perçu comme "nouvel **espace** de la révélation".

La complexité de cette thématique s'avérant aussi fascinante que débordante, je m'arrêterai donc à deux thèmes particuliers : **le support d'énonciation** sur lequel est transférée l'œuvre produite à l'aide de l'ordinateur et **le support de réception** qui met en relation interactive l'œuvre et l'utilisateur.

Il serait intéressant d'écrire une histoire de l'art du point de vue de l'évolution des supports. Dans cette perspective, il n'est pas difficile de constater l'absence, dans tous les arts traditionnels, d'une séparation rigoureuse entre le support et les matériaux utilisés dans la production des œuvres, et il en va de même pour le support d'énonciation qui coïncide avec le support de réception (tableau, livre, etc). Il existe ainsi, depuis la Renaissance jusqu'à la théorie iconologique des "strates de l'œuvre d'art" (Panofski, 1939), un consensus concernant la représentation artistique sur un support matériel.

Avec l'apparition des moyens d'enregistrement mécaniques, optiques, chimiques tels que la photographie, le cinématographe, la discographie et, plus tard, des moyens électroniques, en l'occurrence la vidéo et la télévision, tous s'inscrivant dans le paradigme des moyens d'expression analogiques, une séparation évidente se produit entre les matériaux de création et les supports. Ces derniers se divisent à leur tour en supports d'énonciation (pellicule, bande magnétique) et supports de réception (écran, moniteur).

Dans les langues latines, les termes "moyen de création" et "support" ont des sens clairement définis (même l'allemand a conservé deux termes différents pour distinguer "moyen d'expression"=Ausdruckmittel et "support"=Unterlage). En anglais, malheureusement, un seul terme, "medium", recouvre les deux significations, ce qui explique le célèbre syntagme mclhunienne "The Medium is the Message". Cette superposition référentielle rend plus difficile la compréhension du présent essai en anglais, car il s'appuie justement sur la différence entre **le moyen de création** (matériau, instrument, technique) et **le support** sur lequel l'œuvre est transférée.

J'approuve entièrement les théoriciens qui soutiennent la différence radicale entre la "configuration hypermédia" et la "réalité virtuelle". En effet, il s'agit, pour la première, d'un transfert de l'analogique vers le digital, alors que, pour la deuxième, il est question de la génération des images de synthèse sans référent dans la réalité. Les deux configurations peuvent être accédées sur disque (cd-rom, off-line) ou sur un support réseau (on-line), possibilités auxquelles s'ajoute celle de l'hybridation des supports. Pour alléger mon exposé, je ferai référence uniquement à la configuration hypermédia avec l'alternative disque – installation.

Pour conclure cette partie introductive je tiens à préciser que, du point de vue du groupe Kinema Ikon et du mien en tant que théoricien, ce qui nous intéresse presque exclusivement, du vaste champ de l'informatique en plein essor, est de faire **accepter le système digital comme nouveau moyen de création artistique**. Les œuvres numériques qui ne correspondent pas à ces desiderata, aussi extraordinaires et mirobolantes soient-elles, ne font pas partie de l'univers digital artistique. Elles sont tout simplement autre chose.

Une problématique du type "**support disque** VERSUS **support installation**" ne serait guère pertinente. Je ne rejette pas l'installation en général, ni celle digitale/virtuelle en particulier. J'avoue que celles-ci semblent incitantes pour le grand public, spectaculaires même. De sorte que, aux grandes expositions internationales d'art électronique (y compris ISEA), elles constituent, avec les moyens analogiques (installations vidéo, projections, performances), une majorité écrasante par rapport à l'espace minimal accordé au disque compact. L'installation (digitale et virtuelle) ayant tendance d'ailleurs à devenir une marque autonome dans l'art contemporain. Et les pixels dans tout cela ? Ils restent, eux, simples adjuvants intégrés à la structure hybride de l'installation qui demeure le véritable "support réifié de l'œuvre" (Heidegger, 1957).

Du point de vue de la modalité d'accès, l'installation numérique/virtuelle fait partie de la catégorie du "spectaculaire"(et non pas de la "lecture"), étant donné que l'on a affaire à un véritable holding de supports. Ce dispositif hybride nous propose donc une combinaison de sensations visuelles, acoustiques, parfois tactiles et, toujours, des rapports mentales. Les effets, vus comme métissage de langages, en sont polymorphes, polysensoriels et polyglottes et relativement étranges, ce qui n'est pas sans rappeler les "cabinets" des amateurs de perspective, d'anamorphoses et autres curiosités catoptriques telles que la "camera magica" - Wundercamern à la Athanasius Kircher (1646).

Si "l'écriture est l'art de construire un sujet en le fixant sur un support", alors les installations numériques/virtuelles sont des écritures multiples mises en scène par un protocole informatique performant. Les installations numériques peuvent également être considérées comme dispositifs "bricolés" dans le sens de "processus de la pensée concrète où individus et cultures utilisent les objets pour assimiler et développer des idées" (Claude Lévi-Strauss, 1962). Rappelons dans le même contexte le propos de Sherry Turkle synthétisé par l'expression "object-to-think-with" (1995), qui laisse entendre que les objets numériques/virtuels peuvent aussi être "bricolés pour développer des idées".

Le cinématographe a échappé à la "pression" de l'idée d'installation, les tentatives n'en ont pourtant pas manqué, à savoir la "lanterne magique" et le "cinéma élargi". Quoi qu'il en soit, le support pellicule y est resté prédominant. En revanche, l'art vidéo a été depuis son début (1963) dominé par la structure de l'installation vidéo, au détriment du support bande magnétique. C'est cet héritage qui a largement influencé la naissance des œuvres du type installations numériques et virtuelles.

Je me suis laissé dire (sic) que les pixels d'une structure appartenant à certaines installations digitales ou virtuelles - et avec eux l'entité "bio-computer" – sont frustrés et souffrent d'aliénation et d'angoisse oppressive. De là à la schizophrénie ou je ne sais quoi de plus complexe encore, il ne reste qu'un pas à franchir. Bientôt nous entendrons, peut-être, parler de cliniques cyber-psychiatriques pour entités digitales, érigées auprès de MIT Media Lab, ART 3000 ou ZKM etc.

Pour éviter cette situation inconfortable la première solution préventive serait d'offrir aux pixels la possibilité de jouer dans un espace accueillant tel que le support disque. Les avantages, les arguments pour un tel support d'énonciation, outre la réception de type

interactif par l'intermédiaire de l'écran, sont suffisants et consistants. Mais, avant de présenter mes arguments pro-disque, je vais jouer franc jeu en relevant quelques aspects négatifs du support dont je prends ici la défense. J'avoue avoir été parfois perplexe en constatant que le fonctionnement même et la manipulation du système numérique pouvaient constituer une **entrave** majeure dans la réception d'un discours artistique digital sur support cd-rom. Il s'agit d'abord de l'idée même de l'interactivité à tout prix; et puis, les manœuvres "disgracieuses" exigées par les interfaces de commande, surtout le bruit des touches du clavier et du mouvement tactile du clic de la souris ; la réaction lente aux commandes ; le décalage malencontreux entre la vitesse du discours visuel et celle du discours acoustique, ce qui fait naître un clivage dans la relation image – son ; l'apparition saccadée des images qui perturbe la fluidité de la réception, trouble qui persiste dans le plan syntagmatique du discours ; la lenteur d'échargement du cd-rom sur le réseau, etc.

Aujourd'hui, décembre 2000, ces constats sont encore d'actualité, mais nous savons tous à quel point l'actualité est éphémère. De plus, les outils informatiques ne sont, pour l'heure, que moyennement performants. Tout en restant persuadé que nous seront bientôt libérés de ces "entraves", je vais vous exposer **les avantages du support disque** (cd-rom, dvd et ce qui suivra) par rapport à l'installation numérique :

1. Le risque de mauvaise manipulation est très faible en comparaison avec les installations ou les médias de type audio-visuel ; par conséquent, le statut de co-auteur de l'utilisateur en sort grandi.

2. La démarche interactive y est plus complexe et, quoi qu'il en soit, de nature différente. Le paradigme de la contemplation, valable dans les arts traditionnels, présuppose une certaine immobilité du spectateur car, selon la formule de Louis Lavelle, "il me faut cesser d'agir si je veux contempler" (1921). Le paradigme de l'interactivité dans le système numérique présuppose, lui, "actions" directes de l'utilisateur, autant physiques (motrices, tactiles) qu'intellectuelles par rapport à une structure discursive proposée par un auteur.

3. La possibilité de retour sur l'œuvre par le recyclage en faisant appel au procédé *work in progress* ; l'utilisateur bénéficie du même droit à condition de disposer de capacités créatives et de compétences informatiques.

4. Le mode d'accès par la "lecture" permet, entre autres, l'acquisition matérielle du disque sur lequel on peut ainsi revenir au gré de nos envies. On peut même envisager de faire des échanges de disques, alors que l'installation, par sa nature, ne l'autorise point.

5. Il existe thèmes, sujets et genres de création qui se prêtent mieux à la configuration hypermédia sur support cd-rom comme **l'essai d'art digital**, en tant que "commentaire" au "trajet" d'une œuvre consacrée ou au fragment d'une œuvre qui nous hante (au sens positif du terme). Par exemple "La tache jaune sur le mur" d'une œuvre de Vermeer (Vue de Delft) dans la perspective de la "relation" Proust-Elstir-Bergotte, et bien d'autres "commentaires" du même genre. En somme, une infinité de potentialités.

6. "La transcription numérique de l'énoncé" (Deleuze, 1985) permet la réalisation du vieux rêve de la formalisation du discours artistique semblable à la manière dont E.A.Poe aspirait à des "représentations de visions hallucinantes par une rigueur formelle maîtrisée" (1848).

7. Le pixel en tant qu'entité minimale à capacité créative – le huitième des "qualia sensibles" (1947) dans le système de Souriau, et l'ordinateur comme nouvelle "machine à produire des images stupéfiantes" (Kircher) devraient avoir une **muse**. Il semblerait que c'est bien là la **chimère** de la définition cartésienne de "l'être irréel constitué de parties d'êtres réels". Autrement dit, les objets digitaux construits (de même que les objets virtuels

générés) sont une sorte d' "êtres paradoxaux" (Meinong, 1904) sans patrie (heimatlos) donc sans univers de référence, ce qui me paraît révélateur. En psychopathologie de la création, ce phénomène porte le nom d'"agglutination" et, en psychologie associative, de "synectique", les deux expressions étant au fait des synonymes complexes de la chimère.

8. Une fois les objets numériques construits, le problème le plus difficile se fait jour, à savoir leur insertion dans un discours artistique cohérent de nature fictive-narrative. Dans cet état de crise intervient la capacité créative de la **méthode hyper-textuelle** à produire des narrations non-linéaires à multiples possibilités de combinaisons et permutations. De la même façon dont l'installation digitale peut être comparée à la Wundercamern, un cd-rom peut être considéré une sorte de Wunderblock (Freud, 1900) avec un potentiel illimité d' "associations libres" des noyaux narratifs.

9. Il ne faudra pas s'inquiéter de l'affirmation choquante de Nicholas Negroponte selon laquelle "le multimédia interactif laisse très peu de place à l'imagination" (1995). Ceci me rappelle "l'assoupissement du cerveau"(1964) comme l'a écrit Leroi-Gourhan à propos du spectateur de cinéma et de télévision. Les créateurs contemporains d'œuvres hypermédia de type discursif ne sont pas tombés dans le piège narratif des jeux d'ordinateur, en comprenant que moins d'intrigue, moins de personnages et un chronotope scénographique plus minimaliste offrent aux utilisateurs de plus grandes possibilités de mettre à l'essai leurs capacités imaginatives.

10. Les arguments ci-dessus présupposent également un nouveau régime de perception digitale que Roy Ascott appelle "cyberception"(1996), en mélangeant Seeing et Being. Autrement dit, le nouveau régime de création numérique a besoin d'un utilisateur qui a recyclé ses compétences dans le champ de l'informatique.

11. Last but not least, le support disque autorise la conversion en format HTML entendu comme langage de programmation pour l'édition par Internet. Et inversement, le transfert de certaines œuvres ou de pages web depuis l'Internet sur un support cd-rom dans un but d'information ou pour "élargir les frontières rhizomiques de l'art digital" (Thimoty Murray, 2000). C'est précisément dans ce genre réversible (on-line – off-line) que peuvent être inscrites l'œuvres de calin man, *Esoth Eric [off-line/on-line project],* productions de l'atelier Kinema Ikon. L'œuvres est construite à l'aide d'une imagerie réellement délirante insérée dans la structure d'une fiction narrée de façon non-linéaire. L'accès s'y fait autant par cd-rom que sur le web, avec des effets synesthétiques semblables. Une sorte de pixels sans frontières.

Cet exposé des avantages de l'esthétique interactive du cd-rom par rapport à l'esthétique spectaculaire d'une installation n'est, tous comptes faits, que la conclusion tirée de quelques considérations subjectives. La réalité de la pratique artistique numérique confirme, elle, l'existence autonome des deux paradigmes de création. Avec le développement des **voxels** (pixels tridimensionnels) on assistera peut-être à un compromis esthétique. Les pixels, en tant que mini-entités bi-dimensionnelles, resteront attachés à la configuration hypermédia sur support disque, quant aux voxels, avec leur dimension holographique, ils deviendront les actants principaux dans la structure discursive des installations, y compris pour le rôle des majorettes… Dans la pratique artistique on peut également constater que certains auteurs produisent des versions parallèles de la même œuvre – installation, cd-rom, Internet - sans plus rappeler la tentation d'hybridation des formes et des supports. Ou, au contraire, la tendance à transcender la notion de support, ce qui libèrent pixels et voxels de la pression des genres.

Quoi qu'il en soit, le lecteur/auditeur aura compris que j'ai utilisé le terme de pixel comme métonymie des entités digitales/virtuelles dont le sexe ou la capacité de rêver restent des

desiderata utopiques. Les chercheurs de référence affirment qu'il ne s'agit pas d'une utopie et que les "créatures" sont pourvues d'un ADN, avec des récepteurs chimiques, des neurones, des lobes temporaux et autres paramètres spécifiques du cerveau humain. Si ces "créatures" se reproduisent, tel que les rechercheurs le prétendent, cela voudrait dire qu'ils sont de sexe opposé et qu'ils peuvent s'accoupler dans le bonheur. Aussi spectaculaire que soit la manière dont les choses évoluent dans le domaine de la Vie Artificielle, deux processus psychiques resteront pourtant impossibles à reproduire : que ces "créatures" rêvent ("A quoi rêvent…" du titre n'est bien entendu qu'une métaphore) et, surtout, qu'elles aient des révélations au sens le plus profond du terme. Car les révélations naissent dans un lieu immatériel, la zone érogène du troisième œil …

PIERRE SCHAEFFER
OU LE CAPITAINE NEMO DE L'AVENTURE CONCRETE

PAR SYLVIE DALLET

"Il y avait une fois, entre l'époque des Double-Croches et celle des Ordinateurs, un sorte de musicien, appelé Pierre Schaeffer"...

Résumer l'œuvre de Pierre Schaeffer est une gageure. Évoquer son itinéraire continue à donner le vertige, tant sa personnalité et son influence artistique participent des combats contemporains pour la création. Cependant, malgré toute la curiosité que le personnage suscite, je pense que vous n'attendez pas de moi une biographie du passé, mais des outils ou des armes pour l'avenir. Schaeffer définissait lui-même sa démarche par cette formule sibylline :

"Je suis un fondateur, non pas d'ordres mais de services".

Je résumerai donc très vite une histoire hors normes dont la prise de risque artistique éclipse, à mon avis, celle des essayistes contemporains, André Malraux et Walter Benjamin, jusqu'à atteindre les qualités prophétiques d'hommes aussi divers que le philosophe Gaston Bachelard ou le cinéaste Serguei Eisenstein.

L'œuvre de l'ingénieur polytechnicien Pierre Schaeffer (1910/1995) comporte plusieurs facettes indissociables : de 1934 aux années 1980 il est connu comme dramaturge et romancier, à partir de 1948 il s'illustre comme l'inventeur et le théoricien de la Musique concrète, c'est enfin un des essayistes majeurs du monde contemporain qui, à l'instar du canadien Mc Luhan, propose une analyse globale des simulacres audiovisuels. Par ailleurs, ce résistant n'est pas un universitaire mais un cadre supérieur de la fonction publique : il a su, dans une guérilla administrative constante, réunir techniciens, artistes et scientifiques autour des projets créatifs et accompagner les mutations technologiques par un bouleversement total des manières de travailler ensemble.

Cet homme écrit en 1952 :

"Il s'agit de savoir si l'évolution de l'homme en tant que créateur rattrapera l'avance de ses moyens, et qui, de l'*homo sapiens* ou de l'*homo faber*, aura le dernier mot ?"

Pour cet effet, il va organiser tout au long de sa vie, privée et professionnelle des espaces de confrontation et de création artistique, le Studio d'Essai (1942), le Groupe de Recherches de Musique concrète (1951), le Groupe de Recherches Musicales (dit G.R.M., fondé en 1958, encore en exercice aujourd'hui), le Groupe de Recherche Image (1960), le Groupe d'Études Critiques, le Groupe de Recherches Technologiques, la Section d'Études Prospectives (1964), le Service de la Recherche (1960-1974) jusqu'à ce Centre d'Études et de Recherche Pierre Schaeffer qui constitue son ultime initiative et que je représente parmi vous.

En d'autres termes, Schaeffer fonctionne en homéopathe : les outils de l'enregistrement servent d'antidote et de poison. Les arts issus des nouvelles technologies ne peuvent être de simples "chambres d'écho" des styles anciens. Pour accélérer le passage en douceur, Schaeffer décide également de travailler en accoucheur de la création artistique contemporaine. Celle-ci doit se hisser hors du chaos des affrontements bipolaires du XXème siècle et redéfinir les potentialités de chacun grâce aux instruments de l'ouïe et de la vue.

Pour ce faire, ce fils de musiciens issu d'une famille de médecins et de paysans, va développer prioritairement le champ d'application musical et des relations Image & Son. Il souligne souvent la pertinence de ce lien :

”la musique est un personnage qui, naturellement, colle à ma peau. Elle se pratique au carrefour des connaissances”.

Dès 1967 il résume ce qui constitue pour lui à la fois une éthique et une méthode :

”J'ai été accusé d'empirisme, de bricolage. Je revendique - plus encore que la création d'œuvres novatrices - le droit **d'expérimenter en musique**, tout comme on fait en sciences. (...) J'estime avoir mis à l'épreuve, dans le champ très particulier de la recherche musicale, une méthode adéquate, susceptible d'être **généralisée** à l'ensemble des recherches sur l'homme. (...) L'Art, c'est l'homme, à l'homme décrit, dans le langage des choses. “

Ce carrefour des connaissances se situe dans le contexte audiovisuel, mais s’inscrit également dans une relation subtile avec les sciences de la matière et les arts plastiques. Sous les chocs différés du cinématographe, de la radiophonie et de la musique concrète, la définition classique des arts, en gestation depuis les “arts majeurs” grecs jusqu’aux “arts mineurs” chrétiens, a volé en éclats après 1950. L’enregistrement isole des fragments sonores ou visuels dont la création artistique s’empare mais dont il faut désormais tester et valider les fruits sur tous les domaines de la communication humaine. Nos arts sont les relais d’une mutation fondamentale, dont 1895 et 1948 constituent les tournants majeurs.

En effet, la révolution de la musique concrète procède des principes du montage cinématographique et annonce le couper/coller informatique. Cette musique concrète, matrice de la musique électroacoustique, est devenue en l’an 2000 une expression musicale dominante, après avoir opéré sa jonction, via l’informatique, avec la musique électronique. Née de bricolages et d’intuitions, cette musique reste spirituellement proche des œuvres plastiques ou cinématographiques des années 1920 qu’elles soient issues de Fernand Léger de Serguei Eisenstein ou d’Abel Gance, Comme toute révolution, elle s’offre la double tentation, de se revendiquer comme une avant-garde esthétique ou d’épouser la demande croissante de l’industrie du disque ou du cinématographe. Celles-ci réclament des musiques de film, des musiques à danser, des musiques de supermarché et comme Erik Satie le définissait autrefois, toutes les “musiques d’ameublement” nécessaires à ce siècle frileux.

Il faut donc, pour Schaeffer, se prémunir, grâce à une démarche complexe et rigoureuse, des tentations liées aux extrêmes. Cette méthode reste prioritairement liée et aux richesses de la langue et de l’outil, ces deux inventions de l’homme, à la fois “faber” et “sapiens”, habile et imaginatif, conceptuel et systémique. L’ordinateur, trop vite présenté comme une panacée, ne le rassure guère dans la mesure où cet outil combine la résonance avec le raisonnable dans une mimétique simplificatrice du comportement humain.

Il avait précisé, avec humour, en 1970 lors d’une conférence à l’U.NE.S.C.O., intitulée *La musique et les ordinateurs* :
“Une vraie science, mais aussi une vraie sagesse, qui est un Art de l’homme, indique qu’il faut tenir fermement les deux bouts de la chaîne. Et la chaîne n’a jamais été plus lourde pour l’homme à tenir, que lorsqu’il y a un ordinateur à l’autre bout”.

Dans la création artistique, Schaeffer s’attache à démontrer, sur exemples, que le complexe conditionne le simple et que le tout n’est pas la somme des parties. Ferraillant en philosophe contre la tentation sémiologique, il contourne les procédures d’hypnose de nos médias de masse pour valoriser les contre-feux qui s’élèvent. De fait, un enregistrement télévisé et plusieurs articles témoignent de l’opposition personnalités emblématiques des années 1960, Marshall Mc Luhan et Pierre Schaeffer, l’universitaire

libéral et le polytechnicien responsable d'un service public : Pierre Schaeffer reproche à Mc Luhan de rester en retrait des prophéties qu'il répand à travers les médias, en d'autres termes, de ne pas imaginer des contre-pouvoirs qui équilibreraient le glissement social et politique annoncé.

Ironie de l'Histoire, son travail reçut le premier prix Mc Luhan (1989), alors qu'il avait contesté l'eschatologie macluhannienne. Schaeffer, en moderne Nemo plaide, au-delà de l'expérimentation artistique, pour une morale participative dont il accepte avec ironie les nécessaires impasses :

"Dès que je m'exprime, je me trompe ; dès que je communique, je trompe les autres ou, plus souvent, me comprenant d'une autre façon, ils se trompent eux-mêmes. Ne communiquons plus, n'écrivons pas : nous vivrons alors plus encore comme des déterminés, des électrons, des imbéciles. On n'en sort pas. **C'est qu'il ne faut pas en sortir.**"

Pour le polytechnicien, la capacité du contre-pouvoir dépasse tout système de représentation binaire qu'il soit réaction/révolution ou tradition/modernité. Il s'agit principalement de favoriser de petites structures de production à choix multiples liées à l'éducation et au terrain. Cependant, pour garder à l'usager la liberté de cette confrontation, au-delà des simulacres que la technologie perfectionne, les responsables publics doivent aménager des espaces de diffusion et de confrontation artistiques. Au contraire de Mc Luhan qui promet de sa chaire l'inéluctable, il œuvre à la source pour garder à l'audiovisuel son caractère d'expérimentation démocratique, entre des citoyens motivés et des chercheurs-artistes-techniciens interdisciplinaires.

Pour résultat, "l'art des sons fixés" comme l'essayiste Michel Chion[6] désigne aujourd'hui l'électroacoustique, demeure, au XXème siècle, la seule expression artistique née au sein du service public français. Pour exemple, le Service de la Recherche employait en concordance cinq " groupes recherche " pour des équipes annuelles de 200 personnes. Celles-ci avaient pour mission, outre la recherche fondamentale, la coordination critique, la création sur de nouveaux supports, la formation professionnelle et la prospective audiovisuelle. A partir des années 1980, Schaeffer s'investit dans l'aventure des radios libres et participe à des projets multiples dans le cadre associatif, qui lui paraissent garder le lien vivant avec la société civile.

Dans cet effort de restructuration artistique, Pierre Schaeffer s'attache plus particulièrement à comprendre les implications de l'invention de 1948 : vingt ans après, le Solfège sonore imaginé par lui et validé par ses équipes est livré à l'appréciation du public sous la forme d'un livre, le *Traité des Objets Musicaux*, accompagné de trois disques d'exemples, réalisés par Guy Reibel et Beatriz Ferreyra.

Ce solfège sonore généralisé conçu par Schaeffer identifie désormais les sons par familles, selon une morpho-typologie complexe dont la note demeure le pivot culturel. Cette approche révolutionnaire facilite à la fois la composition, l'enseignement musical et la perception de l'environnement sonore.

Ce solfège arrime solidement à la fois la nouveauté à la nouveauté (enregistrement Image, enregistrement son) et la nouveauté au passé. En effet, Schaeffer y transpose le vocabulaire des arts plastiques : désormais les sons ont une texture, une masse, un grain, une couleur... Les sonorités, devenues matériaux par leur capture, peuvent être échantillonnées mais aussi filtrées, assemblées, coupées et collées à l'oreille. Le "toucher de l'oreille" répond au toucher du doigt. La distorsion sonore s'inspire de l'anamorphose optique et annonce une réflexion en filigrane sur les anamorphoses spirituelles et

[6] Michel Chion,

temporelles, celles dont Jurgis Baltrusaitis analysait la venue dans les années trente sous le terme de “perspectives dépravées”. Schaeffer invente à la fois l’échantillonneur et l’écoute réduite, le procédé technique et démarche musicienne, qu’il relie sans cesse à un imaginaire visuel tissé à partir du cinématographe.

Pour exemple, le Conservatoire national supérieur de Musique de Paris lui propose en 1968, d’ouvrir une première classe d’électroacoustique et de recherche musicale, classe que Schaeffer intitule immédiatement “Musique fondamentale et appliquée à l’audiovisuel”. En effet, Pierre Schaeffer interpelle la créativité audiovisuelle bien avant l’invention de la musique concrète. Il attire à rebours l’attention des créateurs sur la contradiction des procédures mimétiques liées à l’enregistrement : ces procédures entraînent un appauvrissement de la créativité via la reproduction illimitée d’une chose/œuvre qui prend désormais valeur de modèle. A l’inverse, les variations sur le modèle induisent des choix multiples qui constituent la source même de la créativité. On retrouve la citation de Paul Valéry, “rien de beau ne peut se résumer” : un seul chemin conduit à l’impasse, divers chemins mènent à la profondeur.

Dès 1942, Schaeffer désigne sous le terme d’Arts-Relais des expressions aussi différentes que le cinéma, la radio, la télévision à travers des supports tels que le film, la vidéo et les installations mixtes qui en procèdent. Le polytechnicien a été frappé de la dissociation apportée par les premières procédures d’enregistrement alors que les inventeurs (Charles Cros, Edison...) les avaient conçues dans la continuité. Les caractéristiques surréalistes de ce qu’il nomme les “Arts infirmes”, la “radio aveugle” et le “cinéma muet” coïncident avec les révolutions artistiques du XXème siècle, alors que le médium Internet, accompagne peu ou prou un retour au réalisme, au texte et au clonage. Schaeffer n’aura pas connu l’expansion du web, mais sa réflexion et son engagement pou les radios libres, thématiques ou de proximité, révèle une anticipation du réseau Internet.

Dans sa relation avec le média audiovisuel, la réflexion de Pierre Schaeffer ne se réduit pas aux possibilités artistiques du cinéma, du film d’animation ou de la vidéo expérimentale qui constituent les 618 œuvres du Service de la Recherche. L’explorateur des potentialités de la caméra et du micro entend rester l’artisan de la confrontation publique : sa démarche artistique rejoint une démarche éthique dans la mesure où **le moyen prime le but**.

Il ne laisse pas donc pas en friche, ”l’autre bout de la chaîne”, c’est-à-dire la communication de masse et la loi des grands nombres. Le souci d’analyser la création contemporaine par ses deux axes, le conduit à une interrogation sur la consommation audiovisuelle et la nécessité de préserver l’hétérogénéité des goûts du public, quand bien même ces goûts ne correspondraient pas aux siens.

Autant, il reste attentif aux expériences extrêmes, dans leur caractère isolé, autant, il responsabilise ses collaborateurs dès qu’il lui semble que ceux-ci flirtent avec l’événement médiatique. Pour exemple, il réprouve l’initiative du sculpteur Arman, de filmer un piano qu’il avait préalablement incendié· De même, il ne goûte guère la systématisation des “sons inouïs” dans la composition musicale trop souvent utilisée pour commotionner le public.

Si l’on résume le combat schaefferien par des symboles, je dirai qu’il se situe du côté d’Orphée contre Prométhée et qu’il s’investit dans la figure complexe du Janus contre les mythes séparés et insatisfaits d’Écho et de Narcisse.

En effet, la tentation prométhéenne constitue une des lignes de force majeures de l’époque contemporaine qu’elle perdure à travers ses avatars scientifiques, littéraires ou politiques. La création contemporaine s’est parfois inscrite en faux contre cette tentation,

par une esthétique de la destruction et du débris. Cependant, et Schaeffer le souligne avec force, les artistes les plus contestataires se dégagent difficilement d'un "air du temps" consumériste diffus après les années 1950. Accommoder les restes demeure paradoxalement plus subtil que les exhiber.

Si on confronte maintenant les observations que Schaeffer tisse à partir des arts électroniques, on relève des formules convergentes. Sous un apparent patchwork d'interventions artistiques, Schaeffer propose de rester attentif aux êtres et aux choses, créateurs de par leur simples relations. La plupart des philosophies (et des prises de position esthétiques) tentent d'aplanir les contradictions alors qu'elles constituent les véritables moteurs dynamiques de la vie. En bref, le dualisme, qu'il soit intellectuel ou artistique en appelle à l'enfermement. La clef de la liberté réside dans l'adoption, à part égale d'un troisième dimension, qu'il soit espace, temps ou personne.

De fait, le vocabulaire schaefferien reflète ses choix incommodes, ses postures de retrait et de défiance vis-à-vis des néophytes qui s'imaginent démiurges ou des cyniques qui n'imaginent plus rien. A travers des formules à l'emporte-pièce-"étoile filante", "scaphandrier des profondeurs", "singe en son miroir", "coquille à planètes", "zeste de l'orange"...-, Schaeffer réunit sous un même front de refus l'expérimental et la recherche contre les simulacres conçus pour une consommation de masse. Alors qu'il en appelle ses collaborateurs à une alchimie créative, il utilise comme un apprentissage à rebours, des mots issus de l'enfance : ses études, bidules, machins et brouillons, accompagnent l'acte de création, réservant aux objets (objets visuels, objets sonores, objets musicaux) puis aux corps (corps sonores, outils, choses) une place autonome dans la construction de la connaissance.

Il récuse également l'investissement massif dans les machines et les laboratoires. L'art, selon Schaeffer, reste le fruit de bricolages tenaces ; c'est, avant tout un "arte povera" lié à l'émotion, à l'intuition et à la réceptivité au monde. Il s'oppose donc dans les années 1970 à la dotation de moyens exceptionnels pour développer la lutherie contemporaine à l'IRCAM, de même manière qu'il réclame pour l'audiovisuel public un véritable effort de diffusion expérimentale à l'attention d'un public diversifié. Une machine, toute puissante qu'elle soit, doit être détournée à d'autres usages. L'être humain, dans sa maladresse ou son extraordinaire adaptativité, demeure créateur quels que soient ses outils.

Il le rappelle ironiquement dès 1970 :

"On a bien le droit de rêver à l'introuvable lorsqu'on garde tout son bon sens. Le compositeur pourra demander à la machine : "Qu'est ce que la musique et la machine lui répondront par une liste d'exemples sans fin ; mais il faut un compositeur pour poser la question, personne d'autre ne le fera à sa place. Ce qui le surprendrait bien, c'est qu'un jour la machine réponde "C'est ceci" et s'arrête."

Nonobstant, la définition de l'artiste change alors que celle du créateur s'étend. Autrefois, le sens commun spécialisait la création sur des savoir-faire. Nous sommes désormais créateurs de nos vies, ce qui suppose une infinité de prothèses possibles. La création liée à la commande collective met en jeu des mécanismes assez flous qui vont de la complémentarité à une véritable participation en passant par tous les modèles de l'interactivité. Schaeffer estimait que la responsabilité écologique ou biologique concernait aussi la culture et la création intellectuelle. L'art doit assumer le regard ou l'écoute d'autrui, comme un médium parmi les autres médias.

Pour ce faire, le polytecnicien-poète accentue le caractère composite des groupes du Service de la Recherche qui deviennent tout à tour des témoins et des créateurs sous le vocable d'"observateurs/observés". Pour Schaeffer, il n'y a pas de création sans confrontation, ni de réflexion sans brouillon ni recyclage. Il appelle cette dialectique "l'art

d'accommoder les restes". On ne crée pas ex nihilo. Ces précieux brouillons, bidules, machins et exercices sont aujourd'hui conservés, inventoriés et présentés au public au Centre Pierre Schaeffer.

Ce respect de la diversité de l'apprentissage, de la création et de la connaissance s'exprime paradoxalement dans sa tentation scientifique d'un alphabet/solfège, travaillé comme un lien universel.

Schaeffer, dans un resserrement poétique, traduit à sa façon cette recherche sur les correspondances artistiques, sans toucher à leur agencement : la grammaire constitue, pour lui, un substrat culturel collectif lié au long terme. Pour défendre son solfège, cette morphotypologie tributaire de l'enregistrement, il récuse la réduction de la création musicale aux modèles de la linguistique et de l'acoustique, autres fruits dérivés de l'enregistrement.

Il écrit en 1967 :
"Si la science constituait en effet la panacée universelle, l'unique chemin de la connaissance à quoi servirait l'art ? "

En ce sens son parcours personnel préfigure des interrogations très actuelles : Schaeffer, en "gardien de phare aveugle" redoutait d'aborder un siècle de "faussaires" sans avoir formé de passeurs. Au-delà de la création artistique, du jeu sur la matière et du détournement des codes, le créateur porte intimement en lui l'enjeu de la mémoire collective.

Les années ont passé depuis l'édition des deux livres testamentaires de Pierre Schaeffer, le *Traité des Objets musicaux* (1966) et les *Machines à communiquer* (1972). Ses intuitions, si paradoxales dans les années 1970, prennent en cette année 2000, un extraordinaire relief. Notre époque s'enorgueillit des capacités de stockage accrues de l'informatique et néglige ses passeurs traditionnels. L'informatique détruit les étapes de la création pour aller plus vite, dans une relation simplifiée à "l'œuvre" qui rend illusoirement proche l'imagination créatrice et le produit fini.

Jusqu'au XIXème siècle, la préservation des contenus étaient essentiellement lié aux codes alphabétiques et chiffrés sur lesquels s'ancraient le langage et les arts. Aujourd'hui, la notation semble en déclin alors la communication orale ou visuelle, apparaît en plein essor. Si le chiffre est omniprésent grâce à l'informatique il est désormais caché, peu accessible et participe d'une sorte de dépersonnalisation de la mémoire. Celle-ci abandonne progressivement la chair des systèmes collectifs ancestraux qui avaient misé, non une communication de masse, mais la capacité de survie de l'identité culturelle par la codification de la langue et la pratique de l'initiation.

Si comme Pierre Schaeffer le pensait, la technologie précède l'idéologie (*Faber et Sapiens*), il semble encore temps d'aménager notre liberté en harmonie avec nos outils. Nous avons du pain sur la planche et de la belle ouvrage en perspective. **Faire et entendre** reste le leitmotiv de la pensée schaefferienne qui confère à l"artiste" du XXIème siècle, les attributs du "chercheur". Cette réconciliation avec le réel s'exprime dans l'écoute, une attention opiniâtre à l'unique et au discontinu. Celle-ci bâtit son œuvre familièrement dans une écologie symbolique et physique, détournant les instruments de duplication et de clonage de leurs procédures excessives. En bref, nous autres, hommes et femmes de la Renaissance, devons retisser la trame des correspondances créatrices d'un monde, fragilisé par l'irruption des machines. Et Schaeffer de conclure sur cette offre :

"L'art est un symptôme. (...) Au-delà du divan, il y a la rue et la cité.

À vous de jouer”.

A STUDY ON THE VISUAL COMMUNICATION IN THE ELECTRONICALLY NETWORKED SOCIETY
KABAKOV's "Album" and MIYAMAE's "Kamishibai"

BY KIYOFUMI MOTOYAMA

The purpose of this study is to investigate the mode of visual communication in the electronically networked society, referring to the works of two artists: Ilya KABAKOV (1933-) from Russia, and MIYAMAE Masaki (1957-2000) from Japan. While not directly related to Media Art or Electronic Art, there is commonness between their visual images and cyberspace.

KABAKOV's "Album"

The ARPAnet, which is the original Internet, was put into action in the end of the 1960s. Since the first node for that computer network was set in UCLA, the net grew rapidly during the 70s. We can say that the electronic network age began at that time. In the art scene of those days, we know well the "Art & Technology" movement. And it was also during the early 70s, before Perestroika in the USSR, that KABAKOV produced and performed a series of works he called "Album". "Album" was a stack of thick cardboards displaying drawings and text, performed by showing one by one while reading the text before a small audience. I only point out a few aspects about "Album." KABAKOV used a flat material as a support to make "Album." Each flat cardboard is an independent artwork without bound, but the artist says that he can also imagine another scenes, which precede or follow it. This means that there exists a story in "Album", and the story progresses as the artist shows the drawings. It is not to say that his works are visual, but we can recognize that the text supplements or excludes the visual expression.

Kamishibai and "Album"

I introduce Kamishibai, which MIYAMAE, a Japanese artist, used late in his life. Kamishibai is a medium specific to Japan, in which a story is read dramatically while a series of pictures illustrate its scenes. We can find its origin in "Genji Monogatari Emaki", which illustrates the early 11th century Japanese classic roman "Genji Monogatari." After a long history, Kamishibai was established as a medium in the early Showa Era, around 1930, and it was used a sort of spectacle to sell candies and cookies to the children on the street. I notice the similarity between Kamishibai and KABAKOV's "Album". First, both are composed of independent drawings, which combine to make a story. So the story progresses by showing drawings one by one. Secondary, both use not only visual expression but also text.

MIYAMAE's "Kamishibai" performance

MIYAMAE began his career as an artist in the early 80s, often using electronic media such as video and computer, unlike the low-tech KABAKOV. Though MIYAMAE was conscious of the context of Art &Technology, he didn't enter into the field of Media Art.Now we review his "Kamishibai" performance. He said that it was only in the opening of his solo exhibition, held from 7 to 25 January 1997 in Galleria Finarte, that he did his "Kamishibai" performance in the exhibition space, though he actually performed it in his studio and other spaces from the middle of the 90s. He tried at least two experiments using the old medium of "Kamishibai." In one he shuffled drawing papers at random, and so tried to de-construct his original story. In another he appointed one viewers to perform
the "Kamishibai", intending to invert the usual relation between performer and viewer. Thus, MIYAMAE made trials more than 20 years after KABAKOV's "Album" using a similar medium.

Metaphor of cyberspace

Mosaic was developed as a network hypertext viewer in 1993, and Yahoo was founded in 1994. MIYAMAE's "Kamishibai" was performed just around the time when people were accepting the new reality of electronical networking into their daily life. As MIYAMAE said that he used Kamishibai as an analog a of cyberspace viewer, his performance can be considered to correspond with the new mode of story and interactivity. Logically we can imagine infinite dimensions in cyberspace. But actually most windows on the internet have less than 3 dimensions. Cyberspace can be thought as a stack of 2D views sequenced by hyper links. In this sense, the visual image of cyberspace resembles that of "Album" and "Kamishibai".

Conclusion

In this paper, I considered the similarity of KABAKOV's "Album" and MIYAMAE's "Kamishibai." Then I noticed that the time when they were produced corresponds with the years when electronically networked society was founded and became popular, and that the visual image of "Album" and "Kamishibai"resembles that of cyberspace. There we can see one mode of visual communication reflected in the electronically networked society.

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LO-TEK MEDIA: IMMANENCE ONLINE

BY LAURA U. MARKS

This talk will draw attention to digital works that offer alternatives to the discourse of virtuality by making reference to their own technological bodies. An immanentist aesthetics of digital media understands their meaning to be embodied in their physical and codic architecture. Low-tech digital artworks offer alternatives to the discourse of virtuality and the corporate-sponsored myth of transparency by making reference to their own technological bodies. The talk draws on the "digital aesthetics" of Sean Cubitt, the criterion of which is materiality, as matter cannot be reduced to symbolic systems. Low-tech digital artworks assert their own materiality and the economic and social relationships in which they are embedded. These works for the Web insist that electronic media occupy not a "virtual" space but aphysical, global socioeconomic space. They invite a phenomenological understanding of online media in terms of our shared fragility, corporeality, and mortality.

Discourse of virtuality vs. material reality:

Against the tide of virtuality of electronic media, a popular counter-current is beginning to move in favour of the actual or the material (more on the distinction between these terms in a moment). From cinema to television to the internet, some of the most popular images appeal to the desire for the real and for the indexical: evidence that what the image represents actually occurred. In cinema, a new science fiction genre deals with "virtuality anxiety," the fascinated fear that our real worlds will turn out to be virtual constructions. Movies like Fight Club, The Matrix, Strange Days, Nurse Betty, and the Spanish crossover success Abre los Ojos (Open Your Eyes) play on popular anxieties that our everyday immersion in symbolic, computer-generated worlds is ruining our ability to distinguish between virtual and actual. (Though this can also be seen as an enchantment with the indiscernibility of actual and virtual.) Now that so many spectacular images are known to be computer simulations, television viewers are tuning in to Big Brother, COPS and When Good Housepets Go Bad. Internet surfers are fixating on live webcam transmissions in a hunt for unmediated reality. The re-issue of archaic computer games like PacMan speaks, if not exactly to a desire for indexicality, then for the warm, gritty immediacy that these once-cold-seeming games now connote.

So there is a renewed popular interest in the material, in the physically existent, even as the desire for ever-greater verisimilitude supports the construction of ever more elaborate virtual worlds. To some extent these are personal, aesthetic choices. The political dimension of the actual-virtual dichotomy lies not with virtuality itself. Rather, it lies with the death wish behind the desire for transcendence that would reify the virtual from the material. (explain)

Here I must sketch out what I mean by virtual, actual, and material. As a Deleuzian, I argue that the universe is a material entity, which resides in an almost purely virtual state, and of which only certain elements are actualized at any given time. Henri Bergson, C.S. Peirce (at least in the early years), David Bohm, and mystics of various stripes concur in this non-dualistic conception of the universe as a "plane of immanence." What we call reality emerges from its immanent state when we turn our attention to virtual events, so that they become actualized. But they,re all material. When talking of digital computers, we have to extend our understanding to the quantum level to describe how this may be so. I've "proven" that the even digital media refer indexically to material states, if one believes a minority position in quantum physics (reference: "How Electrons Remember"). Note that physics denotes what exists physically, as opposed to the virtual realm to which

mathematics devotes its energies. At this level, we may embrace the world of virtuality that exists on the WWW as what Manuel de Landa calls nonorganic life.

The question of materiality becomes more pointed when we move up from quantum to classical states, and to the crude level of material life. This brings a more clearly political edge to the virtual-actual dichotomy, which is addressed by Marxist materialism, and by feminist theories of embodiment, and by non-dualistic philosophies of immanence.

To establish a politics of materiality in digital media, Sean Cubitt has proposed a neo-Marxist "digital aesthetics." Beginning with the Adornoesque premise that what he calls synergetic corporations are infinitely capable of incorporating resistance, Cubitt is rightfully suspicious of mere subversion of the dominant digital culture. He calls instead for the building of social alternatives, which are grounded in the materiality and locatedness of specific human-machine interfaces. His criterion for digital aesthetics is materiality, because matter cannot be reduced to symbolic systems such as those created by digital media. The material, or we might say analog, relationship is the source of the social. Thus we might look for digital artworks that refer to the social circumstances in which they were produced, or that draw attention to the physical platforms on which they were built. In the following I will examine some of these works and the level of materiality on which they may be said to exist.

Most commercial applications of digital media, and many artists, applications as well, seek to make their physical infrastructure invisible: to merge computer-generated images with photographic images. The rhetoric in Hollywood suggests that "in the future" movies will be entirely computer-generated. Observing this phenomenon, Lev Manovich remarks provocatively that, with the brief exception of 150 years of photo-based imaging, the history of all media arts is a history of painting. Increasingly, the virtual masquerades as the material: I am suspicious of this development, for it seems to want to replace the indexical image of a pro-filmic reality with the signifiers of indexicality. Perhaps the most spectacular example of this is the spectacle of indexicality in the 1999 film American Beauty. American Beauty,s famous, apparently unedited shot of a plastic bag blowing in the wind functioned as a testament to the mystical serendipity of life itself. How ironic, then, to discover that the shot was not the result of a 35mm film crew waiting patiently in an alley for the bag to perform its ethereal dance, but was generated in computer. (Whether this matters to people other than materialists like me is a Peircean question: does the index need to indicate something pre-existing in reality, or merely our imagining of something that existed?)

The seduction of virtuality is that we can come to believe that we no longer need the material world. To paraphrase Cubitt, human communication is material and thus transitory. The abstraction of communication into information is an attempt to hold mortality at bay, but it takes place at the expense of our own dematerialization.

Digital media, because they necessarily abstract experience into information, invite us to mistake their information worlds for reality. They invite us to believe that we, too, exist in an abstract realm. The material consequences of this are considerable: We can pollute all we want, for example, as long as there are virtual rain forests to visit. A digital aesthetic, Cubitt suggests, would recorporealize the world by refusing its reconstitution as information.

The Web and other computer-based media rely, of course, on a material substrate. They are not "virtual" media; the images they produce are not immaterial. A well-running platform, for those who have the $$, has a false transparency that makes it quite easy to believe we are operating in a virtual realm. Software, hardware, and server corporations have a deeply vested interest in this myth of transparency and the dependency on their

services it creates. But anyone who has a less-than-perfect system is likely to be reminded often that all this stuff exists at a material level. When our computers fail us we are most forcibly reminded of "virtual" images' physical being. Breakdowns and failures, anomalies of low and obsolete technologies, low bandwidth, and the ways electronic media are actually used as opposed to how the software manuals imagine them. The materiality of digital media asserts itself at a number of levels, which are, from micro to macro:

0. quantum level. Permit me just to assert that we are in fact all interconnected physically at the quantum level.

1. electronic level. Unpredictability: errors, breakdowns. True randomness.
The myth of transparency would have us believe electrons behave the way they do in diagrams.

2. hardware level. Low bandwidth, obsolescence.
The myth of transparency would have us believe everybody's working with optimal hardware.

3. software level. Viruses, lack of money for upgrades, obsolescence.
The myth of transparency would have us believe everybody,s working with optimal software˜and using it for instrumental, often commercial purposes. Many makers of digital media fall into the upgrade trap. Those who can afford to, use the newest technologies to (for web artists) produce on-line works that are inaccessible to audiences who lack the necessary bandwith, memory, servers and plug-ins. In contrast, works that use low and obsolete electronic technologies may be considered an act of corporate refusal and an insistence on the materiality of the medium. "Appropriate technology"-style applications use software for purposes for which it was not intended.

4. social level. Lack of access for poor people and poor countries, lack of money, means people aren't online at all.
The myth of transparency would have us believe everybody will "eventually" be connected.

Next I will look at several artists, web sites that deal with one or more of these levels of materiality following this discussion, I will return to the questions of embodiment and immanence in net.art.

To elaborate on materiality level 1:
Toronto artist Norm White points out that electrical engineering imagines digital media to produce a square wave, its two poles reflecting 1 and 0. But in reality, those square waves are very wobbly, as the electrons can never be fully tamed by the electronic circuits that herd them around.

*Draw/Overhead:
Square wave in theory
Square wave in practice

In fact, then, electronic error is inherent in digital computing, and it is the errors that remind us of the physical existence of the medium. At a micro level, our digital media are actually analog media: errors occur analogously with these tiny declarations of electronic independence.

At a more macro level, the materiality of digital media asserts itself in economic and political questions of absence, corporate dependency, and obsolescence.

To elaborate on materiality level 2:
Many artists fall into the hardware upgrade trap, making works that require fast computers with lots of RAM. Others, however, make virtue of necessity by exploiting the aesthetic and communicative potentials of "obsolete" hardware. Web sites designed for low-bandwith, slow modems.

show Redundant Technology Initiative, www.lowtech.org/revolting :

A page on the RTI web site reveals a memo circulated by Microsoft to its subscribers, encouraging them to stop using the amateurish and unpredictable ASCII art and instead use Microsoft,s clip art. (Even Microsoft Word now auto-corrects ASCII art, turning :) into a smiley face, for example *draw*.) Microsoft,s goal is to ensure dependency at every level and to eradicate individual, creative, and unauthorized uses of its software. This leads me to--

materiality level 3: The hardware and software upgrade traps constitute a conspiracy by digital media corporations to enforce dependency on more sophisticated software and the bigger, faster machines it requires. However, there are artists, web sites that resist the software upgrade trap and exploit the potentials of low tech:

a. works for the web that are intentionally low-tech or that mimic a low-tech interface, in a nostalgic reference to obsolete platforms.

What deserves to be considered the folk art of the digital age, ASCII art, ignores the potential of graphical, audiovisual interfaces images to persist in the text-based interface that graphical interfaces have superseded. ASCII art uses the limited technical means of keyboard characters to produce a great creative variety.

show Veronika Carlsson,
http://www.ludd.luth.se/users/vk/pics/ascii/ASCIIM.HTML:

beautifully modelled naked men, Schiele-like, a sort of digital chiaroscuro. We may consider ASCII art to be an electronic variant of traditional art forms identified with women, such as textiles and embroidery. In their amateur status and private circulation among friends, ASCII sites function as another form of community-based, rather than professional, art practice. But rather than invoke a hierarchy between "low" and "high" arts, I,d like to suggest ASCII art is not only a legitimate artform outside the professional art world, but a political refusal of the upgrade trap.

People operating within the art world also incorporate ASCII art:

*show Juliet Martin,s ASCII-style concrete poetry web sites,
http://www.bway.net/~juliet/: and Vuk Cosic,s ASCII music videos.

More recently (i.e., in the last year), many sites are incorporate ASCII-style text-based interfaces, including membank.org, pretty site on turbulence, and

*show m9ndfukc.com

It’s interesting that some of the most sophisticated sites reject the graphical interface for an animated, text-based interface. Nostalgic for the old-style Atari interface, these sites often use green or orange text on black screens. In these cases, extremely sophisticated programming hides behind, or alternatively, pays homage to, the military applications for which the interface was developed.

*show www.turbulence.org/Works/now/index.html

Primitive graphics reminiscent of early NASA, and Tron-style figures in
Here and Now by David Crawford evoke the history of the medium, from its military development to the first commercial applications of shoot'n'kill software.

Scores of interfaces meet their come-uppance every year as the sotfware companies encourage us to upgrade. Outdated software suddenly calls attention to itself as a physical entity. Losing currency, old software gains a body. (Currency, or cash, = the ability to translate objects into information.) Hence Vivian Sobchack,s nostalgia for the wobbly forms and poor resolution of Quicktime 1.0:

b. "Appropriate technology"-style applications use software for purposes for which it was not intended. Art web sites that adopt this intervention often comment in structuralist style on the commercialized form of off-the-shelf web-authoring software like Adobe PageMaker, Dreamweaver, Shockwave, etc. Commercial software colludes in the corporate attempts to turn the 2-way medium of the WWW into a one-way medium, as occurred with television in the 1930s. In place of the equal exchange of early days of the web, a supplier-consumer relationship has been set up, and web authoring software is complicit in this unilaterization of the exchange.

I've identified a few ways in which web artists subvert the commercial purpose of web authoring software: the click box, the hotlink, the error message, the pop-up window, and the survey. While these works do not draw attention to the materiality of the interface as ASCII art does, they do point out the commercial purposes built into seemingly innocent software.

i. Online forms help marketers gather information from consumers, such as credit card numbers. Click boxes automate the "interactive" process into a series of consumerist choices.

Shulgin, Form Art Alexei Shulgin claims credit for the invention of Form Art, and sponsored a Form Art contest in 1997?

*show Juliet Martin, clack

What the genre of "Form Art" does is de-instrumentalize the form and click box, by reconceiving the consumer web page template as an aesthetic medium. Commercial web pages, "content," which is basically a medium for online shopping, is rendered all form. (We might compare Warhol,s aestheticization of the box of laundry soap.) These examples show the pleasing patterns made possible with the structuring medium of web authoring software. (Ask Juliet M what software she uses)

ii. The hotlink is perhaps the defining form of the visual web interface term? Meanwhile the competition for choice URLs means that a hotlink is already a form of advertising, whether one follows it to the linked page or not. Easylife, for example, has built poems of hot links to sites with suggestive names, hijacking their commercial and informative intentions for aesthetic purpose.

iii. Netscape/Javascript error messages
Javascript (always?) error messages are a powerful reminder that all these graphics come to us courtesy of programmers with varying degrees of time and experience. As you know, some sites become inaccessible because they have so many errors; to me this creates a material link to the harried programmer working late at night and making mistakes. Error messages become found poems in sites such as m9ndfukc, where we must assent to a

series of errors that go, "juzt 1 clik"; "juzt 1 clik"; "bizt du gluchl!ch?+" "ja?+", before dumping us onto the mysterious sales site "Kagi."

*show www.turbulence.org/Works/short/index.html

John Hudak's Short Work, on turbulence.org, combines Form Art and the Javascript error poem, making these impoverished forms the indexes for sensuous experiences one cannot have online. A tiled image of wintry bare branches and a repeated sample of birdsong ironically invoke the distance from nature. Click on any of the array of click-boxes and you get an error message: "Coughing in the wind"; "the dog,s hind legs"; "My son imitates the ferry horn"; "smell of fresh brewed coffee"; "nose in peat and ivy." Here Form Art rejects verisimilitude in order to point past the sensuous limitations of the interface, asking us to imaginatively call up a multisensory narrative.

iv. the pop-up window
Like the error message, the pop-up window so maddeningly familiar to users of "free" servers like Yahoo! is a way of showing us the inexorable limits of the interactive medium. This in itself reminds viewers of the commercial constraints on the medium.... In some art sites these windows, usually meant for advertising, fill the screen faster than you can click them closed, until your computer runs out of memory and shuts down. Examples include Alexei Shulgin "This morning" and

*show Antoni Abad, "Kisses" -unless it,s too unruly (address)

Again, commercial form becomes useless and even dangerous.

materiality level 4, the social level

Beyond electrons trapped in silicon, hardware, and software, a fourth level at which the materiality of the WWW can assert itself is the broadly social level. Artists, web sites dealing with this level are too numerous to mention, as their material for parody, subversion, and sabotage is so broad. But to mention a few:

(The survey accumulates information about consumers in order better to market products and services to them. Amazon.com, for example, greets repeat visitors with "Hello, [Laura]! We have new suggestions for you in books, videos, and music." This format has been most famously subverted in Komar and Melamid's World,s Favorite Paintings web site. Their meticulously accumulated and charted information results in outlandishly undesirable "favorite paintings" for each of the ?? countries they survey. Komar and Melamid are basically critiquing digital thinking, which attempts to quantify and categorize subjective desires and beliefs. "Hello, Kenya! You prefer outdoor scenes, wild animals, and the color blue? We have a painting for you!").

Faux-commercial sites criticize the commercialization of what was once an interactive medium by delivering useless or impossible products. The faux-commercial web site has the potential to draw unsuspecting surfers into what looks like just another chance to shop but really is designed to mess with their heads. As with many actual e-commerce sites, it is near-impossible to divine, through the fog of sales rhetoric, what products these sites are selling. Airworld.net is programmed to search the web on buzzwords and download images and text from corporate web sites into their own, changing all company names to Airworld, so indeed it looks like you could join the Airworld company, invest in Airworld stock, fly Airworld airlines, and purchase Airworld hair products.

*show pavu.com appears to be selling designer soap, but it,s really an art distributor...

At this level exist many sites that apply Noophagism, or eating information (Mark Rudolph describes them as "anthropophagic", though really they're info-phagic sites). Like Airworld, these sites suck information off other sites and reprocess it. They include some of the most sophisticatedly programmed sites: Jodi.org, Mark Napier's Shredder and Composter, easylife.org, and M9ndfukc.

These vampiric sites live off the commercial activity on the web and recirculate it in monstrous forms; also they make information that normally would have a limited lifespan Undead. This may be termed a structuralism of "Nonorganic life" (explain). These and other works for the Web insist that electronic media occupy not a "virtual" space but a physical, global socioeconomic space.

Discourse of immanence

Let me return to the desire for indexicality I mentioned above. If electronic media are indexical, they are indexical of a particular level of materiality: they are indexical of the imperfect flow of electrons that constitute them, or of the platforms on which they were built, of how much time and money it cost to make them, or of the social networks in which they exist. Thus we can read an online artwork for bodily existence just as Benjamin sought the hand of the painter in the form of brushstrokes. Here the bodies indexed are the material bodies of subatomic particles, the physical bodies of platforms and servers, the tired bodies of programmers. These bodies are all immanent in the pages that flash on our screens: we only need to be able to read them. What is actualized on the screen is the tip of a virtual iceberg (bad metaphor): what is virtual within the web is bodies, organic and nonorganic, all interconnected. It is easier to be aware of these many bodies when transparency is not perfect.

(more on embodiment)

Technologies age and die just as people do˜they even remind us of our common mortality--and this is another fact that the myth of virtuality would like to elide. Digital aesthetics thus invites a phenomenological understanding, in which we can understand media in terms of our shared corporeality.

IS THE INTERNET FOR EVERYONE?
ART IN SEARCH OF A BETTER CONNECTED SOCIETY

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In recent years the Internet has often been associated with the notions of progress, improved quality of life and greater democracy. Nonetheless, research shows that – with rare exceptions – only the apex of the social pyramid in each community is connected to the Internet, totalling a paltry 7% of the population of our planet. “Unless we ensure proper capillary penetration and are creative in introducing alternative forms of universal access, we shall be helping perpetuate inequality and violating the essential right to communicate” (Afonso, 1999). At the Electronic Arts Unit, at PUC-Rio University, we run a series of research projects on social issues: our project “Internet, illiteracy and social exclusion” focuses on the emerging actors inside, at the fringe or outside the Net society. The projects’ site shows how 120 people living in different social-economic circumstances in Rio de Janeiro perceive and understand the Internet, how it affects their lives, and its implications for their future. It also encourages users to send their opinions, images and ideas so that they become part of the site’s data bank, in a very dynamic and intriguing way. In this paper, we present and discuss the results of this project, and the advent of what we call the “net-social-diversity”.

From New World to Third World: what changes with the Internet?

A curious parallel can be drawn between the era of the great sea voyages – when a number of European countries set out to conquer the new World – and what is happening in the present day as a result of the spinning of the World Wide Web of computerized communication [1].

Just as happened half a millennium ago – when the countries that had mastered the technology and know-how necessary for long-distance sailing drew a new map of the world, full of colonies of continental proportions – so today, a few developed countries are increasing overwhelmingly their potential for influence, their wealth and their consumer markets in relation to the communities inhabiting what we no longer call the New World, but the Third World.

A number of studies show that the increasing spread of the Internet and the World Wide Web – a new kind of navigation initiated only a few years ago – are accentuating socio-economic inequalities among nations and groups on our planet, and are once again redrawing our world map [2].

Today certain communities have the resources and knowledge with which to conduct leading edge research in this field. They hold the rights to, and control the generation,

distribution and production of, technology goods and they have – or are investing to obtain – the necessary technological infrastructure to put these goods to work. In the last analysis, they have the access and the opportunity to make full use of the potential of this gigantic information and communication network and to benefit more and more from its proliferation and expansion. On the other hand, certain other communities merely have access to the Internet, but not the capability to harness its potential fully or even partially, for lack of appropriate infrastructure, and of resources and investment in either technology and science, or education. Meanwhile, there are even communities that have no access at all to this technology – and no prospect of gaining access in either the medium or long term.

According to the 1999 United Nations Human Development Report [3], “writing computer programmes and revealing genetic codes have replaced the search for gold, the conquest of land and the command of machinery as the path to economic power”. The report describes how the privatization of scientific research and the constraints of intellectual property rights – which raise the cost of access to new technology – are sidelining poor countries and threatening their interests. It warns of the undemocratic nature of the Internet, which favours only certain groups and excludes the rest: “Current access to the Internet [… divides] educated from illiterate, men from women, rich from poor, young from old, urban from rural”. This imbalance, it continues, will not be corrected by market forces: rather, for this to happen, there is a need for rapid, energetic measures, which in turn involves issues ranging from expanding the infrastructure of connectivity in developing countries, through to, for instance, instituting a form of taxation on Internet use, revenue from which could be used to invest in extending the network’s benefits to all [4].

That the Internet has far-reaching democratic potential is refuted by theoreticians who believe the endless growth of information and the new transnational reference horizons thrown open by the Internet have not made transcultural relations easier or expanded anyone's understanding of other people, but have more often led to the mere repetition of "binary, manicheistic schemes that divide the world into rulers and the ruled, modern and traditional, centers and peripheries" (Canclini, 1998, p. 2).

Quéau (1998) highlights the danger of using expressions like "global society" and "universality". For him, globalization is not universal, since it does not affect everyone in the same way. The concept of "global civilization" is simply the projection of a privileged minority (the "manipulators of global symbols"), a small fraction of the planet's inhabitants. "The great majority of people do not understand the concept of globalization or even benefit from it, even when they in fact support its consequences and are directly or indirectly – but truly – affected by it" (p. 1). Jérôme Bindé, who directs UNESCO's Analysis and Forecasting Division, claims that countries located to the south of the planet are less worried about access to information highways than about developing basic infrastructure, including telephony, which is the very key to accessing the Internet and cyberspace technology. "Four fifths of the planet still has no telephone today" (Bindé, 1998, p. 3).

South Africa is the African country where the greatest number of people have Internet access, but many hospitals and around 75% of schools have no phone line. Even at universities, when they do have an Internet connection, contingents of up to 1,000 people depend on a single terminal to connect. “Information is only one of many needs”, says the UN report. “Email is no substitute for vaccines, and satellites cannot provide clean water. High-profile technology projects risk overshadowing basic priorities” [5].

A number of authors take the rather optimistic view that communications network technology creates radically new conditions for society. Many theoreticians feel that the Internet is causing individual and cultural expression to flourish, along with democratic access to information. Weston (1997) says that the Internet gives a large number of

people the wherewithal to speak for themselves in public. He thus considers the Big Net a "techno-social accident" which caused an ironic turnabout from the way historically centralized communications technologies shaped modern social relations – where the few held decision-making power over what information could be broadcast to the many: "As soon as it was clear there was not enough band width for everyone to send their smoke signals or drum rolls, we have organized and re-organized to ascertain who could – and who could not – put their hands on the blankets or the drums – and on the printers, the microphones and the cameras. (...) Until very recently there was no reason to imagine that some day we would be questioning the abundant access to the means for producing, exhibiting, distributing and reproducing cultural goods. Suddenly it's time to begin imagining these situations. This is the big issue for the Internet" (Weston, 1997, p. 195).

For some writers, not only can the Internet transcend geographic, social and political barriers as a means for exchanging ideas; in its present unregulated form, it can also circumvent enforcement of certain laws, rules, customs and morals (Mehta and Plaza, 1997, p. 161).

For Lévy (1998), cyberculture reflects the moment at which our species, by economic globalization and by densifying communications and transportation, is tending to create a world community, even if that community is rife with inequities and conflicts (p. 10). For this author, the paradoxical essence of cyberculture is a universality that lacks any central meaning, a system in disorder, a labyrinthine transparency, an immense act of collective intelligence. Cyberculture embodies a new kind of universality: "universality without totality" (p. 6). On the assumption that technology is a particular dimension of collective becoming, Lévy (1993) also believes that "techno-democracy" is possible. For the necessary changes in politics to become possible, he holds, one key element is for the technical options to be fully integrated into the process of democratic decision-making: "To become a techno-democracy, all techno-politics has to do is to take place in the public scene as well, where the actors are equal citizens and where the rule of the fittest does not always prevail" (p. 196).

Others feel that the Internet is expanding the locus of day-to-day, direct, self-mediated political involvement: "Those who previously had to have themselves represented by way of agents of mass communication, new begin to represent themselves. What was previously local, domestic, idiosyncratic and private can, for the first time, become external and public" (Weston, 1997, p. 197).

The digital economy leveraged by the Internet has been defined as the first economy in the history of capitalism to make it easier to overcome spreading the proliferation of social inequality, by allowing minority and underprivileged groups to become part of the producing class, and not just of the consumer class. “As a result of its non-hierarchic structure, anyone can join it and start their own business”, declared Michael Powell, member of the United States Federal Communication Commission, recently [6].

Yet in a world like today's – marked by dramatic social, cultural and economic disparities – is it really possible for “anyone”, as above, to start their own business on the Internet and become part of the producing class?

The media increasingly convey a democratic and globalizing image of the Internet, along with discourse that would lead one to believe in the possibility that it will include many, if not all, of us. Today however – with extremely rare exceptions – only the very apex of the social pyramid is connected to the Internet, totalling a paltry 5% of the population of our planet [7].

How can one hope to include a substantial proportion as Internet users – in the short, medium or long term – so as to make the Web truly global, when the financial, technological and educational obstacles facing countless communities are of such an order as to preclude even the minimum conditions necessary for survival? How can one hope to extend the benefits of the Internet to them – unless in rhetoric, ignorance or irony – when so many have neither housing nor food, sanitation, clean drinking water, literacy, electric light or telephones? Is it to be a case of: “They have no bread. Let them eat cake!”?

Factors like wage earnings, level of schooling, age, ethnicity, nationality, sex and language all contribute to defining who has a chance of being part of the information society, and who will be excluded – partially or wholly – from the benefits of this new form of social organization, and from this new world map now being drawn.

For Quéau (1998), the quest for the "common good" – universal ethics and moral awareness, beyond geo-political borders or the specific interests of certain groups or contexts – is our greatest present challenge, since the "common good" will only be brought about by mankind’s acting jointly and in common to achieve it. Instead of a "global world," what we really need is a "common world". For this author, the unity of the human species cannot be based on a single religion, philosophy or form of government. It must be based on multiplicity, on diversity. Globalization, which imposes a simplified form of unification, has thus threatened the basis for building solid human unity: "The blue planet seen from the satellite appears united, but fragile. The Internet planet also appears united, thanks to the 'universality' of the TCP/IP protocol and HTML language. Yet global social consensus is still more fragile than the ozone layer" [8].

Internet and social exclusion: a gaping chasm

It took 38 years for radio audiences to reach the 50 million mark, 13 years for television to reach 50 million viewers, 18 years for personal computers to enter the daily lives of 50 million users, but only 4 years for the Web to net 50 million surfers.

The Internet is unquestionably the fastest-growing medium in human history. The number of people worldwide connected to the Internet today is estimated at 378 million, and the forecasts point to a total of more than 700 million users in 2001 [9]. As impressive as these numbers may appear at first sight, however, surveys of the Internet must also be analyzed in terms of issues of infrastructure and access, technology research and development investment and funding, government human resource capacity-building policies, means for the production, exhibition and distribution of information, and other factors in the various countries and communities.

Canada and the United States alone – home to only about 5% of the world’s population – account for around 50% of all Internet users, while South Asia, where some 20% of the world’s population lives, houses less than 1% of those connected to the Big Net [10].

There are more computers in the United States today than in all the other countries in the world together. In June 1999, 110 million United States citizens (around 41% of the total) were connected to the Internet. When the world’s ten largest economies, by GDP, are ranked by number of Internet users, the US is followed by Japan with 16 million users, Great Britain with 14 million, and Canada with 12 million (Afonso, 1999).

A survey by Network Wizard showed that, in Finland, one in every 11 inhabitants is connected to the Internet, while in the United States the proportion is one in 15. In Great Britain, 1 in every 59 people is connected to the Internet, and in Germany the ratio is one to 83. In China, Internet use increased 324% in 1999 – going from 2.1 million users in 1998 to 8.9 million in 1999 [11].

Although Brazil stands out as one of the developing countries where Internet use has grown most in recent years, in June 1999, a total of 3.3 million Brazilians – that is, barely 2% of the population – had an Internet connection [12]. Six months later, in December 1999, studies pointed to a contingent of 5.1 million users in Brazil, still far less than 3% of the population, today estimated at 165.3 million by the Brazilian Geographical and Statistical Institute (IBGE).

The number of Latin Americans connected to the Internet went from 4.8 million in 1998 to 7.5 million in 1999 (half of them in Brazil), according to a study by International Data Corp, which forecasts that by 2003 the number will rise to 19 million Net surfers. The analysts suggest that the Internet's growth potential in the region is very great, despite the lack of telephone lines, an average per capita income of only US$4,000 per year, and the resulting difficulty of purchasing a computer, which costs an average of more than US$1,000. Some details are unexpected, such as the average length of time connected to the Internet in Latin America, which is 8.2 hours per day, as opposed to a US average of 7.1 hours. Sales via the Internet in Latin America are expected to rise from their present level of US$167 million to US$8 billion in 5 years (Scofield Jr., 1999).

However, the issue cannot be discussed solely in terms of overall results and statistics for each country. Take the United States, for instance: as in several other industrialized countries, enormous disparities in Internet access, control and use can be observed there between different segments – as a function of ethnicity, race, socio-economic situation, education, gender or age. The phenomenon known as the "digital divide" has been growing over the years: that was the conclusion reached by the United States Department of Commerce, as presented in its second report on the state of Internet development in the US, released in August 1998. The study found marked differences in Internet use between white, Afro-American and Hispanic families. Of families in the USA with Internet access, 40.8% are white, 19.4% are latino and 19.3% are black. More serious still, the study found that people belonging to the minorities were even less likely to own computers or to have access to the Internet when they lived in rural areas. The gap between white and latino families in terms of access to the new technologies has widened significantly. According to the report of the conference "Falling through the Net: defining the Digital Divide", organized by the United States Department of Commerce in December 1999, wage level is a strong determinant of an individual's or a family's potential for Internet access. "For those at the lower end of the income scale ($5,000-9,999), 12.1% use the Internet (...). This contrasts with 58.9% of those in the highest bracket ($75,000+) accessing the Internet..." In addition, this indicator also affects where and how a person uses the Internet: "persons with incomes of less than $35,000 use the Internet more often outside the home, while (…) those earning $35,000 or more annually" access the Internet mainly from home. "The digital divide" in terms of access to the Internet "between those at the highest and lowest income levels grew 29 percent". The report also showed that level of education plays an important part in determining the likelihood that a person will have a computer and Internet access. College graduates are more likely to have access to the Internet at home or at work than those with lesser educational accomplishments. While 61.6% of those with four-year college degrees use the Internet, least usage (6.6%) occurs among those persons with an elementary school education or less. "Those with a college degree or higher are more than *eight times* as likely to have a computer at home (…) as those with an elementary school education. In rural areas, the disparity is even greater. Those with a college degree or higher are more than *eleven times* as likely to have a computer at home (…) and are more than *twenty-six times* as likely to have home Internet access (…) as those with an elementary school education" [13].

Nonetheless, industrialized countries have shown they have the means to reduce or even eliminate these discrepancies, if they wish. Last month, as part of the Technology

Opportunities Program (TOP), the US Department of Commerce announced funding of US$12.5 million for local governments and non-governmental organizations in the United States to invest in small organizations providing services to the most underprivileged rural and urban areas. The purpose is to narrow the existing gap between US citizens who have Internet access for purchases, research and business, and those that do not. Since this program was set up six years ago, it has channeled more than US$135 million into projects that make practical use of telecommunications and advanced information technology.

In his opening address to the Digital Divide conference, in December 1999, the President of the United States said: “I just ask you all to think about this one thing: What do you believe the economic impact would be if Internet access and usage were as dense in America as telephone access and usage. I think it's clear that we need to keep working until we achieve this goal.”. He concluded by calling on all those present to participate in this “great national endeavour”: “Together we have the power to determine exactly what we want the Internet to become, and what we want it to do is to be an instrument of empowerment, education, enlightenment, and economic advance and community building all across America, regardless of the race, the income, the geography of our citizens” [14].

While the industrialized countries are seeking ways to bring their citizens into the computer network by investments and political action, the gap seems vast – and in many case probably unbridgeable – to those on the technologically less-favoured side, in the Third World. The ethics, the rules and the interests that govern the Internet’s development today have devastating implications for the developing countries: “In private research agendas money talks louder than need. (…) The rush and push of commercial interests protect profits, not people, despite the risks in the new technologies” (UN Human Development Report 1999, p.57).

Is the Internet undesirable technology then, something harmful and destructive that should be rejected by technologically underprivileged countries? Or is the Internet the technology with the greatest democratic potential mankind has ever developed, technology that, at its present volume of one billion documents on-line, affords free and indiscriminate access to the most complete storehouse of information ever accumulated?

The transcultural challenge of the "common world"

Those who see the Internet as a *locus* for democratic access to the acquisition and distribution of knowledge, or as a new public, participatory space for transcultural and international communication, seem to have embraced a narrow, simplistic view of the process of communication, ignoring the diversity of social contexts in which communication takes place as well as the notion of meaning as a social construct.

Intercultural communication is a field of study which investigates verbal and non-verbal interactions between individuals with diverse behaviour patterns based on their different life histories and in their different cultural contexts.

Trillo (1997) states that subjects involved in the activity of communication always bring with them a repository of group experiences, knowledge and values, which vary depending on their cultural background. When these repositories are different, one can say that intercultural communication is taking place (p. 1).

What then would be the ideal way for the cultural groups and communities currently left out of the Internet, gradually to be incorporated – but without harming them? As we will see, opinions differ as to the possible results and the implications of the process of global computerization, and the impact that the Internet will have on cultural minorities.

Several authors have used the prism of intercultural communication to discuss the vulnerability of minority cultures in the light of globalization. What is Lévy (1996) believes that the "brutality of cultural destabilization" should not blind us to socially favourable emerging forms, whose development should be enhanced. Emerging new forms of communication for de-territorialized collectivities – including chats, electronic forums, groupware for cooperative learning and so on – represent a decisive advance towards collective intelligence. These the author calls "all-to-all communication", as opposed to the classical forms of "one-to-all" communication in which information comes from one broadcasting center to "passive receivers, isolated from each other" (Lévy, 1996, p. 113).

For Bindé (1998), on the other hand, the opportunities offered by the technological revolution – simultaneous participation by all cultures on a global scale, the chance to dialog in real time across geographical borders – are simply the sunny side of a much more insidious process which is progressively being inflicted on the mainstay of cultural minorities. This author suggests we look critically at the flow of information on the Net and ask: "Who informs whom?" In fact, of the present one billion documents available on-line, 86.55% are in English, 2.36% In French, and only 0.54% in Dutch (NUA Internet Surveys, 1999). According to Bindé, "Behind the gratuity of information on the Internet and the facility of access to sites, we must recognize the expression of dominant cultures, which use the new technologies as vectors of their supremacy. Post-modern wars will be waged on a new territory: that of information and communication, the place where the decisive battles will be fought" (p. 3).

Will the Internet thus be the information society's Tower of Babel? Will it be a quest for unification, power and supremacy that will end up scattering men ever further upon the face of the earth, as described in the Biblical passage? Should we, taking a lesson from our ancestors' failures, resist its potential? How, on the other hand, could we pass up the opportunity for intercultural contact made possible by the advent of this new technology? How can we deny the desire for communication with others, the feeling of estrangement, even at the risk of cultural homogenization?

Some authors see the possibility of culture shock giving rise not to "a planetary monoculture" [15], but to brand new cultural syntheses and novel intercultural forms. It would be as if a new cultural diversity were in the throes of creation and development, enhanced by conditions supplied by the new technology. "This new cultural diversity would be joined with the pre-existing cultural base, with that diversity which has been in the making for centuries" (Bindé, 1998, p. 3).

Yet, is it really possible – and desirable – that this happen?

There may have been a time in human history when people from different cultures used similar objects demanding similar skills and aptitudes to carry out the same kind of tasks and functions. From a present-day perspective, however – with technological progress rapidly and intensively widening the gaps between societies around the world – such an egalitarian view sounds at best ingenuous, if not absurd. Countries have now been categorized on the basis of their stage of technological development, quite apart from their natural wealth, their size, their people or their culture. The world has been divided into First and Third Worlds, and technology plays a key role in maintaining that segregation.

"In Cambodia in 1996, there was less than 1 telephone for every 100 people. In Monaco, by contrast, there were 99 telephones for every 100 people. A widely accepted measure of basic access to telecommunications is having 1 telephone for every 100 people – a teledensity of 1. Yet (…) a quarter of countries still have not achieved even this basic level. (…) At the present average speed of telecommunications spread, Côte d'Ivoire and

Bhutan would take until 2050 to achieve the teledensity that Germany and Singapore have today" (UN Human Development Report 1999, p. 62).

Most research and development in the new technologies takes place in developed nations. In 1996, while Brazil invested US$10 per capita in research and development, the United States invested US$507, Germany US$576 and Japan US$619 [16]. It is important to consider the international dimension of the development of computer technology. On a global scale, this can be seen in processes of technology transfer – from developed to developing countries – which exacerbate the problem of economic and cultural domination. Kaplinsky (1996) analyzes several aspects of the potential conflict generated by technology transfer. For him, any set of complex relationships amongst individuals or groups can generate misunderstandings and conflicts. In technology transfer, however, "the conflict does not just arise from the misunderstanding of the other's motives and intentions, but is intentionally built into the process". Kaplinsky's explanation for this is that the technology being transferred is the primary factor in generating profits: "Control over this technology is crucial, not just because it implies control over the generation of profits, but also as an important element for controlling the distribution of profits" (p. 197).

Laurel (1992), on the other hand, discusses the creation and design of computer environments and tools in the First World and their exportation to other countries, highlighting problems such as access and colonialism: "Should white heterosexuals from the First World create small, virtual terrariums for Blacks, Latinos and homosexuals, based on their own ideas and visions with regards to such cultures?" (p. 91).

Some people will, de facto, have a hand in creating, developing and controlling computer technology, while others will have to follow – and adapt to – the rules, design and logic established by the former group. It does not take a visionary to foresee who will belong to which group, since economics, technological progress and education have always been interdependent variables (Spitz, 1999).

Images in a distorting mirror

The so-called "modern lifestyle" of consumer society demands that a single model be adopted by developed and developing countries. This uniform pattern dictated by developed countries makes it harder – or even totally unfeasible – to generate alternative, differentiated technologies based on the social, cultural and economic parameters of each context, and ultimately leads to the Third World's being recreated in the image of the First.

According to a 1998 UNDP study, the world is experiencing an explosion of consumption, fed by the globalization of markets. "From 1975 to 1995, sales grew by 500% for TV sets in Latin America, 1,400% for cars in Eastern Asia and 400% for radios in Africa" [17]. Advertising is another consumption-related phenomenon: an average American watches 150,000 TV commercials in a lifetime. The global advertising market is estimated at US$435 billion, and curiously Colombia is the country that spends the largest share of its GDP on advertising: 2.6%, or US$1.4 billion. "The very definition of populations' need is changing, says the UNDP, making it ever more difficult to make out what luxury means" (Berlinck, 1998).

As early as 1993 Negroponte maintained that, "Today people are using computers as part of their daily routine. (...) There is not a human being in the modern world who currently uses less than 12 computers a day, from faxes to microwave ovens" [18]. While this is still not in fact the case for the majority of Third World inhabitants, there are forecasts that in the near future citizens of developing countries will have to face the digital challenge and interface with computers in many of their daily tasks.

Other forecasts go even further. Kevin Kelly, executive editor of *Wired* magazine, predicts that very soon digital money – a tiny chip laid into a conventional credit card, called a smart card – will replace bills and coins. "Instead of going to an ATM to withdraw cash, we will stick the smart card into a bank terminal and it will be loaded with a given value. When we buy something, another little gadget in a store or subway, for example, will unload it" [19]. For some, the entry of credit cards into the world of chips will drastically reduce the occurrence of fraud, and will be a tremendous technological leap. But what will the social impact of this change be in developing countries, which normally have a huge contingent of illiterate or semi-literate people who already find it hard to deal with current bank automation? Surprisingly, the smart card has already been tested in Brazil by various financial institutions, such as Bradesco, Banco do Brasil, Visa, Ceará State Bank, Master Card and American Express [20], clearly suggesting that – sooner than we might imagine – money will have been reduced to information carried virtually in a credit card: a difficult, abstract notion, hard to grasp for many.

So much the worse for us, citizens of the Third World, since, as Galeano (1993) suggests, "big cities in the south of the planet are like the big cities in the north, but reflected in a distortion mirror. Copy-cat modernization multiplies the defects of the model" (p. 15).

Created using parameters set in developed countries and designed to meet the needs of certain groups of users who belong to those contexts, computer technology is now impregnated with biases and values from the developed Western world that are built in to its architecture, interfaces and languages. Streibel (1986) identified several factors that contribute to the rule of certain cultural codes in computing. He stresses that, with their technology to manipulate data and symbols based on formal rules of syntax, computers tend to legitimize knowledge that fits into that structure, and deny legitimacy to other kinds of knowing, such as interpretation, intuition and introspection. For Streibel, computers demand that we be agents of forecast, calculation and control, even when we approach the world as active, constructive and intuitive subjects.

The expanding use of computers in developing countries – alongside dramatic levels of poverty, deprivation, social exclusion and violence – calls for careful analysis of the social and cultural specifics in each context, and discussion of the computer's impacts on less economically and technologically favored societies.

Take access to medical information in different national contexts. On average, a medical library in the United States will subscribe to 5,000 scientific periodicals; meanwhile, “the Nairobi University Medical School Library, long regarded as flagship centre in East Africa, now receives just 20 journals. (…) Developing countries suffer many of the world’s most virulent and infectious diseases, yet often have the least access to information for combating them” [21]. In theory, access to the mass of medical information available on the WWW really could narrow the existing gap between these libraries, by affording a doctor in Africa or the United States access to the same data and information. Implicit in this description, however, is the idea that these two doctors – given the same information – could make equally effective use of its content or, in the last analysis, could treat their patients’ illnesses with the same quality. This is the specious, distorted and mistaken aspect of the argument. Even given the same data, with access to the same accumulated knowledge, on the basis of the same information, even so these two doctors would still be facing entirely different situations in combating and treating their patients’ ailments and diseases. As a health worker in Katmandu put it: “Our priorities are hygiene, sanitation, safe drinking water . . . how is access to the Internet going to change that?” [22].

Double Illiteracy

Ongoing and accelerating growth in computer use in developing countries – where illiteracy rates are often very high and constitute a major social challenge – may lead to an

increasingly critical situation. In contrast to other technologies like radio and TV – which are very popular in these countries due to their audio and/or visual content, which is easily apprehended by those who cannot read – computers are now a quite sophisticated technology, highly dependent on reading and writing skills.

One of the most damning findings by a recent IBGE survey of standards of living in Brazil was the number of children unable to complete elementary school: 8% of children between the ages of 7 and 14 are out of school. Worse still, 10% of Brazilian children from 5 to 14 are already working. "The cruelest statistics are from the Northeast, where 15% of boys and girls are in the labour market, with the child labour figure reaching one in four, that is 25%, in rural areas," according to Oliveira (1998).

This mass of potentially illiterate children and youth is part of the vast contingent of Brazilians – according to the United Nations fully 16.7% of the country's population – who can neither read not write. Other sources which include those who have only very rudimentary notions of reading and writing set the mark at over 20 million people [23].

As Paulo Freire put it in his book *Pedagogy of the Oppressed* [24], literacy is not a matter of learning to read and write, but being able to say one's own words. Literacy goes beyond the mere ability to encode and decode abstract meanings, and centers on the ability to create meanings within an interpretative context. What matters in an inter-subjective dialog is the meaning of the content of the message, not just the mechanical repetition of words.

Research on the relation between schooling and proficiency (Paiva, Fontanive and Klein, 1998) in the Brazilian cities of Rio de Janeiro and Campinas found deeply disturbing results. Out of 2,057 tests done with individuals from 15 to 55 years of age, close to 75% of the population is at "the lowest level on the scales of prose, document and quantitative skills. (...) The majority of the population in that age range, on reading a simple informative text, only recognizes the topic, but is unable to differentiate a fact that is narrated from an opinion contained in the text, nor can they locate a piece of information in texts longer than 30 lines" (p. 7). The results also reveal that the same percentage can only add whole numbers and amounts of currency, but cannot, for example, add or subtract decimal numbers.

As if this dramatic scenario of functional illiteracy were not enough, the prospects for greater use of computer technology in the Third World also raise the issue of "computer literacy." Changes now underway in technological society, brought on by the globalization of capital and the re-ordering of politics, demand a population with basic training and specific abilities, including the capacity to communicate correctly in writing. "The complexity of today's world demands homogeneity in the population's basic training at a level that is no longer that of pure and simple literacy, in addition to downplaying the formalism of diplomas in favour of real skills that can be proven in daily life" [25].

Many countries are in fact witnessing the advent of a phenomenon that could be called *double illiteracy*, in which those who are already excluded from society as illiterates will now be totally excluded from the system, due to their lack of computer skills. Entire regions and populations in certain parts of the world are still not at all connected, or have been excluded from the social process of computerization, from the benefits of "collective intelligence" and from cyberspace's "universality without totality", in Lévy's (1998) terms. They could be called the *computerless*, an expression that may soon replace others like *homeless* and *landless*.

There is talk that the printed and electronic media will coexist peacefully, yet at the same time there is much effervescence at the possibility of "instantaneous distribution of

information" over the Internet. Santis (1996) suggests that "some foresee that, in a few years, paper will be a luxury medium" (p. 33). She states that the high cost of cellulose has led businessmen in communications to consider electronic distribution as a cost-cutting mechanism which will make trade in information more profitable. We can thus expect that, very soon, the *computerless* will have to either assimilate and join the digital logic or – if that is beyond their reach – live outside the system.

“Yet even if telecommunications systems are installed and accessible, without literacy and basic computer skills people will have little access to the network society. In 1995 adult literacy was less than 40% in 16 countries, and primary school enrolments less than 80% in 24 countries. In Benin, for example, more than 60% of the population is illiterate, so the possibilities of expanding access beyond today’s 2,000 Internet users are heavily constrained” (UN Human Development Report 1999, p.62).

“It is clear that the poor of Africa will go on being proletarian, not because of the computer, but because they have nothing to eat”, said Umberto Eco during a meeting to discuss humanizing globalization, held in Davos, Switzerland. He sees three classes of Internet users in the future: the proletarians, the petit bourgeois and the governing class [26].

Illiterate citizens in developing countries will be in the doubly unfavourable situation of not belonging to the First World – with all the technological advantages that this can mean – and of not being part of the select group of people in the developing world who can access and control the logic of the computer age, those who can learn to learn. The computer’s integration into daily routines will be more hostile towards the excluded, since they will not be able to learn gradually, to make use of or to participate in the development of this new technology. The "computer illiterate" will not survive in a world mediated by computers.

What, though, does "computer literacy" actually mean? Does it mean knowing how to type with keys and to "click" on appropriate icons? Or does it assume an understanding of the underlying logic of computers as symbol processing machines? Can such a quality be measured in terms of knowing computer jargon or being able to deal with data input and output peripherals? Or might it be quantified in terms of skills in creating computer languages and codes to be shared with other members of the community?

The Aspen Institute Leadership Forum on Media Literacy and the Canadian Association for Media Literacy define "media literacy" as the ability to access, analyze, assess and produce communication in a variety of forms (quoted in Trillo, 1997). The American Library Association Presidential Committee on Information Literacy defines in greater detail what they consider information literacy: "To be 'information literate' an individual must recognize when information is needed and be able to actually locate, evaluate and use the necessary information. Ultimately, information-literate persons are those who have learned to learn. They know how to learn because they know how information is organized, how to find the information and how to use the information so that other people can learn from them" (in Trillo, 1997, p. 2).

For a citizen of international society, it is no longer enough to know how to read and write, or to have learned a skill. One must have access to information, know how to look for it and find it, master the usage, organize it, understand its organizational forms and, above all, make appropriate, adequate and effective use of it. "Even a global information society could become an ignorant society if it is unable to organize the information it receives, if it does not learn to decode the messages for appropriate education, if it is not accompanied by democracy and citizenship," says Bindé (1998).

On the eve of the third millenium, however, how many of us are actually capable of participating in, influencing and deciding on the destinies of the information society?

Cognition, interculturalism and computer literacy

Here it is crucial to observe the relationship between culture and learning in contemporary society. After all, the "real skills of daily life" discussed by Paiva, Fontanive and Klein (1998) and needed for survival in an interconnected society will arise from situations experienced by each person, in each community. Cognitive processes are always subordinate to the meanings attributed by individuals in each social and cultural context. There are subjects who display a skill in one context but not others, thus underlining Cole's thesis [27] that cognitive processes may be of a situational nature. Winograd and Flores (1986) say we must understand cognition not as a mental activity separate from reality, but as a behaviour pattern essential to the functioning of the person or organism in the world.

In fact many transcultural experiments on cognitive development have shown that cultural differences do not lie in a specifically intellectual capacity, but in differences in the valuing of learning experiences, depending on different contexts and situations. Carraher, Carraher and Schliemann (1982) did an experiment with semi-literate children living in the poorest areas of the Brazilian Northeast, to observe how they developed their numerical calculations. The researchers selected children from 9 to 15 years old who sold fruit along the beach or in the market. The first tests were conducted in the workplace. The researchers began by asking the price of a single product, and gradually moved into questions demanding that the children understand more and more complex mathematical operations. The results showed that the children's ability to calculate improved when dealing with concrete situations, such as those faced in their daily work selling fruit, and declined in more formal contexts, such as school. The authors concluded that failure in school is not a failing of the child but of the school itself: "failure in its inability to measure the child's real skills, in its ignorance of natural processes that lead a child to acquire knowledge and in its inability to relate the formal knowledge it hopes to transmit to the practical knowledge that the child, at least in part, already possesses" (p. 86).

Based on observation of the particularities and idiosyncrasies of each group, in each context, and considering the situational and cultural aspects of the problem of cognition, it may be possible to make a concrete attempt to understand and comprehend others, thus giving rise to integrated, reliable and radically new conceptions of intercultural communication for the Internet, as suggested by Bindé (1998).

Internet in Brazil: a towering wave

An article published on the NUA Internet Surveys site points to the rapid growth of free Internet services in Brazil, a move being financed by banks and automobile firms: “Apart from offering free Internet access to customers, Brazilian banks are also extending their financial services online and creating online shopping malls on their sites. There are few credit card holders in Brazil but recent developments allow Internet users to shop at these bank-malls by using money held in the bank to pay for purchases. Italian car manufacturer Fiat is giving free Internet access to the first 1,500 purchasers of one of its new models and a General Motors spokesman said the US giant may well follow suit. In a bid to stave off the unorthodox competition, ISPs in Brazil are also now offering free access. Industry executives estimate that 70 percent of Internet users there will have free access by the end of 2000. Average annual income in Brazil remains low and the cost of Internet access has hitherto been a serious barrier to growth in the B2C sector. B2B ecommerce is taking off in Brazil as open trade policies and increased foreign investment have created the right climate for Internet commerce” [28].

In October 1999 Brazil ranked third in South America in terms of number of telephones installed: 16 telephones for every 100 people. In less than two months, Brazil’s telephone

companies installed 850,000 fixed lines and in 13 months the conventional telephony network had grown around 28% as 5.6 million new telephones were installed. It is speculated that telephony – as the mainspring for introduction of the Internet – will enable computer sales to spread among the poorer classes, thus boosting the practice of e-commerce in Brazil. E-business professionals are not about to overlook a country with 160 million inhabitants, of whom only a little over 5 million are connected to the Internet today. Already, intensive publicity campaigns in the press and on television are urging people to buy telephone lines and computers in order to use the Internet, while access providers jostle with ever more attractive offers. Brazil's extremely high potential for e-commerce is determined by certain national characteristics: widespread, installed television technology, along with extremely high national audience ratings, which makes it easy to instill consumer values and needs; an ingenuous, orderly, peaceful population with scant education and high rates of illiteracy, inclined to accept and repeat whatever television dictates and recommends, and to consider anything from abroad as better and more reliable than what is produced in Brazil. To judge by the volume of investment in publicity broadcast in Brazil to promote the Internet, by the soaring numbers of telephones being installed, and by the flocks of providers marshalling new users by offering Brazilians free or low-cost access, there will very shortly be an explosion of e-commerce in Brazil. There is talk of international investors' interest in incorporating the C and D groups into the Internet with a view to selling the – generally low unit cost – household appliances and other goods consumed by this bracket.

Note, however, that this promotion and popularization of Internet use, motivated chiefly by interest in the Brazilian e-commerce market, brings in its wake the opportunity for an ever larger contingent of Brazilians to make use of the Net's vast informational and communicational potential. But are we Brazilians – and this includes Net users in the C and D groups – prepared, in the short term, to make full and effective use of this technology? Are we in a position today to learn, to adapt and to meet the standards set by those who developed this technology in the First World? Will we – and the other communities of our planet – be able to perform the complex activities entailed by search machines, by research through access to the data banks of major universities and institutions, by visiting museum collections around the world, consulting international data and news, gathering, exchanging and distributing data, news, goods and feelings? Will we be able to benefit fully – just as some communities already do – from the existence of this wondrous technology?

In this context there can be no denying the importance of government capacity-building policies for efficient Internet access and utilization. In Brazil today, there is an almost total lack of measures with national scope in this regard, except for a few sporadic, discrete activities, which are generally small-scale and produce little in the way of effective results. In an interview in late 1999, Carlos Alberto Afonso, one of the pioneers responsible for the introduction and administration of the Internet in Brazil, touches on the subject: "In Brazil, there have been NO effective nationwide moves in this direction. None. On paper there are top-down proposals whose scope we have no way of assessing, because nothing has been done yet. (...) Everything that grows explosively in terms of well-being, comfort and services in this country benefits the middle class and up. (...) Look, even Peru has a significant policy for setting up multipurpose tele-centers (for access and training) overseen by the Peruvian Scientific Network – one of the most inclusive measures to extend universal access to the Net of its kind in the world. There are hundreds of tele-centers there, training young people in the interior of the country in information technology and Internet services. The community tele-center (at public schools, community centers, etc.) is an effective way of introducing appropriate local access solutions in societies where ideal (individual) universal access is not going to be possible even in two generations" [29].

In Third World countries – where access to telephone lines and personal computers is limited to the tiny upper classes – there is a need to find alternative solutions to permit Internet access to those in the less privileged classes. This was the point of departure for the Peruvian Scientific Network (*Rede Científica Peruana*, RCP) when it conceived and implemented its Public Booth Network: "The booths are community centers able to offer 60 different services, particularly for producing and circulating information, communication tools, entertainment, education and e-mail. The booths have 20 computers connected to an Internet server". Speaking in December 1999 at the conference "Citizenship and the Internet", the project's coordinator, Jose Soriano, stressed that "this alternative model of access must be self-sustaining – it cannot be linked to the State or depend on the major communications corporations. In order to ensure this self-sustainability the booths had to be made commercially viable and generate income for the institutions involved". A series of projects was also set up in connection with the booths to encourage dealings among the various regions of Peru, and to promote the exchange of commercial and cultural information. "Mothers in Cuzco trade the recipes for their homemade *empanadas* with mothers in other regions. Although this trade is sometimes done informally and on a very small scale, this is the right approach to *e-business* in the Third World" [30].

These initiatives in Peru have served as an example of how developing countries can – and must – encounter solutions tailored to their specific situations if they are to universalize Internet access and use.

"Unless we ensure proper capillary penetration and are creative in introducing alternative forms of universal access, we shall be dynamizing this 'new society' for the 'already-haves', helping perpetuate inequality and violating the essential right to communicate, and that in a context – right from the start of the next century – where having effective, low-cost access to the Net will be at least as essential as having access to a telephone line. While backbones in Brazil are still at the 2-megabits-per-second stage and only 3 in 100 people have access, in the developed world, these circuits are already being readied to transmit petabits per second (that is, a billion times faster) and at least 30 in 100 people already use the Internet" (Afonso, 1999).

It is not the technology in itself, but rather the policy for introducing, accessing and using it, how it is applied, the laws and the rules that legitimate it, the ethics by which it is to be governed, and the principles that sustain it, that must be reviewed and evaluated constantly so that it is used appropriately and efficiently, in accordance with the purposes of each context and each community.

As Caminha so rightly said in 1500, this people of Brazil "is good and of good simplicity". Nonetheless – as the rapidly approaching wave of popularization of the Internet towers over us – it is urgent that policy strategies be traced to protect national interests, and that immediate, emergency investment be made in education to ensure not just superficial computer literacy (as occurs today in the few projects of this kind), but rather that the people of Brazil have the opportunity for active, aware participation in the information society. Otherwise, "whatever stamp one wish to give them will be quickly imprinted on them..." [31].

Now that we know the world is round, and that we can sail its oceans without fear of the abyss, we perhaps need to re-learn how to do just that, so that a New World can be not discovered or found, but built.

Social commitment and responsibility: electronic art for a real world

Wilson (1987) perhaps answers that question when he suggests that the prime function of artists and designers is to watch over the cultural frontier. For him, these professionals

have cultivated sensitivities and expression skills that allow them to anticipate and interpret cultural patterns, to reveal unrecognizable aspects of the contemporary world and so serve as guides to a more human future.

In a scenario pointing to the need for individuals to access, know and use the information now moving on the Internet – on a truly global scale – the designer plays a leading role as an intermediary between human beings, their culture and their technology.

At the *Núcleo de Arte Eletrônica* (NAE), an electronic arts laboratory set up in 1992 at the Arts Department of Rio de Janeiro Catholic University, we have embarked on a series of research studies and projects, most of which relate to social issues. Our projects deal with subjects like the WWW and illiteracy, ATM interfaces for users with different levels of schooling, and so on, and are financed and supported by public research funding agencies. At present, we are engaged in the project “Misery, Illiteracy, Internet and WWW: myths and challenges”, which involves setting up a site that will convey how citizens from various social strata in Rio de Janeiro State perceive and understand the Internet [32]. Our aim is to set up a site about the Internet. We are interested in finding out what ideas people have of the Internet, its main purposes, its structure, functioning, usefulness and future. We intend to show that “people” is a very broad category, especially when one lives in a state like Rio de Janeiro, which is quite well known for its dramatic social contrasts. The majority of those living in luxury homes and sophisticated apartments share the same public space, shop at the same supermarkets, travel on the same public transport and frequent the same beaches as people who live in unreliably built shacks, who have to climb the steep slopes of the shanty towns to reach their homes, who live without drinking water or sanitation in conditions of extreme – material and human – misery that are spreading further and further through all Brazilian towns.

We interviewed 120 people – both literate and illiterate, young and old, poor and rich – living in Rio de Janeiro: teachers, street sellers, web designers, fishermen, doormen, students, artists and children. We interviewed people who live in shanty towns and people in exclusive neighbourhoods, people from urban and rural areas, people who earn 100 or more minimum wages a month and others who would be happy to earn just one minimum wage (approximately US$60), because they do not even make that much. We collected all these people’s impressions and declarations regarding the Internet, and we began to weave a network of identities as part of our site. The aim of the site is to show the diversity of the opinions documented, and the potential and prospects of the Internet boom in Rio de Janeiro – and how the haves and have-nots understand the connected society. Through the site we hope, in short, to present and discuss what we know as “net-socio-diversity”.

Netizens, net-fringers and outsiders

So, the site we are designing is about people – people who connect, who chat, people who e-mail, log in, plug-in, download, exchange and interact in real-time with other people through the Internet. People who are striving to be able to share common symbols and codes with people from different backgrounds, even if sometimes it implies surrendering some of their cultural traits. They are the “netizens”.

It is also a site about people who have heard of the Internet, who may understand its importance for their future, but who have no access to it. A few of them may have a chance to get close, perhaps to surf the Web over other people's shoulders. But they will never quite be able to understand the complex logic of the Net, nor to explore its full potential. They are not being prepared for this and, after all, the Net is not being designed for them. They can be called the “net-fringers”.

But this site is also about people who will never have access to the Web, people who do not know what the Internet is, people who are excluded from all possible benefits a networking society may offer. For the "outsiders", the Internet makes no sense, and brings no hope.

This is a site built with passion and criticism, with patience, observation and respect; a site where every person counts.
No matter who.
Just the way we hope the Internet itself will be, one day.

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COOL BUSINESS: ETOY'S TOY WARS

BY BIRGIT RICHARD

The immaterial Cyberspace, the net, is by no means an empty space. In the net a topography of a new kind has been developed, in which the former pioneers, eg artists and activists, have been declared outlaws by the law offices of the big companies. The economic structures claim control over the word, the name and its phonetic and etymological elements. In the virtual space of names typing mistakes provide an increase in turnover. To submit to this structural force means that the less experienced user can vanish from of the virtual community without trace. Virtual power is and makes any virtual live invisible. It aims at destroying any communication, the total isolation from media: name and image are to be deleted. For those groups of artists and activists operating within the net co-operating closely with other media, eg print media, is imperative.

The US-company Networksolution is operating like the residents' registration office, it can reject immigrants and kick out inconvenient tenants. The loss of an arduously established domain is like a small extravagant boutique being hurled out of a capital's main street into the side-street of a village.

The software of the order of culture is the precondition of the invisible execution of a structural force that transfers abstract routines eg juridical ones from reality into the World Wide Web in order to develop new economically motivated mechanisms of discrimination. Those mechanisms are founded on the same principles as described by Foucault (Foucault: Discipline and Punishment, 1977 (engl. Version 1978- *Anm. der Übersetzerin*) The Order of Discourse 1974). In the internet the grammar of culture becomes evident: who is speaking, who is allowed to speak (Blissett/Brünzels 1998, 25f) and in which context is it allowed to speak? Another crucial factor is: what is the name of the person, the entity, that leaves a html signature in the net while speaking?

Derrida (2000, 10) puts this phenomenon as following: "Who signs with which allegedly own signature?

The grammar of culture remains as invisible in the virtual world as in the real one. It implements routines with the intention to let them grow natural. Here, an abstract immaterial form of cutting back the discourse comes to fruition (Foucault 1974), which concerns specially the text-based structures of the internet, in which controlling names, address, URL and its neighbourhood is a crucial means of the exercise of power.

The precedent in connection with the war declared by the artists' corporation *etoy* to defend their domain name against the toy retailer *eToy* illustrates the strategies of economy and the counter-strategy of visualising and materialising. Violence, as it is the object of this article, is non-visual; therefore the imaginary has to be called into action: *etoy* use the symbols of the image-based power of the business world and the war metaphors with the greatest of ease. They illustrate their toy war against a toy company in order to show the abstract means of violence, which are difficult to make out for outsiders. Doing this they gained the support of a big web community.

Subversive net strategies: netart, hacker, activist

Following the Handbook of Guerilla of Communication (1998) edited by Luther Blissett/Sonja Brünzels, conventional non-digital procedures are named, which got a new form and a new life in the net. They can be called as follows: Camouflage, subversive affirmation, overidentification, purloining and reinterpretation, fake and forgery or doubling.

In the internet, a specific media-related subversion becomes manifest by changing or doubling codes, transformed skripts and interfaces in the net, as done by the net artists jodi.org. The doubling strategy of drawing up fake websites (see http://rtmark.com/bush.html and http:GWBush.com) bases on an optical doubling effect, that means on an illusionary identity of the original site and the fake generated by a minimal amendment of the "source code", on which every site is based. This technique has been taken over by companies like Diesel, that has taken up the story of the polish girl's Joanna tragic fate in their print campaigns and continued it in the net.

Hacktivism is this sort of hacker activity, that is implemented by art-activists called "reflexive hacking" (eg the marginal amendment of the eToys site). In such a case, the aim is not entering and destruction by an anonymous puberty soul leaving a scent mark, as done to DoS and Yahoo by hacker Mixter. Mixter also wrote some sort of Tribe Flood Network Protocoll (Drösser, Die Zeit 17. Jan. 2000, 41) in order to rise attention and promote his own career as an security expert.

Activists focus on activities of limited duration, symbolic character, not without giving advance notice: disruption not destruction is their aim. A program like "Floodnet" obstructs by loading the same website from different terminals at the same time. A website is faster called up than it possibly can be build up and the server is permanently receiving the information that build up the site is not needed while it is receiving the command to build up this site. Scripts running on the own computer or on the inserted server automate this routine. Having been called up a certain number of times the attacked server gets slower and slower. (Denial of Service Attack, DoS). DoS is translated as virtual sit-in. That shows the general necessity to find metaphors for non-visual program routines that run in the background.

In addition, net art generates a new kind of artist corporations. These are world-wide networking taking globally working companies as an example. They take the advantage of the collective identity, the anonymity of individuals using pseudonym (good examples are the etoy corporation www.etoy.com and the rtmark corporation, www.rtmark.com). The former call themselves "art virus", the latter "activists". The net artists refer to the business world and the virtual codes of the international share trade. Connections to a conform business identity can be traced in the web as well as in their appearance in real life.

Etoy vs. Etoys: The violent economic occupation of the Cyberspace

(8 Zeilen engl. Einleitung "etoy.....)

The centre of attention is the "violent " clash over the domain name of etoy. An announcement to the net community ("etoy TIMEZONE/& a law suit" from 05.11.99 21:28:33 MEZ from agent zai@etoy.com) says, that the US-toy company founded 1997 http://www.eToys.com/ (with a "s") took legal proceedings against the net artist group etoy at the 8th of November 1999 in Californien. Etoy is officially and legally using their own name as com.domain and registered with the international register on the 13rd Okt. 1995. The opponent is the online retailer eToys, a virtual start-up company founded late in 1996 and present in the net since the end of 1997. In 1999 the firm had its IPO at the NASDAQ with approximately 80 million $ starting capital; with this sum it wants to become market leader. Its rigorousness bases on its virtual existence, which is threatened by fluctuating share prices. Since 1998 eToy tries to purchase the domain (name) etoy.com from etoy. The offers range from some 100$ (to begin with) up to 524 000$ (cash in the form of shares by the end of 1999) before the trial started, which temporarily put an end to the art activities in the web. Etoy reject any of these offers, because they concerned the creative process. By the means of an interim injunction the unpleasant rivalry concerning the names provoked by the artist corporation has been suspended. eToys' aim is to ban the

artist corporation from the top domain level, to deprive it of its global and international status and to relegate it to the Swiss domain ch.

The attack is going to become a signal for the fight for a global art and international projects in the dot.com system. The “toy retailer” blames etoy for squatting the domain name and tries to eliminate the artists with the help of their legal staff by criminalizing them and pushing the costs of litigation. Once a Grandson and his Grandfather got lost in the net and complained at eToys; the company took the opportunity to attack the troublesome opponent. Namely the product “digital hijack” is quoted. Etoy’s reputation became that of insanes - according to Foucault’s analysis - insanes within a diffuse crowd, that is living up to the rules of economy, insames who are threatening law and order (Fink-Eitel 1989, 26); and there is an attempt to legally incapacitate the deviant.

..for.....

Even the fear of negative reports in the media that etoy launched with the support of many media activists and that can leave a negative overall impression on the investors cannot withhold the company from taking legal action against etoy. The charge is infringement of the trademark. In the USA, non-profit organisations normally have no chance to win a lawsuit of this kind, because it necessarily involves expenditures of 100 000 Dollars. Thus, the company expects that etoy cannot afford prolonged legal proceedings and hearings of evidence on American ground. “They let us bleed until we will die. But in etoy no blood is flowing, so we won’t bleed.”

At first, etoy gave themselves optimistically: “for etoy: your action entertainment agents always online - sometimes lost”, because some details give reason to believe, that they might win the suit: the small difference, the missing “s”, and the fact of having been registered much earlier than eToys gives hope. In the Californian district court a negative court decision is postponed in order to drive up the cost of litigating that the artists have to pay. On the 29th November the domain etoy.com is suspended by a temporary injunction under penalty of a fine of 10000 $ per day.

Here, the restrictions of unregulated net use become manifest. The confusion caused by an art project, that is leaving the art gettho in order to act in the net as a public space, is not tolerated any longer by the business world. Etoy fakes business values in such a convincing way, that the difference between parody and exaggeration cannot be told apart. They are so convincing playing their game to the rules of a economically determined value system that even the performers themselves could be part of this system.

“disclaimer ....”

The shares etoy are selling not only in a symbolical sense are visualising speculative business transactions and increase in value. They show the irrational mechanisms of the market, that became a virtual one long before the new markets e-commerce and NASDAQ did (see Baudrillard 1983). On this virtual terrain, myths, utopies, stories and rumour are the deciding factors for loss or win of trillions of dollars. One of these stories led to the first defeat of etoy.

Etoy moved onto the bare IP address http://146.228.204.72:8080. In addition they established the site www.toywar.com to offer a platform to net activists like www.rtmark.com, the thing new york, ninformaina, detritus.nat, illegal art, plagiarist.org, namespace, negativeland, evolution control commitee, styro2000, boombox.net and personal records who are supporting etoy’s opposition against eToy. They fight for the freedom of net art and equal rights for art and commerce. Their aim is to prevent the

selling of digital territory to corporations and to re-establish fair co-operation and peaceful digital neighbourhood.

Then, after first boycott activities submitting to economic pressure Network Solutions eliminates etoys DNS-entry, though that was not part of the court judgement. Etoy is cut off its webcommunity.

***we.....

This precedence indicates that the balance of powers within the internet has changed and that commerce and non-profit interests within the world wide web are drifting apart. From now, in accordance with the New World Order, the internet only provides specifically defined space to artists, which ties the art system to limited play areas, as it happens in the real world. The case of etoy shows that all social systems are no longer allowed to co-exist or develop equally concerning the purchase of domain names.

What all successful net activists' performances have in common is the creation of different media levels; virtual protest activities range from legal actions to purely anarchic destruction. Those artists, however, who joined toywar act from a completely legal platform. Via rhizome.org mailing list, rtmark activists condense their resistance potentials to politically efficient forms that come down to creating a network between web, print media, tv and everyday routines. There is an impartial Campaign Information Center, the so called Crisis Advisory Board driven by the theorists Barlow and Rushkoff, where all information flows together and is passed on to the press; rhizome.org is at disposal. Its supporters organize a press conference at MOMA in New York as well as protest actions in front of the companies headquarters. The measures taken in order to build up an infrastructure begin at the thing, a platform from which EDT is acting. After a Floodnet attack the thing suffers from eToys' reprisals; the thing is shut down at short notice. The next level makes up the infrastructural program-based activities. Those campaigns go beyond the boundaries of the internet, they address the shareholders and the staff of the company: a. Toby step down (the request addressing the manager to quit), b. Web against etoy and c. quit eToys, (the request addressing the staff to quit). These activities are initiated and organized by rtmark corporation and announced as a entertaining multi-player online game: Help destroy eToys.com! December 12, 1999 new INTERNET "GAME" DESIGNED TO DESTROY ETOYS.COM.

rtmark are the spearhead of the internet communities' protest, that fights against corporations and their claims to power not only on the internet. Therefore, rtmark raises one of their mutual funds that comprise subversive projects; the fund includes the following elements: the originator of ideas, executive worker and investor (http://rtmark.com/etoypress.html). The intention of the projects in the etoy Fund is to lower the eToys stock price to $ 0,00. The projects also integrate DoS Attack FloodNet Applications, which are to obstruct the company servers massively during the christmas business (http://rtmark.com/sitin.html). Another important means of agitation is to publicize and distribute information about the company.

"This....

rtmark starts an infowar- or desinformation campaign supported by the Electronic Disturbance Theatre. Those and others co-ordinate the different activities on different levels in the net via fax and telephone in order to severely disrupt eToys' internal and external communication and to put the investors into a state of uncertainty. On eToys' website the input area is occupied by protests. On the 16th December the virtual sit-in is successful. It causes high traffic and distorts statistical data. The server is attacked for short spans of time only, for 15-minute periods on the Christmas shopping days. All

software operations performed by the protesting netcommunity shall overload the eToys server and force it to keep busy running an innumerable number of routine tasks. Seven, eight rotating mirrorsites on which five different script are running performed a number of activities. Beside the FloodNet attacks there is the tactical approach to make the counter for the financial evaluation inefficient, that means to corrupt the company's webstatistics. Therefore the non-linear skript "killertoy.html" mounts continously goods in cookie-based shopping carts, without actually buying anything of course. That way, the server has to generate the whole list with every mock purchase. The mirrorsites produce more than hundred thousand of requests and the time needed to calculate the list is getting longer and longer. Because of this "super plus version" script the platform the thing was shut down by the Backbone provider Verio. Beside the scripts there are tools which the individual user can install on his home computer and single email activities like "mailbombs", that the eToys service department and management has to deal with, working on them step by step and without having program routines at their disposal. This attack is meant to be symbolical, protest on a broad basis, not a hacker's activity. Affected by the marked dynamics, which means by the system's internal proceedings of NASDAQ, the company's stock price lowers by 50% in the course of this activity. The online toy retailer has to compete with traditional trading firms like toys`R us, that also want to conquer the electronic marked. The fall of the eToys share is progranned, it will be introduced to the stock exchange on the 20th Mai. After the turnover that was expected from the Christmas business in November has been brought in, the stock price is already falling. Bad news in dealing with the artists, the influence by the webcommunity on the investor forums and the bad press come just in time to speed up and consolidate the downward trend of the price. As a typical occurrence, there follows a substantial decline in stock prices after the IPO at the stock exchange, if the issued share isn't backed up by a promising story.

This does actually not depend of the actual turnover. The activities of the artists uncover the mechanisms and monstrosity of the *Neuer Markt* (which is Germany's equivalent of the US technology index NASQDAQ - *Anm. der Übersetzerin*) and phenomena like start-up. They refer in a creative way to the fact, that it is absurd to speak of one reality, but that there are different levels of reality, which run crosswise to reality and virtuality.

Toywar Victory: the user is the judge © etoy kisses from your etoy.Agents (SOFTWRE&HUMAN BOTS)

As you can read on the toywar victory parade on the restored website, the world-wide support for the etoy corporation is enormous. The Toywar campaign is unique, because so many activists and artists have been co-operating. An existing, loosely connected net has been activated by a joint venture, made up the connections in real life and won new members. Different kinds of activity and the Toywar battlesite call the internet community on a common platform and concentrate the powers of the individual.

The Toywar game goes on as following: a virtual battle field is opened, 700 agents represent the first elite troop. In the second round registered agents and Toy Generals can recruit soldiers, who are settling in the battle fields of Santa Monica, San Francisco, Hanoi, Italy, Ibiza, Tonga, Great Britain, Switzerland, Sao Paulo, Cuba and Tokyo. Before recruitment, the participants can decide which role they want to play. They can choose between bomber, bank employee, DJ, soldier, spy, solicitor, reporter and a programmer. At this point, etoy visualize those actions that are most important to them by figures which according to their function are appropriately equipped. Apart from a dynamite stick and a bomb with fuse there are gasmasks, camouflage dresses and cameras, laptops and turntables that are used as weapons. On the battlefields, which can be swopped, there is a radar function, which allows to make out the agents and to communicate with them. All battlefields had a particular function according to the agents and generals who settled

there. There are tools that allow eg to enter emails into a mailing list or to exchange music records; here, the CD “Toywar lullabies” is produced. Later, tourists get the opportunity to travel around on the battlefields with cameras dangling from their necks. With helicopters the curious onlookers are carried to the scene and they may have a look around for fifteen minutes. After re-conquering the domain name a victory parade is taking place on the website, which is also presenting the losers (Toby Lenk, eToys’ CEO). The slogan *cheer on the heroes and heroines* is accompanying the whole parade and the participants are represented according to their contribution to the victory. The parade begins with the solicitor’s stretch sedan, followed by the truck transporting the etoy tank, a number of generals and military heroes, special vehicles for rtmark or the thing net (a helicopter), and at last a troop transportation vehicle with fotmen. The parade flashes across the screen from the right to the left side. Using the military metaphor a hierarchy is implied, which is clearly visualized here.

The fotmen’s fighting could consist of eg the writing of emails. 80% of the game’s participants don’t understand the rules of the game at the first go and cannot manage to get registered: As a result, the sreen showes a cemetery filled with coffins in the Indian Ocean.

“No physical movement, no contact by phone. Email and websites, everybody can do it, you too” (Grether 9.2.2000 telepolis). As many people cannot understand Beuys concept of the social plastic, the users lack of financial and technical skills made it difficult at times to support the activities, though their skills could be of use in other levels.

The underlying participation concept is a hierarchic one: Only those could rise to be general, who were able to write scripts or knew the right places and people. The toywar is successful: At the beginning of 2000 the company eToys drops the lawsuit against etoy and pays $ 40 000 reimbursement of expenses, as a countermove etoy drops their claims.

Knowing eToys’ vulnerability was the deciding factor, namely that the only evidence for the company’s existance is the website. In spite of the fact that eToys is selling material goods, it hasn’t got only one site in the web as Toys`R´us, which does not depend on being present online. As an abstract virtual company without face, the retailer is initiating abstract legal proceedings. It depends on abstract stock market prices having no direct link to the real material world.

From the “entry to the data highway” to “Thank you for flying etoy” (Street Style and Business to Business)

“offensive, depraved, insane, obscene, prurient, perverse, destructive, anarchistic,. rebellious and anti-social in nature” (from the statement of claim against etoy)

The Surface Visuals and the Corporate Identity etoy as artist and stock corporation have their effect in different ways: in a material way by the personal appearence of the etoy agents, who were wearing an etoy uniform appropriate to the situations and to the virtual appearance of the website in the course of the company’s history.

During the company’s history, they were more and more concentrating on Hyper-Business surface presentation, which could also be military ones. They expropriate visible business concepts and e-commerce and give an estetic form to it. The etoy corporation has shareholders. Their countersigned shares are not neutral ones, but a reproducable “unique specimen”, though the etoy corporation considers only the blueprint of the shares to be of value. Etoy share distribution only takes place via the website. By purchasing shares or performing special tasks during toywar, user can become a part of the etoy art and business system, that is oscillating between net and reality.

The shares' visual surface include an important message. In a new stock market style, the shares' motifs adapt the ups and downs of the company's history which can be read on a chart on the website. The motifs provide the visuals for their selfmade history of accumulation of cultural values. Etoy shares represent the subcultural and creative resources, which the user can participate in and whose increase in value is a precondition for further projects. The increase in the resources of art and subculture increase even the value on the market.

Etoy take the standard modules of Business-Visuals as a basis for layout and editorial and transform them. In the module structure of the etoy corporation, specific elements are varied and presented in an abstract way in the web as well as in reality eg in the Postmasters Gallery in New York 2000 (exhibition Impact Management) and at Ars Electronica. This is specially the concept of the tank as TCP/IP Data Package, a Business and Creative Think Tank and a mobile etoy Headquater, consisting of an orange container with the etoy name on it and, connected to it, communicating labyrinth pipe systems, which are the grid for the web appearance and lead in the form of floating hotspots to the next level.

For the overall impression, strong contrast is an important formal principle. Screen and screen background very often are black or darkblue (Shares eg by cui). On this background the letters are printed in primary or secundary colours. Black and radiant orange is the dominating combination.

Etoy quote different reference systems and blow up their trivial stereotypes: Those start their career as agents, some in security business, some as figures inspirated by James Bond. The agents are trotting carrying a suitcase or getting out of an helicopter landing on snow covered heights. At Ars Electronica 2000, the agents for the first time appear with two stewardesses, who are dressed in compliance with etoy CI in black and orange, orange forage cap on their heads, orange skirts, black gloves. Their excaggerating poses are imitations from those known by civile aironautics or the airline companies. According to their slogan "Thank you for flying etoy ..." , a logic development of the corporation.

All items (suitcase, radio set, the agent's batons in Digital Hijack) are labled with the name etoy. The name etoy appears everywhere even on the adhesive tape for the packing of the etoy shares and on e-pilles 1996. The etoy name is spelled with small letters as a sign of globality. One of the etoy accessories is the magnetic card for the members of the community and the shareholders, which serves as visiting card.

The appearance of the agents is always the same. They are unifomed and present themselves as de-individualized collective. In Digital Hijack 1996, they are wearing orange bomber jackets, mirror sun glasses, and bald heads and present themselves as de-personalized non-human cyberagents. Their image of black skin trousers and DocMarten's steelcaps is borrowed from the underground and reinforced by electronical means. The agents have an aura of lonesome bold heros' masculine coolness and toughness strictly organized in the etoy collective. The businessman style has only been developing during the following years. The non-individual attitude and collective anonymity have a protection function at auctions beside of its conceptual importance, because the agents are not easy to differentiate.

Even for an event as Toywar the agents clothing style is fitted and carried out in complyance with the etoy style. Appropriate to the threatening situation the agent wears an orange bullet-proof vest underneath his Business outfit consisting of a jacket with the sponsor's name sewed on it (which rather seems to be taken from motor sports). Also in this case the original (protecting) function is annulled by removing the protecting plate from the vest and by its striking colour. Having finished the toywar successfully, the agents

wear general insigna made of lego. Etoy turn from outlaw online-muggers into businessmen being sponsored.

Etoy have a reduced CI, because they exclusively address the outer world. Thus the principle of representation is similar to the representation concept of HipHop, which is based on the reality of the self-created picture.

Radical and digital conservative = subversive = etoy

Etoy know the rules of the game of the immaterial business and developed a sound Corporate Identity based on an artificial language. While nothing can bring their opponent, the e-commerce company eToys, out of its purely virtual existence, the make-up of the personality of the etoy corporation is embedded in reality. If their slogan "... we left reality behind ... long time ago..." etoy generating cultural value & global impact ... since 1994" would be true, they never had won the lawsuit. The slogan is not, as Stalder insists, the reason why unpleasant reality has cought up with them (Stalder Telepolis 22.11.1999). The etoy corporation's work consists of a skillful and easthetic meshing of media world and real world, which for a long time has been controlled by abstract and legal facts. The effectiveness of the net activities as described above consists in commuting from art to life and from life to art.

The combination of well designed and well timed web strategies, toywar web support, and first of all the connections of the individuals to real life eg to print media, lawyers, activists and theorists have made the artists win this time.

The example toywar demonstrates potential interfaces for future art and business strategies: via platforms within the web and between the web and reality. Only those who possess suitable interfaces to both levels can win the battle.

Also the toys are presented in an ambivalent light, the Lego-playmobil-styled etoy soldiers are a purely virtual product. They have a connotation relation to reality. This is the reason why a material counterpart needn't but could exist. Their probability or potential truthfulness, that consists in a total phantom life, is the crucial point. All visual presentations could be real, that's the way the etoy concept is working.

Grether considers etoy to be a purely virtual net creature, a code controlled data set (telepolis 29.4.2000). As a purely virtual thing without relation to people from the real world, they would have been defeated by eToys. Just the anonymous agents' physical presence, their particular style, the tank systems make etoy so attractive and efficient. Etoy present each of the different levels in a way appropriate to the subject. Voluntarily, they bring their activity into the context of art. Their art concept has many rootes eg action art, Happening or an extended concept of virtual conceptual art. They represent an interface concept that is controlled by the artists. Etoy consider the accessability of their material and the possibility for everybody to work with it as a essential principle of their work. They never give away the controll over their work. There are precise regulatives from the artists side, which never leaves anything to chance in their CI. Rather than developing and testing a new participation concept, they transfer the aquisition and merger business to art network and there it into new aesthetic dimensions.

No rebell-type artist, no avantgarde-like denial-of-art-attitude as it has been taken up by activists like rtmark. Here, anti-individualistic smart well-styled people appear, who on the first sight look all the same.The transfer of surfaces from the business world into art also is an escape from the uniform art system as the aparent adaption to the business world doesn't comply with the understanding of the artist's role. So unifomity and the collective temporarily give a shock. The apparent de-individualization and voluntary uniforming increase the efficiency of the collective approach as individual competences are

concentrated on a platform. Etoy represents the next artist generation: smart and web-based, elitist and creative. Net art, activism, traditional art and marketing strategies as well as youth culture subversion meet in the etoy corporation concept. Etoy appropriate not art but business visuals. Instead of the usual revolt an appropriation of business weapons for a structural surface war and the aesthetic occupation of space is taking place. In addition they make use of the anarchic impudence of the youth culture. What Felix Stalder in his Telepolis article called bad boy attitude is the typical dandy attitude of the aesthetically acting individual (vgl. Mattenklott 1987). Etoy bring the artist's boheme attitude and youth's provocational power together again.

This net art crosses political and economic space. It does't stay within the provided space. Etoy offend against the unwritten rule of the art system not to interfere in other systems. The company eToys wants to hurl etoy out of real life back into the field of art, because as pioneers for business visuals in art and as visual virus they occupied commercial territory when it still was officially available. This kind of art is not modestly confined to those niches, which has been left to them, but it has conquered and filled a globally accessable place a long time before. It is unbearable for the commercially ruled world that artist corporations dominate the strategies of a corporate identity in different media, that means that they expropriate their practices. The brand etoy makes art competing against the business on a visual and structural level. Etoy's visual doubling of the representation of business creates a second business world, which on the surface hardly differs from the original.

Etoy possess the content-lacking verbal elegance of the advertising branch and of the public surfaces which are influenced by the business world. Etoy continue the business art that Jeff Koons created in the 80ies. He referred to himself as a "radical conservative". To transfer this attribute means that there are new subversive strategies in art that impact on many levels and can change from one system to another depending on the situation. "Radical conservative" makes etoy an up-to-date representation of a subversion concept, that is the only possible contemporary one. Revolutionary gestures and rebellion are expected and have no effect within the art system. Other phenomena of our time are "radical conservative" as well, eg the pop quartet or the latest styles of the club culture. Those phenomena are not recognized as new important deviation because of its apparent conformism, its superficiality, its orientation towards business, consume and luxury. The domination of business images over public space is overcome by excaggeration and by indicating their artificial and constructed character. Etoy re-occupy public images and set up new ones. Like Koon, they are not afraid of legal and financial battles, because this are the conditions artists are grown up with.

"we.....

Etoy create a collective body on the basis of a comprehensive aesthetic concept, their CI. The virtual body is able to resist temporarily economic and legal pressure. Their new forms of organization are related to the forms of the business world. This makes them an expression of the super-modernity (Augé 1992). On the other hand there are the collective forms of computer games, that set up virtual bodies following a pre-modern clan or tribe principle (Maffesoli 1996).

Net art invisibly uses individual or collective bodies the reverse way: It creates an anonymous collective body, which protects the individuals by integrating them completely. The collective body is not as easy to defeat as the individual artist, who has to give way to the global economic pressure.

The net collective is a selected joint de-localized accumulation, which once will disperse again. Etoy's collective is temporarily open to activities as toywar, otherwise the CI -structure is not accessible.

Joint actvities of art collectives and activists are accompanied by a Hydra phenomenon: where the head of an individual is chopped off a new collective body is growing and new members of the net community are following - like Medusas head. Also online multi player computer games show this new quality; not the lonely fighter is requested, but a collective defense of the opponent's attack. So, in spite of all the primitiveness, computer games are good practice for joint activity. Net art redefines the computer game; the same did toywar; net art uses the attraction of the common game and can therefore resist any invisible form of economic pressure. The selected merger is a new non-committal but identity establishing form of community. In the case of computer games, collectives become evident while playing together. Net art prefers the initially invisible principle of collective disturbance and of forming swarms. For this purpose an interface, a visual surface is set up. In this connection, the net activists make use of the uniform images of the global trade and on this basis they develop the efficient collective strategy of *uniform subversion*.

EXPÉRIMENTATION DANS LES ARTS DU CONNEXIONNISME

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Les *modèles fonctionnels* [Cardon 2000], traditionnellement utilisés en synthèse d'image et dans les arts interactifs, produisent des systèmes déterministes dont les trajectoires sont entièrement définies dès lors que sont connues les conditions initiales. Les *modèles comportementaux*, par contre, permettent une interactivité *émergente*, en ce sens que des comportements non programmés peuvent résulter des nombreuses interactions au sein d'un *réseau* complexe. Nous nous intéressons aujourd'hui à des modèles d'inspirations neurobiologiques (*vie artificielle* [Heudin 94]) qui, pensons-nous, permettront de renouveler les situations de créations interactives.

En s'appuyant sur les travaux de son auteur, cet article tente de mettre en place les conditions et les modalités de nouvelles pratiques artistiques :

Une première réflexion sur les techniques de modélisation des corps vivants permettra de quitter le domaine de la pure simulation des apparences pour entrer dans celui de la génération des fonctionnements. Les paradigmes géométriques et mécaniques s'inscriront dans ceux, plus généraux, de la dynamique des systèmes adaptatifs.

Les corps artificiels ainsi construits possèdent certaines caractéristiques du vivant, comme l'autoadaptation (modèles connexionnistes) et l'autoreproduction (modèles évolutionnistes).

L'*œuvre* artistique perd son immobilité et sa permanence d'objet pour gagner une adaptabilité, une précarité et une indétermination relevant du vivant. Les relations du créateur à sa création s'en trouvent profondément modifiées, l'humain devant quitter sa position d'arbitre et abandonner son égocentrisme archaïque pour accéder à une conscience élargie d'un monde où il ne serait plus le seul être pensant.

1. Introduction

Toute pratique artistique suppose une technique et donc des modèles et des théories. Parfois initiateurs (comme la perspective du quattrocento dont est redevable la géométrie projective), parfois expérimentateurs (comme l'impressionnisme utilisant la théorie des couleurs de Chevreul), les artistes ont toujours été en phase avec les grands courants intellectuels de leur époque. Ainsi peut-on mettre en parallèle le surréalisme et le freudisme, le cubisme et les géométries non euclidiennes des mathématiques (Lobatchevski) et de la physique (Einstein). Aujourd'hui, avec la révolution du numérique [Couchot 98] et les avancées des neurosciences, de nouvelles opportunités s'offrent aux plasticiens.

Les sciences cognitives et l'informatique sont nées ensembles de la crise du formalisme logico-mathématique qui opposa Hilbert et Poincaré au début du XX^{ème} siècle. Turing [Turing 47] imagina les premiers ordinateurs comme des machines "intelligentes", ce qu'ils ne sont pas devenus, pas plus d'ailleurs que l'*Intelligence Artificielle* ne réussit à synthétiser de la pensée. Bien qu'ayant abandonné le formalisme de Hilbert, l'informatique continua cependant de privilégier le langage et les manipulations symboliques au détriment de phénomènes beaucoup plus simples susceptibles d'engendrer, comme le montre le vivant, de la complexité. Il revient au *connexionnisme*

d'avoir proposé de nouvelles pistes actuellement explorées aussi bien par les sciences dures que par les nouvelles technologies ou les sciences humaines.
C'est dans ce cadre que nous allons discuter des implications possibles de ces courants de pensée sur la création artistique.

2. Problèmes de modélisation

Si le *dualisme* de Descartes a pu penser les rapports du corps et de l'esprit en termes d'exclusion, le Darwinisme, puis Poincaré contre Hilbert, Piaget et aujourd'hui Berthoz [Berthoz 97], ont bien montré qu'il était impossible de concevoir l'un sans l'autre. C'est à travers une tentative de modélisation du corps humain que nous allons expliquer en quoi les nouveaux modèles de la *vie artificielle* permettent de reposer les problèmes de la *représentation*, aussi bien que ceux du *fonctionnement* ou encore ceux de la *créativité*.

2-1 Le corps

Les artistes (sculpteurs ou peintres) qui produisent l'image d'un corps ne peuvent faire l'économie d'une certaine connaissance de son anatomie : Le rendu final de la peau (seule surface visible) dépend des dispositions relatives des os, muscles, graisses et autres organes. De plus, une bouche ouverte, par exemple, laisse voir une partie de l'intérieur.

Mais un corps vivant ne peut se concevoir sans le mouvement ni sans une volonté le produisant : La synthèse du corps est donc inséparable de son devenir et d'une simulation de la pensée.

La seule simulation de son *apparence* est impuissante à donner vie à un corps. Une description *fonctionnelle*, si elle permet bien de simuler un comportement, reste cependant très en-deça de ce que montre le plus simple des organismes vivants. Les systèmes fonctionnels ne produisent, au mieux, que des robots déterministes qui, même s'ils peuvent s'adapter par *apprentissage*, sont incapables de survivre dans un environnement incertain. En clair, l'*homéostasie* (qui est la faculté de conserver un équilibre et une cohérence face à des perturbations extérieures grâce à des mécanismes internes de rétroaction), nécessaire mais insuffisante, doit être complétée par l'*autopoièse* [Varela 74, 89], c'est-à-dire la capacité, pour un système, de s'autodéfinir (en réorganisant et en remplaçant continuellement ses composants) dans un environnement changeant afin de s'en distinguer. Et comme cet équilibre n'est ni prédéterminé ni stable, le système n'est pas assuré de survivre. Son *espèce* devra donc *évoluer* en se *reproduisant*, non pas à l'identique, mais par des combinaisons aléatoires de son patrimoine génétique produisant ainsi une diversité maximale tout en s'adaptant le mieux possible à son environnement.

2-2 L'interaction

Un *système réactif* réagit aux sollicitations de son environnement sur le mode *réflexe*, se réduisant à un maillon d'une simple boucle de rétroaction. Des *automates à états* permettent d'en modéliser le fonctionnement, qui reste déterministe et non adaptable. La plupart des installations interactives construites avec de telles méthodes ne fournissent que des dispositifs de type *mécanique* sans aucune autonomie et, pensons-nous, sans véritable intérêt artistique.

Avec les *modèles comportementaux* est introduite la très importante notion d'*émergence* : Une propriété émergente d'un système résulte des interactions internes (entre ses éléments) et externes (avec son environnement), elle est manifestée par le système sans pourtant appartenir à aucun de ses éléments. Une analyse descendante (disséquant le

système en ses éléments) fait disparaître de telles propriétés, alors qu'une *synthèse*, même si elle ne permet pas de construire effectivement un être artificiel, crée du moins les conditions expérimentales de son étude. Les réactions d'un système construit sur de tels modèles ne sont plus préprogrammées et des comportements imprévus, bien qu'adaptés, peuvent émerger d'une confrontation avec l'environnement ou avec des intervenants humains.

Un *système adaptatif* présente une *complexité organisationnelle* de sous-systèmes évolutifs. Il est capable de se créer une *représentation* de son environnement, de simuler et d'anticiper son activité au sein de cet environnement, Alain Cardon [Cardon 2000] peut même parler à son sujet de *conscience artificielle*. Et lorsque cette représentation contient une symbolisation du système lui-même, peut-être pourrait-on parler d'une *conscience de soi* artificielle.

Un système adaptatif peut se décrire schématiquement comme un *noyau*, constitué d'entités en interaction. Une *membrane* lui sert d'interface avec le monde extérieur dont il n'a connaissance que via des *capteurs* et des *filtres* en entrée et, en sortie, via des *effecteurs*. Il s'adapte à son environnement en s'en construisant une *représentation* et en se réorganisant pour y agir au mieux, de façon non téléologique. Il n'a de perception que des conséquences des actions de ses effecteurs sur ses capteurs (*rétroactions* ou feed-back) et la représentation qu'il se fait de son environnement n'a de sens que pour autant qu'il y agit.

Représentation Système Environnement

Avec les systèmes adaptatifs, la notion d'interactivité change de sens puisque l'expérimentateur lui-même est symbolisé dans la représentation que se fait le système de son environnement et, devenant *autre* pour le système, il est invité à se redécouvrir au sein d'un environnement plus large l'incluant.

2-3 Synthèse du corps

La modélisation d'un *corps vivant* est une tâche complexe nécessitant plusieurs niveaux de description [Bret 2000] :

Du point de vue de la *forme* d'abord, l'aspect de la surface visible d'un corps dépend de sa structure interne : Un modèle anatomique [Richer 96] sera utilisé pour définir un squelette sur lequel viendront s'attacher des muscles, des graisses et des organes. La peau sera ensuite tendue sur ces différents éléments. La déformation des muscles provoque les mouvements du squelette ainsi que les modifications de la peau. Le modelé réaliste du corps est alors assuré automatiquement quels que soient ces mouvements.

Du point de vue de la *physique* ensuite, une interaction dynamique du corps avec son environnement sera simulée en attachant des propriétés mécaniques (masses, élasticités, contraintes, ...) aux différents composants du corps soumis à des champs de forces. La forme d'un corps est inséparable des mouvements par lesquels elle s'exprime, des modèles biomécaniques [Valet 96] [Goubel 98] permettront de relier la forme à la fonction.

Le *vivant* enfin se caractérise par des propriétés telles que l'autoconfiguration et l'autoreproduction dont la modélisation implique certains concepts introduits par la *Cybernetique* (boucle de rétroaction) [Wiener 48], puis par la *Vie Artificielle* (homéostasie, autopoièse) [Heudin 94]. Des modèles *comportementaux* seront utilisés pour donner à des *acteurs* de synthèse une certaine autonomie. La définition de comportements évolués conduira à étudier des organisations complexes dont le *connexionnisme* [Bechtel 93],

avec les *Réseaux Neuronaux* [Bourret 91] [Bharath 94] [Abdi 94] [Sarzeaud 94] [Jodouin 94] [Kaimal 97] [Faure 98], propose une modélisation efficace.

Les *modèles évolutionnistes* enfin, avec les *algorithmes génétiques* [Goldberg 94] et la *programmation génétique* [Koza 92], en simulant l'évolution de populations de tels êtres artificiels, définissent de nouvelles méthodes de synthèse.

3. Un modèle comportemental de corps vivants

3-1 Le corps comme objet

Le corps de la synthèse a longtemps été décrit comme *objet*. La science, mais aussi une certaine forme d'art, reconsidèrent aujourd'hui le problème de la vie à la lumière de sa simulation virtuelle : Plus complexe qu'une machine, sans être tributaire d'une mystérieuse *force vitale*, elle serait une propriété émergente de certains systèmes adaptatifs, indépendamment du support de son expression.

Dans ces conditions, il était urgent d'abandonner la seule modélisation géométrique et la seule animation dynamique, pour orienter mes recherches dans le sens du *connexionnisme*, de l'*évolutionnisme* et de la *vie artificielle*. Aussi ai-je conçu une modélisation *comportementale* du corps le définissant comme objet hybride, à la fois matériel (squelette, muscles, organes, peau, cheveux, ...), spirituel (réseaux neuronaux) et social (algorithmes génétiques).

La matérialité de ce corps peut être analysée selon plusieurs couches de modélisations emboîtées :

- D'abord le *squelette*, structure articulée d'éléments rigides soumis à des contraintes angulaires.

2) Ensuite un *système musculaire* constitué de tissus munis de propriétés élastiques simulés par des *ressorts*. Ces muscles reçoivent leurs ordres d'une couche supérieure de contrôle (voir 3-3 plus loin).

3) Des organes et des graisses, modélisés comme des tissus élastiques attachés aux éléments précédents.

4) Une *peau* enfin, qui est un organe souple et élastique enveloppant l'ensemble anatomique précédent (os, muscles, organes et graisses). Pratiquement cette peau est obtenue par le procédé, dit du *laser virtuel* consistant à analyser cet ensemble anatomique simulé par un rayon virtuel issu d'une source tournant autour d'un axe et se déplaçant le long de cet axe sur une surface cylindrique. L'intersection de ce rayon avec le modèle anatomique du corps fournit un élément (n,f,x,y) avec :

n = identificateur de la partie intersectée du corps (os, muscle, graisse ou organe).
f = facette intersectée.
x,y = coordonnées barycentriques de l'intersection dans cette facette.

L'objet constitué par ces éléments figure la projection du cylindre sur le corps. Un ressort est alors fixé entre chaque élément et le sommet correspondant de la surface cylindrique, puis on laisse celle-ci trouver dynamiquement une position d'équilibre (méthode de *relaxation*) en lui interdisant de traverser le corps (considéré comme obstacle). Pour chaque mouvement du corps, la peau se réajuste alors automatiquement à la nouvelle configuration du modèle anatomique.

Étant programmable, le laser virtuel présente une beaucoup plus grande souplesse que son équivalent réel :

La surface définissant le laser n'est pas nécessairement cylindrique, mais peut déjà s'adapter à la forme globale du corps.

Il peut visiter des creux : Il suffit de ne pas viser l'axe du cylindre mais dans la direction de la normale au corps.

Sa précision peut être réglée en fonction de la densité de détails de la surface analysée.

Intersection Projection "Axe" gauche Adaptations

La figure suivante montre les 3 couches principales du modèle :

Squelette Modèle musculaire Peau

3-2 Le corps en mouvement

Un corps muni de certaines propriétés (*masse*, *élasticité*, *non pénétration* de ses parties) et placé dans un champ de *forces*, entre en mouvement sous l'action de ces forces et aussi de forces qu'il imprime lui-même à ses *muscles*.

Des mécanismes de compensation réflexes permettent de maintenir une posture (par exemple la position debout) lorsque celle-ci est contrariée par un champ de forces (par exemple la pesanteur). La longueur du muscle et l'amplitude de ces forces sont régulées par une boucle de rétrocontrôle négatif (feed-back) : Un point de consigne ayant été défini, le paramètre contrôlé est mesuré par un capteur, et la contraction est modifiée de façon à minimiser l'écart entre la valeur lue et la valeur prédite.

Par ailleurs des mouvements complexes, expression d'une volonté consciente, se traduisent par des programmes de mouvements. Le déroulement de ces programmes implique des ajustements posturaux anticipés et des rattrapages de déséquilibres. Ces mouvements volontaires se distinguent des mouvements réflexes en ceci qu'ils sont acquis lors de phases d'apprentissage.

Un modèle *dynamique*, qui rend compte du comportement physique d'un corps, doit donc se doubler d'un modèle *comportemental* expliquant les réactions volontaires de ce corps à son environnement.

Considérés comme éléments dynamiques, les muscles sont assimilables à des *ressorts* de raideur et d'élasticité variables, soumis à des forces de compression ou d'élongation : Ainsi les muscles squelettiques s'insèrent sur des os fonctionnant comme des leviers (par exemple le biceps contrôle le radius relativement à l'humérus). La *force totale* exercée sur un muscle est égale à la somme d'une *force élastique* de rappel et d'une *force contractile*. L'énergie accumulée par l'allongement du muscle extenseur lors d'une flexion est libérée sous forme d'un rappel élastique provoquant une extension [Goubel 98]. Les mouvements d'un membre résultent de l'équilibre entre les forces de rappel des muscles extenseurs et contracteurs (considérés comme des ressorts) et des forces exercées sur les tendons sous le contrôle du système nerveux.

3-3 Le corps vivant

Les organes des sens fournissent au cerveau des informations sur le monde extérieur et sur l'état du corps lui-même. L'analyse de ces informations passe d'abord par une sélection des capteurs pertinents (par exemple, lorsque nous regardons le monde la tête penchée, nous continuons à voir l'horizon droit car l'information visuelle est corrigée par celle provenant de l'oreille interne). Alain Berthoz [Berthoz 97] parle du *sens du mouvement* comme cette perception multisensorielle par laquelle le corps évalue correctement sa position et ses mouvements.

Le rôle du cerveau est triple :

1) D'abord il construit un modèle prédictif de ce que sera l'état du système corps-environnement à une date ultérieure.

2) Ensuite il lance une simulation à partir de ce modèle.

- Enfin il assure un contrôle interactif permanent entre la simulation et la réalité en ajustant si nécessaire la première à la deuxième.

De tels comportements peuvent s'implémenter par une *machine à états* commandant une suite d'ordres élémentaires dont l'enchaînement est déterminé par les valeurs des capteurs.

COMPUTERS AND ART: MYTHS AND REALITY

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The words "computer" and "progress" have become regarded as synonyms long ago, though the development of cybernetics in our country, as it is known, met dramatic conflicts at the beginning. But "dramas of ideas" accompany computerization of our life permanently, even after it's exclusive usefulness and inevitability have become obvious and indisputable - especially when applied to technology, natural sciences, economics, statistics, intellectual games and so on. The situation with computer application to art creative work appeared to be more problematical. Here we meet some inherent prejudices and myths that began to form since the very beginning and are present not only in common consciousness, but also in a social one. Let's consider these myths in their logical and historical order.

1st myth: **sooner or later, computers should be able to make adequate model of any form of human mental activity, including art form**. The pathos of such slogans was displayed especially brightly in our country, when after initial persecutions of cybernetics as bourgeous false science, the pendulum swang into opposite position. Even humanitarians suddenly began to sing enthusiastic hymns to expected potentialities of computer's art. This forced one prominent poet to shudder: "Any progress is reactionary, if man falls to the ground!".

Such expectation of "Art ex machina"[44] was, using the expression of French theorist in the field of cinema, A.Bazin, "most of all bourgeous". Saying so, he had in mind cinema and photo-technique. By his opinion, the advocates of this conception see the destination of new technique in allowing ones "to fabricate art works, not being the artists themselves" [1]. Let's add that the following attitudes are "bourgeous" as well: a desire for man's liberation from "pains of creation" by shifting them off onto computer; i.e., an expectation of marvelous birth of new artistic value spontaneously and practically "from nothing". The father of cybernetics N.Wiener warned about danger of such attitudes. He anticipated that there might appear new tribe of "machine worshippers" who will gladly expect that "some functions of their slaves can be passed to the machine". The logic of its operation might be unknown, but still it is regarded as "reliable" and wittingly "objective" [2]. Of course both Bazin and Wiener point out here the position utterly humiliating both artist and art itself. But "drama of ideas" is called as "drama" just because one cannot achieve harmony immediately - harmony between question mark and exclamation mark, between desire and possibility.

So, when researchers began to investigate the problem "Art and Computer", arising in aesthetics since 1950-s, they met paradoxial fact: even those machine's "creative works" (more concretely, computer graphic compositions) which were obtained without any artist's interference (in the process of solving pure mathematical/engineering tasks), often were demonstrated at special "cybernetic art" exhibitions and their beauty were widely recognized. Especially it relates to the amazing fractal geometry patterns, that were discovered not long ago (and would lead one to conclusion that God was probably the first programmer with somewhat aesthetic inclination, when He created the whole beauty of nature around us).

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[44] Originated from well-known expression "Deux ex machina", i.e. "god from machine". This is a symbol of the marvelous tool which acts beyond logics of any real events.

It is therefore reasonable to ask - why these computer's products could not be considered as an art, if they are looked so nice? But, from other side, no artist took part in the process of their creation (except the selection of the best results) - it seems they cannot be regarded as art works. Isn't it insolvable contradiction? And aesthetics practically left this question unsolved, thus showing it's own helplessness before new problems, raised by the epoch of scientific and technological revolution.

The first results of our theoretical investigations allow us to answer this long-standing question. The alternative "man or machine" has appeared to be false, and the above contradiction - far-fetched in the final analysis. In order to answer this question, let's remind those bygone disputes in our (Russian) aesthetics which were connected with seemingly scholastic reflections on similarity and differences between two basic categories of aesthetics: "aesthetical" and "artistical".

The "beauty" of computer graphic compositions obtained as by-product of solving pure mathematical problems, is beyond doubt. The beauty presents in them, as it presents in natural objects, including inorganic ones. (Everybody knows and recognizes the beauty of snowflakes, sunset, dawn, water-play, jewelry, etc.). Aesthetical contemplation, aesthetical perception of computer's compositions that were not created by artist, is therefore justified when we regard computer as an object, belonged to inorganic nature, though of artificial origin (including computer programs which reflects structure and features of this physical, inorganic world).

Some person (artist in potential) may select and combine natural objects (flowers, stones, roots etc.) and put them together to create composition of a certain aesthetical value, reflecting the beauty of the nature in concentrated form. Just in the same way, any interested person may pick up some computer's graphic compositions, obtained as by-product, out of programmer's intention, and places them "into the frame". Now they may be regarded as something similar to the art work (computer's "ikebana" of a sort).

But, strictly speaking, the function of art is not reduced to making interesting games or senseless beauty. In a true art work there is always present creative "Ego" of an active artist. You see, art is principal and essential in its functions. It is exactly and by intention the subjective (artistic, belonged to the artist) image of objective reality. By the way, the latter includes an artist himself, with all his passions, private feelings and attitudes.

In connection with this, the results of searching for algorithm of art creative process on the basis of specially devised computer programs, are disputable. The stumbling block in this case is, firstly, the impossibility of complete formalization, algorithmization of art creative process; secondly, any possible algorithm should change continuously, depending upon current social, cultural, artistic, style and personal context. As a result, an old conclusion by A.Kholmogorov (Russian famous mathematician) still remains as actual today: "It seems, that in order to build an automaton, able to write poetry at a level of prominent poets, one has model the whole development of cultural environment in which the poets are developing actually" [3]. Another researcher of this problem L.Pereversev wrote about some concrete experiments on computer's music composition, that there "only note texts are modeled, not the process of composition itself" [4]. Let's add one more argument, that would be most humiliating for computers, could they feel humiliation at all. As truly V.Ivanov noted in connection with the same experiment on computer's music, "it is an excellent example of how people must not to compose. With the computer's assistance, human mediocrity is as if imitated. We as if obtain exact mathematical model of a standard, cliche, used by the hacks" [5].

Adding to such computer programs new elements of "creativity imitation", i.e. elements of game and stochastic deviations from strict algorithm, did not change the above estimation

of computer's "creative ability". No one could ignore social nature of art, regarded as a form of social consciousness, a method of communication in a society, and, if you wish, a method of special, image-bearing modeling of a reality.

At any case, euphoria from expectations of coming "computer art" achievements decreased gradually, and, strange as it may seem, in proportion to complication of computer technique itself. Let's remind in this connections thesis of "computer revolution in art", defended by "informational aesthetics" school (A.Moles and others). According to their opinion, in the epoch of scientific and technological revolution, art should not reflect the reality any more. Instead, traditional approach is replaced by computer "programmed" permutation art, i.e. art of "machine" games, computer combinatorics. But today, after the initial euphoria has gone, we may see, that "computer art" actually exists only in pure technological sense, and does not lead to the changes of functions of art, and to corresponding total changes of artist's function. Computer is no more than a new instrument, having some new abilities (maybe, a great one). But these abilities can demonstrate their "great" potential only in the case of close collaboration between man and machine. Such unpretentious conclusion is dictated by practice. Let's add that in order the results of man-computer interactions could become facts of art, there should occur artistic and technological assimilation of this new instrument. This will allow artist to embody the same inevitably "subjective image of objective reality", although using new art language.

More then forty years of art and aesthetical computer experiments in many countries have proved this conclusion. As a result, it is clearly seen today, that any pretensions of independent "computer creative work" are withdrawn and placed to the periphery of art practice. Computers themselves are subordinated, one way or another, to the eternal purpose of further extensions of audiovisual palette. The function of computer in creative process is reduced, in the best case, to the routine, mechanical part of the work (which can be formalized). It seems, the life has set things in their order. But...

A new myth was born: **as if computer audiovisual means, being a product of new art set of instruments, have absorbed merits of all the previous ones, and then should gradually forced them out (including cinema, photo, TV, video).** But, similar to that as one cannot substitute bananas for apples, computer "palette" should take its part in the culture not "instead", but "together" with the previous ones. Of course, it has it's own specific features in the system of art communication, forming new language of art thinking. Let's take for example computer graphics, which specific character is evident even at technological level. Cinema, photo and slide technologies are mainly a process of "*reproduction*" (broadcast, copying) of something that already exists and is sending to the system input. The image then is formed by method of substraction (system substracts some information from initial pattern and lets the rest go to the "screen"). On the contrary, computer display is "tabula rasa", blank sheet, where the image is "*produced*" (in this case by method of addition, "one pixel to another").[45] It is exactly this seemingly pure "external" technological feature, that explains peculiarity of computer image: it's distilled, sterile clearness, the impression of unreality and supernatural, cosmic origin (caused by the absence of air in computer's picture, freedom from Earth's gravity etc.). Let's note also chemical virginity of color, the ideal mechanical movement - all that explains the psychedelic, hedonic character of impression produced by computer animation. It is very near to illusions caused by drags, or to dreams and hallucinations...

[45] Oldos Haxley believed that these images are from without, from the sphere of World Reason. Naturally, it may be discussed, but it is significant here that Hacksley, who tested hallucinations agents by himself, relates exactly to Plato's prototypes. On his opinion, the bright visions, caused by chemical agents, strongly resemble them [6].

In order to understand why these "external" technological differences influence so deeply psychology of perception, aesthetics of computer graphics and animation, we should, on my opinion, turn to some fundamental philosophical conceptions or, more precisely, to historical origins of philosophy. As it is known, one of the main original philosophical trends, "objective idealism" in classic terms, considers ideal reality as primary, which exists in objective sense. Matter is understood as a mere shadow, a faint reflection of ideal reality, but it can be perceived by our sense organs. In poetical form something like this was expressed in Ancient India Holy books: material world is only a veil that covers the true reality of Divine Origin (Brahman). In Ancient European philosophy aesthetical aspect of "objective idealism" was most clearly presented by the great Plato.

According to him, ideas form their own transcendent world, where each idea is an absolute sense of corresponding thing of material, earthly world. The ideal world "above" us, high in the heaven, consists of the same things that we perceive in our own world, but they are given "above" there eternally in the form of absolutely exact prototypes, or "eidoses" (that means "form", "image", "appearance"). For Plato, the words "idea" and "eidos" are synonyms. Therefore, for example, the material kettle is a faint shadow, earthly embodiment of the eidos of "kettleness" which exists forever and outside of man's experience, outside of nature.

Computer images of kettles, bottles, tables, cars, buildings amaze us by their absolute character and by the air of irreality. Are not they kind of "visualization" of Plato's eidoses of these things? You see, they are formed on a display by means of formal algorithmic operations, which are implemented in the bowels of computer "black box". There the images are presented as multidimensional pixel matrixes, or numerical arrays i.e. in a form inaccessible to sense perception. More than that, Plato himself believed, that exactly mathematical objects serve as mediators between world of eidoses and world of perceptible, material things. It is exactly these objects that are accessible to rational cognition (isn't programming relates to this area?).

Actually, all computer images are "devised", are of "ideal" and "absolute" nature (that is the essence of programming means). It is clear why it is very difficult to get rid of these properties when trying to "animate" and make more "human" such visualization of eidoses. On the contrary, how on the spot they are in advertisement, when each toothbrush or kettle has to be presented as "ideal" object? The main purpose in this case is not "ennobling illusion" of artistic image, but illusion of other, psychological and physiological sort. Each thing is radiant with $100 smile, assuming similar reaction in potential happy consumer! The hallucinatory and meditative character of impressions produced by computer digital images, can be explained in this way. Just as in drug illusions or hallucinations (for all their fantastical, bright, hedonistic beauty) there is no object before our eyes, no input signal (in the organ of sight). This signal is appeared "by itself" somewhere in the brain's depths, which plays fancifully with desultory "eidoses" of the previous visual experience...

To what extent such properties of computer graphics may be dangerous for a man, time will show. But many people regard it as sort of "visual drug". Let's remind the famous Delgado's experiments on the rats with electrodes implanted into "delight center" of the brain. The rats were excited by electric pulses up to the loss of consciousness. Drugs, in their turn, achieve "delight center" not through direct electric contact, but via blood stream. As for computer graphics, it influences "delight center" through eye (of course, its drug effect is far weaker then that caused by electrical or chemical agent).

All above conclusions concerning nature of computer image technology, on our opinion, do not bear any evaluation moment, pointing only to its specific character, that

distinguishes it from other art technologies. This has to be clearly understood and taken into account in theoretical investigation of computer potentialities in the art.

Charmful and naive is concept of "eidos" devised in Ancient times. We use it (in the same charm form, as I hope) to explain the cultural phenomenon of XX century's end. There are no any extra pages in the history of culture, everything is interconnected and calls one another - over the ages...

And, finally, one more myth. A.Moles in his works glorifies the merits of computers, that can store, synthesize and perform the wide variety of audio and visual production - music, sounds, speech, text, abstract and concrete images, both still and animated ones. He believes that now **any artist, by simple permutation of this most various semiotic material, is able to create not only new art works, but even new kinds of art! And, which is most significant - the needs in all the previous kinds of art is therefore vanished and abolished.** Thus the art not only loses it's main function (reflection of reality), but also loses any systemic and species features, disintegrating into a lot of separate art actions, connecting neither with reality, nor with each other [7].

At one time we have made out the original system of art [8], so to speak, in the course of sequel of Lessing's "Laokoon". The heuristic character of this system is corroborated, which is significant for us, also in the period of computer revolution.

So, the main feature of our structural (schematic) representation of a system is that man of the art ("*Man*") is placed in the center, and a system itself is shown in the process of development (see Fig.1, then Fig.2).

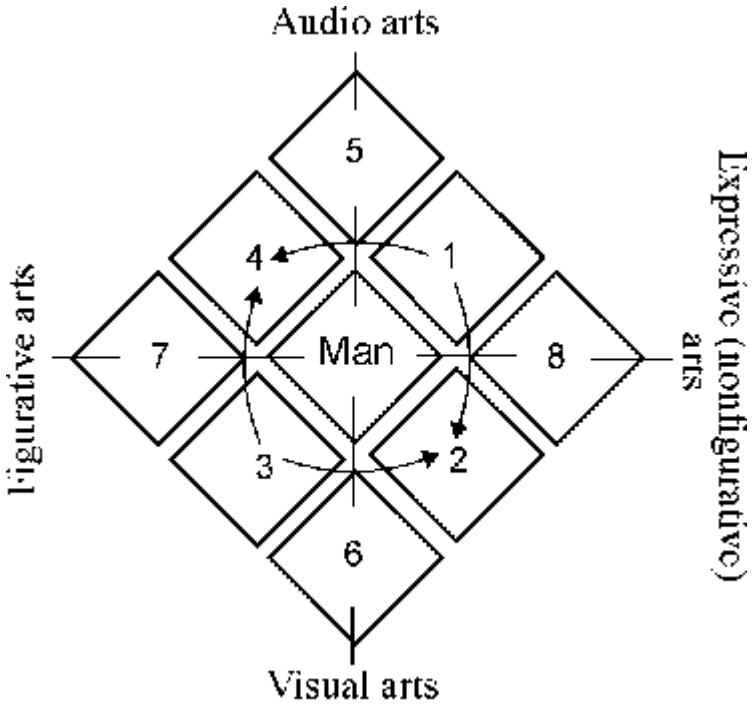

Fig.1. The system of traditional kinds of art, that use "natural" means of art communication.

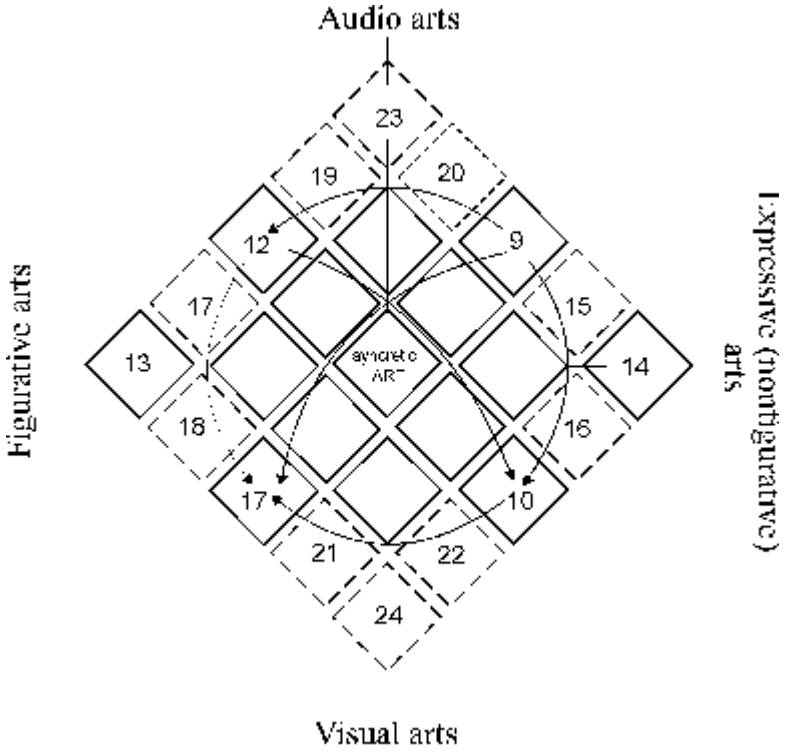

Fig.2. Expanded system of art activity kinds, using "artificial" means of audiovisual communication.

In the epoch of syncretism "*Man*" appeared in the role of subject, object, instrument and product of art at the same time. In the course of division of labor and specialization of art activity, certain essential powers of a "*Man*" undergo materialization. By that the syncretism splits into separate species, that are differentiated according the following pairs of signs (we have chosen them as most significant for the art): "audible - visual" and "figurative - expressive". These are, correspondingly: *music* (1*); architecture, ornament* (2*); painting, sculpture* (3); *art of word* (4). The striving to overcome the arisen estrangement and to restore the integrity of syncretism (that is always inherent aesthetical world view) is assisted by the following factors: - bisensory character of *theatre* (7) and *dance* (8), inherited from syncretic epoch; - bifunctional character of *a song* (5) and *applied* (6) arts; And, beside that: - the arising of a new syncretic formations (shown by the arrows):
book illustration (3+4), *monumental art* (2+3*), vocal music* (1+4), musical graphics (1+2), and, taken together - various genres of *dramatic* and *musical* theatre.

The system shown at Fig.1 has been formed nearly the middle of millennium (Renascence). It's further development consisted of exactly the complication of intrasystem links, i.e. arising of a new forms of synthesis (primarily, stage forms), and other interactions in it.

Thus it is obvious, that just dialectical unity of centrifugal and centripetal forces, revealed here, formed the structure, links and dynamics of a system, and, first of all, determined the integrity of its existence. Indeed, in reality it was accompanied sometimes with a borderline "aesthetical catastrophes", and no wonder that the nostalgia on the lost harmony of Ancient cyncretism gave birth to idea of "Gesamtkunstwerk", that should come to make an end of separate existence of different kinds of art (such was Wagner's delusion). But in the art, unlike science and technology, where diesel forced out steam engine, every artistic act at any level is unique and self-valuable: chef-d'oeuvres of Degas

and Kandinsky neither abolish nor substitute Rafaelle and Jotto, the appearance of opera and balett do not abolish instrumental music. Therefore system at Fig.1, saving unchanged its external appearance up to the end of XIX century, was growing in quantitative respect nevertheless - just owing to the arising of various stage synthesis forms! The "borderline incidents" in the past were often an indicator of growing but unrealized aesthetic requirements of society. They, in their turn, after appearance and assimilation of new instrumental tools (first of all that were based on the use of electrical power), led to the sharp extension of a system (see Fig.2). It was manifested in the emergence of the following new species of art: 9 - *electronic music*; 10 - *kinetic art;* 11 - *photography and silent films*; 12 - *radiotheatre*; 13 - *television*; 14 - *light-music*; 15, 16, 17, 18 - the *sound* and *light scenography* of musical and, correspondingly, drama theatre. (The latter includes such specific forms as 15 - "spatial music", 17 - *"Sound and Light" performances*, 18 - *"Laterna Magica*"). Applied forms are placed in the cells 19,20 - organization of visual and 22,23 - *acoustical media with artistic purposes*; 23 and 24 - *sound* and *light design*, correspondingly.

Noteworthy to say, that here, in parallel with the growing of the estrangement in the system "man - art work", the centrifugal forces are growing too (shown by the arrows). Almost all parallel cells on the left-right, top-bottom do not exist independently, but always are included into synthetical formations (cinema does not exists now without sound, electronic music inclines to the union with image, as well as interaction between TV and light-music is inevitable, etc.). Thus, it is obvious that extended system also is able to keep its unity and integrity just by means of utmost increase of art species interaction.

As regards to the so-called "screen synthesis" arts, which were at first presented as an example of complete realization of "Gesamtkunstwerk" ideals, their potentials were overestimated too. The widespread confidence existed, that they should absorb all another arts. Among the candidates to this role there were called cinema (in early Eisenstein's works) and "Mysterial All-Art" in Scriabin's declarations. The real life had refused such pretensions - neither cinema abolished theatre nor light-music abolished music. But some painful consequences of "functional asymmetry" of the system had come to the light and revealed themselves in different fates of new arts which are shown on the left and right of Fig.2. The point is that in figurative arts which use technology of "reproduction" (broadcast, copying), the functions of artist and constructor of equipment are separated. While in expressive arts which use images and sounds not referring to the reality, existing before only in artist’s imagination, the processes of making equipment and art work itself are joined together. As we see, the situation is unusual for art culture, because in this case not only artwork is unique, but also the instruments, used in creative process. Here lays an explanation of paradoxial and tragical fact of both historical and social status lag of the new art forms on the right half Fig.2 (light-music, electronic music, etc.) as compared with their neighbors from the left half (cinema, radio, etc.). Although it is known that, for example, the idea of light-music itself appeared long before cinematograph.

The liquidation of such "undemocratic" situation in the system of art is assisted by the computer revolution which goes on in front of our eyes. Let's stress it once more, new digital technology is of "productive" nature. It is able to produce any images and sounds, both real and imaginary ones (i.e., figurative and non-figurative ones). Just as the revolver in America of XIX century appeared to be sort of "instrument of democracy", leveling abilities of feeble and strong men, so computers play now similar role, compensating the consequences of "functional asymmetry" in our renewed "periodical system of arts".

It is difficult now to foresee, in what way this system would change owing to further computerization of the art culture. Maybe one more upper layer will be added in our scheme of expanded Universe of arts (which is retracted more strongly at the same time

due to unifying function of computers as universal technique). But at any case it is clear that new computer technique is able to synthesize not only any sound or image, but also any combinations of them.

The total synthesis of all possible components of our extended system is embodied in modern genre of the so-called "multi-media". This synthetic genre imitates at a new, artificial level the primitive syncretism, folklore art forms. (They have many features in common: bifunctional, bisensory and game-like character of their interactive mode; anonymity of the author; usage of canonical methods; impossibility of "easel", completed and monovariant existence). Here computer appears in many roles: as instrument (sound and video at the same time); as virtual subject and as virtual object. At the end the virtual reality is formed and a real subject immerses into it. In multi-media art just as in syncretic art, the art functions are closely connected not only with the game, but also with dissolution in the environment (in this case it is virtual, i.e. artificial and "ideal" one). We may therefore formulate the result in paradoxial (dialectical) form: the system of art is expanding and at the same time retracting, returning to primitive syncretism, which is "virtual" in this case... One may think: here it is, complete and ideal embodiment of "Gesamtkunstwerk"! But, once again, similar to that as impressionism did not abolish realism, realism did not abolish high classics, and modern artist has a right to use all methods and tools that mankind has made out - so computer art in all its variety does not substitute traditional arts (including cinema and light-music also). Computer art is simply one more specific form of art creation and its being. Let's remind, once more, that we see specific character of computer images in that they are regarded as visualization of Plato's eidoses, of some sort.

Thus one can be sure that function of reality reflection, which is inherent art, will remain in computer epoch also, though it will be realized now with the assistance of artificial (synthesized) sound and image. As for elements of independed "programmed", "permutation" art which is discussed by A.Moles, they may be used, but, as it's become clear, only in special game-like forms of contact between man and computer (various exotic "interactive art", "multi-media", "virtual reality" etc., which are close to the former folklore forms).

Universe of arts is expanding, but it never will change into a multitude of homeless and isolated artistic actions, for their growing systemic set still keeps its integrity owing to interactions between them. This integrity reflects that of a man and the Universe.

The main conclusion is as follows: this quantitative growth of a system, which is ensured by computers also, is probably the only reliable indicator of progress in the art, because the contingent of those who can try and show himself in the art creative work is extended too. Now they would be able to realize their formally unclaimed creative potential by means of accustoming to any new accessible art, borned by XX century (as well as to the old ones): cinema, TV, light-music, videoart, computer and laser graphics. (Pudovkin would stayed as unknown physicist and Eisenstein - as architect in Riga, unless new art, cinematograph, would not appear at the beginning of our century). New artists speak new languages, use new instruments, which are made up in the course of development of the united culture, united human civilization, that forms dialectical unity of two processes: development of aesthetical needs, and, correspondingly, means and abilities for their realization...

Futurologists like to joke : it is hard to foresee, especially the future. Already the first day of a new millennium which is at the threshold, may bring corrections to our conclusions and prognoses. But the author is confident in reliability and heuristic character of the chosen method not only due to immanent "beauty" of systemic approach. Almost all authors'

conclusions, related to "outer cells" of scheme Fig.2, have been tested in the course of long-term works in Experimental Aesthetics Institute "Prometheus" under his guidance.

It cannot be denied that among all revolutions only one has justified itself - scientific and technological revolution (including computer revolution). And I would like to join poet A.Voznesensky, who wrote: "Long live scientific and technological revolution, developing into spiritual one!"...

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ALIRE : UNE EXPERIMENTATION DE POESIE INFORMATIQUE EN LECTURE PRIVEE

PAR PHILIPPE BOOTZ

INTRODUCTION

La revue de littérature informatique *alire*[46] propose depuis 1989, en lecture privée, c'est-à-dire chez soi, des oeuvres poétiques créées sur ordinateur et conçues pour être lues sur ce support. Elle a ainsi anticipé un mouvement devenu aujourd'hui commun avec Internet en considérant que l'écran deviendrait un support de lecture aussi normal que le livre. Mais elle ne s'est pas contentée de prôner un changement de support des textes. Elle a pris en compte le caractère dynamique qui en découlait, introduisant, par l'animation, la temporalité comme dimension syntaxique naturelle. Elle a également considéré que le dispositif de monstration ne se réduit pas à un écran, mais qu'il est constitué d'une machine bien plus complexe permettant d'effectuer des calculs, des opérations logiques, de traiter et de stocker de l'information non destinée à la lecture, autant de possibilités absentes des dispositifs littéraires classiques. Le point le plus important dans cette seconde remarque, est l'ajout volontaire d'informations non destinées à la lecture. Ce simple fait suffit pour affirmer que le dispositif informatique introduit une part d'opacité pour le lecteur. Un fossé se creuse entre l'auteur et lui ; le dispositif augmente la distance qui les sépare. Un tel bouleversement ne peut qu'engendrer un changement d'archétype textuel et faire émerger de nouvelles formes littéraires. Mais il ne prend toute son importance qu'en lecture privée, situation qui laisse le temps au lecteur d'intégrer l'œuvre, et donc de se frotter à ses éventuelles opacités, de les expérimenter. Il nous semblait évident, en 1989, qu'un dispositif éditorial favorisant la lecture privée au détriment même peut-être d'une spectacularité adaptée à des présentations publiques, conduirait à des productions d'un type différent. La revue électronique sur disquette, puis sur CDROM, nous a semblé à l'époque constituer le vecteur adéquat pour un tel projet.

Nous ne pensions pas alors découvrir un comportement des œuvres tel qu'il nous apparaît aujourd'hui, de nature à déplacer un peu plus encore la définition du texte. Le texte ne saurait se limiter aux objets observables, il est avant tout fonctionnement, et constitue même un système complet doté des trois faces du système : ontologique, fonctionnelle, organisationnelle[47].

Je me propose de présenter les principales caractéristiques de cette lecture privée, telles qu'elles ont été traitées par les auteurs publiés dans *alire*.

UNE LITTERATURE DU PROCESSUS, NON DE L'ALGORITHME

Une temporalité dans l'écrit

Poésie animée, poésie cinétique

Le premier souci des créateurs d'*alire* a été d'introduire une temporalité au sein de l'écrit. Il a déjà été mentionné que l'écran n'était pas considéré comme un simple espace géométrique, mais comme un espace-temps, et même un espace-temps espace-son. Cette dernière caractéristique ne pouvait pas être expérimentée en lecture privée en

[46] Éditée par MOTS-VOIR, 27 allée des Coquelicots, 59650 Villeneuve d'Ascq, France. http://www.mots-voir.com.

[47] Cette affirmation est développée dans l'article à paraître dans les actes du colloque INTERSENS, qui s'est tenu à Marseille en novembre 2000.

1989, les ordinateurs courants n'étant pas dotés de cartes son et étant de toute façon bien trop lents pour un quelconque traitement multimédia. Les œuvres plus récentes montrent que l'introduction du son enrichit la polysémie de l'œuvre mais n'ajoute pas de caractéristique nouvelle à celles introduites par l'animation spatiale.

On peut introduire de plusieurs façons le temps à l'intérieur d'un écrit. Une première forme joue sur l'animation et la déformation de lettres à l'intérieur du mot, les autres portent l'animation au niveau de la phrase. C'est dans cette seconde catégorie que se situent principalement les textes animés publiés dans *alire*. On peut alors, encore, distinguer deux classes. La première, qu'on pourrait nommer poésie cinétique, se contente de faire bouger les mots sans modifier la structure de la phrase. La seconde utilise l'animation pour déconstruire/reconstruire le niveau syntaxique. Il s'agit alors d'une animation grammaticale, le caractère plastique et esthétique de l'animation s'en trouvant relégués au second plan. Ces textes utilisent d'ailleurs souvent[48] une structuration spatiale calquée sur la page, c'est-à-dire qui utilise les directions et sens conventionnels de l'écriture. La quasi-totalité des textes publiés dans alire, jusqu'à alire 7, appartient à cette seconde catégorie. L'exemple le plus représentatif des caractéristiques de celle-ci me semble être *À Bribes abattues*[49]. Le terme " littérature animée "[50] désigne, dans mon esprit, exclusivement cette forme d'animation syntaxique.

Une confusion entre phrase et texte

La littérature a déjà connu plusieurs déstructurations de la phrase, mais celle-ci présente un caractère paradoxal car elle s'opère en douceur, presque à l'insu du lecteur. Ce dernier est en effet conduit à appliquer à l'écrit une modalité de lecture orale, dans laquelle la syntaxe se construit en fonction de l'ordre d'apparition des mots. La phrase perd alors sa stabilité structurelle et ne peut plus constituer l'unité linguistique de référence qu'elle est à l'écrit ; elle est rendue à l'état de perpétuelle métamorphose, à l'image de l'information qu'elle énonce. En réalité, n'ayant d'existence qu'instantanée, elle disparaît purement et simplement en se confondant avec le niveau supérieur du texte lui-même.

Cette absence de stabilité structurelle apporte une autre caractéristique, liée à l'absence d'une interface de commande des animations programmées : le lecteur se situe toujours dans une localité, c'est-à-dire qu'il ne peut lire qu'une succession d'instants du texte, sans possibilité de retour, d'avance ni même, parfois, de pause. D'une façon plus générale, le dispositif informatique favorise une posture locale du lecteur, lui interdisant parfois une vision globale du projet de l'auteur. *En réponse à la lampe*[51] montre par exemple au lecteur, à la fin du texte, que tout le visuel a été construit sur une logique d'accumulation permanente, qui influe bien sûr sur le sens, alors que le lecteur n'en perçoit que des mouvements et des retraits par le jeu du traitement des couleurs. Il est vrai qu'à l'époque, la cohérence globale de l'architecture spatiale n'était pas liée, dans le programme, à l'état visuel observé mais à une grille d'affichage permanente, qui court sur tout le texte et dont le lecteur ne peut se rendre compte qu'en comparant la position des mêmes mots à des instants différents. Cette grille forme un texte qui n'est jamais affiché et qui, pourtant,

[48] Les textes de Tibor Papp et Claude Maillard constituent une exception notable.
[49] Ph ; Bootz, 1990, publié une première fois dans KAOS en 1991 puis repris dans alire 9 en 1995.
[50] Le choix de l'expression repose sur un jeu de mot : est " animé " ce qui procède de l'*anima*. Cette *anima*, en poésie, est la langue elle-même. Dans certains cas, d'ailleurs, l'animation ne passe pas par le mouvement. Ainsi, elle opère par une transformation graphique du fond dans *Icône* et un processus de transformation lisible/visible dans les *diagrams*, deux exemples qui traités dans le cours du texte.
[51] Ph. Bootz,1992, *alire* 6.

conditionne ceux qui le sont. Ce principe d'un méta-niveau indicé dans les états observables s'applique encore[52].
Cette localisation du lecteur est un des points qui permet de repérer à travers ces œuvres une " esthétique de la frustration "[53] dont nous rencontrerons d'autres expressions. On peut affirmer que, dans *alire*, au moins jusqu'au numéro 9, la matière première qui est travaillée n'est pas la langue mais la lecture. Et paradoxalement, alors que le lecteur est au centre du projet des auteurs, il est placé en situation périphérique dans le dispositif, il lui appartient de " conquérir " sa lecture. Nous verrons comment cette posture instrumentale du lecteur au sein du dispositif se révèle être le levier d'une réflexion littéraire sur la lecture, à laquelle j'ai donné le nom de " double lecture ".

Une confrontation des modalités de lecture

La littérature animée ne se contente pas d'introduire une temporalité au sein de l'écrit. On peut considérer qu'elle introduit une véritable oralité en créant une confrontation entre la modalité de lecture temporelle, propre à l'oral, et celle, spatiale, propre à l'écrit. Cette confrontation augmente la polyphonie et l'ambiguïté en faisant jouer au lecteur le rôle d'un appareil de mesure quantique : c'est lui qui lève l'ambiguïté, par le choix d'une modalité de lecture, mais ce choix n'est, en général, ni conscient, ni volontaire.

Cette ambiguïté sémantique peut prendre plusieurs aspects. Elle peut revêtir l'aspect d'un palindrome, en autorisant deux syntaxes différentes pour un même matériau textuel. *Proposition*[54] est constitue un exemple typique : lorsqu'on lit le texte de bas en haut de l'écran[55], ce qui correspond à l'ordre d'apparition des mots, alors il est optimiste. Quelques inversions syntaxiques, notamment celle d'un sujet et d'un complément, le rendent pessimiste lorsqu'on le lit avec les règles implicites de l'écrit : de haut en bas[56].

Mais dans la grande majorité des cas, le choix de la modalité de lecture s'effectue à la volée, l'animation ne laissant pas le loisir au lecteur de s'arrêter pour relire le matériau affiché selon l'autre modalité. Il est ainsi invité à commuter de lui-même, en fonction de sa lecture, entre ces deux modalités. Cette commutation a pour effet de créer une combinatoire non algorithmique sur le matériau textuel, en laissant parfois apparaître dans sa mémoire des textes qui ne sont jamais affichés.

Dans le mode de lecture spatial, le lecteur est obligé de figer en esprit l'information, se rendant compte alors qu'elle lui échappe, parce que le mouvement réel à l'écran ne s'arrête pas. Cette confrontation cause ainsi une perte d'information que seule la relecture permet de combler. La relecture devient alors une composante de la lecture de surface, et n'est plus nécessaire, seulement, à une prise de possession en profondeur du texte. Tout se passe comme si le texte était " trop grand pour être lu ". Il arrive souvent que les

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[52] Une telle disjonction entre ce qui est de l'ordre du " visuel " pour l'auteur, et ce qui est observé par le lecteur constitue le fondement du fonctionnement de la double lecture dans *Stances à Hélène*. Cette notion est développée en fin d'article.
[53] Je ne sais plus qui, de jean Clément ou de moi, est l'inventeur de cette expression. Notons que la frustration est levée dans une lecture " engagée ", et qu'il ne s'agit nullement d'une esthétique sadique, mais simplement de la mise à mal de la lecture " informative " courante prônée dans notre société de l'information. Il apparaîtra d'ailleurs qu'alire constitue globalement un regard très critique sur l'idéologie de la société de l'information et de la communication, regard exprimé par un fonctionnement ironique des leurres et manipulations sous-jacentes, et non à travers un discours. La littérature publiée dans alire joue sur la forme, c'est en cela qu'elle est poésie, non sur le contenu.
[54] Ph. Bootz, *alire* 5, 1991.
[55] On obtient alors, en ajoutant la ponstuation : " *À tous les caprices, l'amour en grand ouvre la porte, même lorsque la prison reste close.* "
[56] On obtient dans ce cas : " *La prison reste close, même lorsque la porte ouvre en grand l'amour à tous les caprices.* "

programmes des œuvres utilisent l'aléatoire ou des algorithmes générant des processus observables non reproductibles. On peut alors considérer que l'état affiché n'est pas lisible, ou plus exactement que la fonction de destinataire de l'œuvre traditionnellement dévolue au lecteur est une fonction secondaire dans sa nouvelle position. Cette dernière caractéristique se retrouve dans tous les types de productions littéraires informatiques et dépasse très largement le cadre de la revue *alire*.

Le lecteur occupe bien, dans cette littérature pourtant non interactive au sens informatique du terme, c'est-à-dire qui ne présente pas d'interactivité ergodique, une place active qu'il occupe rarement dans le dispositif du livre. C'est le caractère local de sa lecture qui permet ces effets.

Prééminence du processus observé

Processus versus algorithme

La littérature algorithmique informatique s'inscrit dans la continuité des littératures combinatoires des années 60 – 70. La forme la plus aboutie en est, aujourd'hui, le générateur automatique de textes. La littérature animée introduit, nous venons de le voir, une combinatoire non algorithmique. Elle va également montrer que la structure temporelle de l'événement observé le fait apparaître au lecteur avant tout comme processus, réservant à l'auteur la nature algorithmique : le dispositif informatique, interdisant, en général, de remonter aux caractéristiques du programme à partir de la seule observation des événements lisibles, accentue la distance entre l'auteur et le lecteur. Dans cette distance, les propriétés des objets textuels diffèrent pour l'un et l'autre : le texte affiché est production algorithmique pour l'auteur, il est état d'un processus observable pour le lecteur. Les deux notions ne se recouvrent pas et le lecteur ne perçoit pas toujours la nature algorithmique exacte du programme. Par la suite je nommerai " génération ", le processus technique qui fabrique le processus observable (lequel est également dénommé " processus de l'œuvre ") à partir du programme. L'opération centrale de cette génération est l'exécution du programme sur la machine du lecteur. La notion de " génération " ainsi introduite, ne recouvre pas le concept de " génération automatique de texte ". Elle fabrique un processus dont le " texte "[57] constitue l'état observable instantané.

Un exemple démonstratif de cette opacité programmatique est donné par les *opus*[58]. Le visuel consiste en un mouvement incessant de mots ou formes que le lecteur peut suivre mais dont la cohérence [59] de mouvement lui échappe. Avec ce type d'œuvre, l'algorithmique s'efface derrière le processus visuel qu'elle gère.

D'autres productions démontent la littérature algorithmique en inversant son fonctionnement. Celui-ci est construit sur un processus visuel particulier : la page-écran, qui permet, par la stabilité temporelle de l'affichage, de mettre en œuvre dans l'esprit du lecteur les archétypes traditionnels de l'écrit, et notamment la distinction entre texte et paratexte. Les diverses formes de littérature algorithmique informatiques jouent sur cette distinction en attribuant au paratexte un rôle d'interface, dont une des fonctions est d'orienter la lecture, ce qui est la fonction traditionnelle du paratexte. Dans ces productions, une partie de l'état affichée par le programme est ainsi considéré par le lecteur comme " n'étant pas le texte ". La littérature animée va mettre en évidence que ce mode de lecture repose sur une stratégie auctorielle, et que l'archétype réellement à

[57] en fait le texte-à-voir
[58] Sérandour, *alire10/~~DOC(K)S~~*, 1997.
[59] Ces mouvements sont gouvernées par une loi sinusoïdale associée à une initialisation aléatoire et une loi de mouvement brownien.

l'œuvre dans le dispositif est de nature procédurale : l'événement observable est un processus, ici utilisé par les auteurs pour élaborer une stratégie particulière.

L'algorithmique retournée

On peut remarquer que la quasi-totalité des animations de texte ne possède pas de niveau paratextuel permanent : tout l'écran est utilisé pour l'événement observable considéré comme " le texte " par le lecteur. Les éléments paratextuels, comme le titre et le nom de l'auteur, sont même parfois intégrés au processus global et ne se différentient pas du texte. Cette distinction n'est donc pas nécessaire.

Christophe Petchanatz, avec *Cut-Up*[60], va plus loin en inversant purement et simplement le fonctionnement de la page-écran et en proposant ainsi un algorithme " de Pavlov " " bavant " ses cut-up en continu. L'écriture incessante à l'écran entraîne un mouvement permanent rapide du texte empêchant toute lecture. L'état stationnaire observable est le contraire d'une page-écran. Alors que le texte généré par un générateur automatique est gain d'information, se laissant décortiquer et analyser, pour mieux en faire regretter la disparition, la mouvance de Petchanatz ne se laisse pas approcher, elle est perte constante. Le paratexte des œuvres algorithmiques propose de " générer ", celui de Petchanatz suggère au contraire d'arrêter la génération pour permettre la lecture. Cette situation est proche de la confrontation entre les deux modes de lecture dont il vient d'être question. Enfin, alors que le programme du générateur automatique gère, en termes ergodiques, l'ordre de génération, preuve que cette fonction est intégrée au projet de l'auteur et n'en est nullement " péritextuelle ", l'interruption du cut-up automatique de Petchanatz est gérée par le système d'exploitation : le traitement ergodique est étranger à la production de l'auteur.

L'autonomie du processus

Cette symbiose entre le programme de l'auteur et des règles ou contraintes techniques à l'œuvre dans la génération effective du processus observé mais qui sont étrangères au programme, est rarement soulignée. Elle est utilisée astucieusement par Petchanatz qui s'associe Bill Gates comme co-auteur. Et gratos par surcroît ! Mais l'existence d'un co-auteur " distribué " sur l'ensemble du dispositif technique est un fait général qui interdit à l'algorithmique de l'auteur d'être seule responsable du processus observé par le lecteur. Celui-ci échappe à l'auteur presque autant que l'algorithme échappe au lecteur : on peut ainsi parler d'une relative autonomie du processus de l'œuvre (le processus observé par le lecteur) relativement au programme auteur censé le gérer. Plus exactement, le processus observé par le lecteur ne reproduit pas, et les différences peuvent être extrêmes, le processus que l'auteur a observé et qu'il a cherché à figer par son programme. Je ne dis pas qu'il a observé sur sa machine toutes les potentialités permises par son programme, mais qu'il a tenté de figer des règles de construction d'états observables par son programme et que les règles réellement en œuvre lors de l'exécution peuvent en différer ou conduire à des états présentant des propriétés non simulées. Le processus de l'œuvre n'est pas totalement simulable sur la machine de l'auteur. Cette caractéristique ne peut apparaître que dans un dispositif à lecture privée. Elle est évidente aujourd'hui avec Internet où l'utilisation de navigateurs différents peut conduire à observer des résultats très différents dans l'exploration d'un site. Elle s'est traduite dans *alire* par un comportement diachronique surprenant, les processus des œuvres générés par les programmes conduisant à des états observables s'éloignant de plus en plus, par leurs caractéristiques esthétiques, des états réalisés sur les machines des auteurs. Il a ainsi fallu reprogrammer en 1994 la totalité des œuvres publiées, en utilisant un générateur adaptatif qui favorise la lisibilité de l'état observé (le texte-à-voir) sur la fidélité au projet

[60] 1992, *alire* 6.

programmé par l'auteur. C'est sous cette forme que l'ensemble des œuvres DOS antérieures à 1995 est encore lisible aujourd'hui. Le lecteur est ainsi assuré (avec une bonne probabilité) de pouvoir lire les œuvres, mais il est également assuré, avec la même probabilité, qu'il ne lira pas celle qui a été lue par l'auteur, même lorsque aucun algorithme combinatoire, aléatoire ou générateur n'est utilisé[61]. Avec l'autonomie du processus, c'est la pérennité de l'écrit qui disparaît, sans notion de potentialité ni d'algorithmique.

UNE ESTHETIQUE DE LA FRUSTRATION

L'interface questionnée

La notion d'" esthétique de la frustration " s'est imposée très tôt dans *alire*. Elle est associée au concept de " piège à lecteur ". Ce terme désigne tout processus observable qui opère en tant que leurre à la lecture. Il ne s'agit pas toujours d'un leurre volontaire, l'esthétique de la frustration n'est pas une esthétique sadique, mais simplement de la mise en œuvre par le lecteur, à travers sa lecture du processus, d'un archétype qui induit des hypothèses de lecture non compatibles avec le fonctionnement réel de la génération. Le piège à lecteur fonctionne ainsi sur une confrontation entre deux archétypes : un archétype traditionnel, culturel, et celui, procédural, encore émergeant et correspondant au dispositif réel. La double modalité de lecture évoquée fonctionne déjà comme un piège à lecteur, puisqu'elle met en œuvre des modalités de lecture issues d'un écrit statique ou de l'oralité, alors que le processus lu n'est ni l'un, ni l'autre. La stratégie auctorielle d'une œuvre combinatoire ou d'un générateur automatique de textes repose également sur un piège à lecteur, dont on a vu comment Petchanatz le démonte. Ce piège consiste à mettre en œuvre l'archétype du texte statique par une interface visuelle connotée " page-écran ", alors que le texte affiché n'est que l'état transitoire observable d'un processus ; il est constamment, en quelque sorte, en devenir, et jamais potentiel : le mouvement de création /métamorphose /extinction de l'état lu fait partie intégrante de son ontologie.

À l'instar de cet exemple, la plupart des pièges à lecteur reposent sur un questionnement de l'interface visuelle. Ce questionnement vise à mettre en évidence que cette interface fait partie intégrante du projet de l'auteur, qu'elle est le produit d'une intentionnalité et, comme telle, gérée de l'intérieur de son programme. Elle ne saurait, dans l'archétype réel du dispositif, être séparée d'un " texte ". On peut définir l'interface visuelle par tout ce qui, dans l'état observable du processus de l'œuvre, met en place la stratégie auctorielle de lecture. Elle est ce qui, dans l'état observable, invite le lecteur à opter pour un archétype particulier. Elle correspond à l'ensemble des informations paratextuelles relatives au concept de " texte " dans cet archétype particulier. Le piège à lecteur consiste à établir une confrontation entre le fonctionnement du " texte " ainsi supposé par le lecteur et le fonctionnement réel de la génération[62].

Le concept général ainsi exploré a été énoncé par Dutey sous la forme " *Interface is message* ", qui est le titre d'une animation non interactive[63] simulant le fonctionnement d'une interface visuelle. Par ce côté " démo ", qui est lui-même un archétype de processus, l'auteur donne à voir l'interface comme constituant l'œuvre. L'interface-démo

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[61] Dans un dispositif vidéo, on admettrait alors que ce qui a été lu par l'auteur constitue ce qui a été écrit. Par analogie, si on considère, ainsi que le font nombre d'auteurs actuels, que dans une animation simple non interactive l'auteur écrit ce qu'il voit, alors on peut énoncer cette caractéristique sous forme paradoxale en insinuant que le lecteur ne lit pas ce qui a été écrit.

[62] Il s'agit ici du processus technique d'exécution du programme, non de la génération automatique de textes. Les remarques de ce paragraphe portent sur l'ensemble des genres de surface et sur tous types d'algorithmes.

[63] 1993, publiée dans A:\ LITTERATURE ↵ puis dans Le Salon de Lecture Électronique.

est d'ailleurs une composante du fonctionnement syntaxique et sémantique général de cette œuvre. Il s'agit ici d'un énoncé métaphorique de ce type de piège-à-lecteur.

L'inversion entre paratexte et contenu est réalisée, cette fois de façon non métaphorique, dans *Les Mots et les Images*[64] du même auteur. l'œuvre de Magritte *Les mots et les images* y sert de prétexte au fonctionnement d'une interface de navigation qui présente quelques caractéristiques " inattendues ". Elle est tout d'abord extrêmement lourde car elle nécessite de naviguer sur plusieurs couches d'interface avant d'atteindre les écrits de Magritte. Elle met donc le lecteur à distance de l'œuvre de Magritte plus qu'elle ne l'interface. Cette distance est appuyée par l'utilisation de la position de lecture locale du lecteur : il lui est impossible d'avoir une vue d'ensemble de cette œuvre de Magritte, pourtant petite, alors qu'elle est éditée sur papier et que n'importe quelle édition la donne très aisément. Elle présente en outre la particularité de ne donner accès au mode d'emploi qu'à travers l'utilisation de l'interface elle-même, selon des modalités non standards puisque l'interface ne l'est pas. Le lecteur n'apprend donc à utiliser cette interface que lorsqu'il a déjà compris le mécanisme de navigation entre couches. Il ne lui manque alors qu'une seule information : comment sortir de l'œuvre sans réinitialiser l'ordinateur[65], ce que n'indique pas le mode d'emploi. Enfin, ayant compris la syntaxe de l'interface, il se trouve confronté, à un endroit particulier dans sa navigation, à un " bug " : l'interface ne réagit pas. Cette absence de réaction n'est pas conforme à la généralité implicite de la syntaxe, généralité attendue dans toute interface, qui stipule qu'en suivant les modalités ergodiques prévues (la syntaxe), il se passe un événement observable correspondant à une navigation dans l'espace d'information de l'œuvre. Une telle loi implicite fait partie de l'archétype " interface ". En réalité ce non-fonctionnement apparent obéit totalement à la sémantique de l'interface qui consiste à rendre observable l'information adressée par la zone activée. Or cette zone est, dans le cas du " bug ", l'adresse d'une information vide, comme le révèle la cohérence graphique et non celle du fonctionnement. Il s'agit donc d'un faux bug si on comprend que cette interface est avant tout un processus graphique commandé (et non une navigation) dont la logique est structurée graphiquement et non en tant que mécanisme de navigation.

Éric Sérandour, dans *Tue-moi*[66], a également introduit un piège du même ordre, qui repose sur le décalage entre un fonctionnement attendu par nos habitudes culturelles et le fonctionnement réel. Il s'agit d'une petite œuvre html dont le visuel se réduit à une seule image. Le lecteur, au bout d'un certain temps, ne peut, réflexe de Pavlov bien compris, s'empêcher de cliquer sur cette image, puisque qu'implicitement, lorsqu'il ne se passe rien c'est qu'il faut agir[67]. Par ailleurs, une œuvre html repose, en principe, sur la notion de lien. Dès qu'il clique, le lecteur est invité à envoyer un courrier électronique. Ici, la notion de lecture privée intervient explicitement : l'expérience montre que la plupart des lecteurs se refusent à envoyer le message, par peur des conséquences possibles, alors qu'il n'y aurait aucun enjeu en lecture publique. Mais, la curiosité aidant, l'envoient quand même au bout d'un certain temps. Ils s'aperçoivent alors que ce courrier est envoyé à une adresse qui n'existe pas. Ce qui leur a été donné à lire est uniquement leur comportement. Celui-ci a mis en œuvre une conception culturelle du dispositif (la notion de réseau implicitement associée au html), alors que l'œuvre fonctionne en réalité comme une œuvre plus traditionnelle, fermée sur elle-même.

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[64] 1991, alire 5

[65] Cette œuvre a été conçue sous Dos, les raccourcis clavier standards étaient alors inopérants.

[66] Alire11 (cédérom connecté au Web). Cette œuvre se trouve également sur le site d'Eric Sérandour.

[67] beaucoup d'interfaces fonctionnent en utilisant un état statique, ou un processus cyclique, comme marqueur de l'attente par le programme d'une action du lecteur.

La double lecture

Les exemples précédents montrent que le piège à lecteur n'est déjoué par le lecteur que s'il prend du recul par rapport à sa propre lecture, s'il se rend compte qu'il est invité à lire, non seulement le contenu observable, ce qui est traditionnellement son rôle, mais également son action de lecteur : il est invité à " se lire lisant ", à se considérer comme partie du dispositif, comme instrument de sa propre lecture, et non comme destinataire externe à lui. Ces textes mettent en évidence que toute lecture est engagée : elle est " endoctrinée " par nos habitudes de lecture (les archétypes culturels), mais possède a contrario, par la réflexivité, la liberté d' un acte engagé. On connaissait la littérature de l'auteur engagé, on approche ici une littérature du lecteur engagé.

Ce fonctionnement est calqué sur le double rôle du spectateur dans une installation d'art électronique. Celui-ci est aux commandes de l'interface et destinataire de ce qu'il contribue ainsi à générer. Mais, dans l'installation, il apparaît souvent aux autres spectateurs, placés en position classique de simple observateur, comme un instrument du dispositif et partie du visuel de l'œuvre. Il est ainsi, tour à tour, interne et externe au dispositif, interne et externe à la représentation. En lecture privée, ce double mouvement est replié dans l'instantané et n'est mis en évidence que par la relecture et la réflexivité.

Ce positionnement du lecteur au sein de l'œuvre est une recherche constante dans la poésie du XX° siècle. Pierre Garnier indiquait déjà, à propos du spatialisme, que le lecteur devait se considérer comme contenu de l'œuvre. Elle prend en littérature informatique une allure moins directe, puisqu'elle joue sur les caractéristiques paratextuelles et non sur le contenu, mais plus fonctionnelle.

Cette " mise à l'œuvre " du lecteur est apparue sous une forme métaphorique dès 1989 dans *alire*, par l'œuvre *Voies de faits*[68] de Jean-Marie Dutey dans laquelle le lecteur déplace au clavier un personnage qui découvre les phrases sous ses pas au fur et à mesure de ses déplacements. Elle va beaucoup plus loin avec *Stances à Hélène*[69], où les réactions de lecture font partie de l'œuvre, bien qu'elles ne peuvent être destinées qu'à un lecteur virtuel. Autrement dit, cette œuvre n'a, au final, pas de destinataire, cette absence reposant sur la double lecture. En pratique, elle fonctionne sur la distance entre l'auteur et le lecteur, et sur l'impossibilité de ce dernier de remonter au projet de l'auteur. Le visuel observable par le lecteur ne dévoile pas le jeu de masques et la persistance du traitement d'objets graphiques qui ne sont observables que par bribes. La syntaxe de l'état visuel ainsi généré ne permet pas d'interpréter ces objets dans leur particularité, et masque un traitement sémantique réalisé à travers leur manipulation par le logiciel. Les catégories sémantiques manipulées par l'auteur (sécheresse, décrépitude, rejet, obsession …) ne sont pas celles mises en place par leur manipulation dans le visuel observable (femme, amour …). Le lecteur ne peut alors se rendre compte, à la seule lecture du visuel, que son action participe pleinement à une mise en scène de la mort. Le sentiment de malaise et de rejet qui en résulte fait ainsi partie de l'œuvre.

[68] Alire 2
[69] Bootz, 1997, publiée dans DWB et non, pour l'heure, dans *alire*.

GESTION DE L'INTERACTIVITE

Navigation et commande

L'interactivité s'exprime différemment pour le lecteur et pour l'auteur. Notamment, elle peut être considérée par ce dernier comme modalité de navigation dans un espace d'information, et traitée par l'auteur comme activation d'un processus observable. C'est ainsi que fonctionnent les hypertextes *diagrams*[70] de Jim Rosenberg. Ils mettent en évidence la structuration de l'information, en proposant un mappage de l'hypertexte selon un procédé similaire à l'interface de Dutey. Ce mappage ne symbolise pas les nœuds d'information mais les superpose. Le lecteur a ainsi, présent à l'écran, tout le matériau lisible dans la zone mappée. Du fait de leur superposition, ces textes sont visibles mais non lisibles. Par ailleurs les liens ne portent pas sur la succession des nœuds mais sur leur agencement syntaxique : les nœuds sont des paradigmes et les liens des syntagmes. Lorsque le lecteur approche le curseur de la souris d'un agglomérat, un texte devient lisible en masquant les autres. Mais tous les textes superposés ne peuvent être lisibles en même temps. Par ailleurs, les autres nœuds restent visibles sous forme d'agglomérat, de sorte qu'aucune proposition syntagmatique n'est réalisée par le processus. Ainsi, par le jeu d'un processus visible/lisible, l'hypertexte n'est jamais développé dans une succession linéaire contrairement à la navigation classique et sa lecture nécessite un effort de mémoire. La navigation, pour dire les choses autrement, n'a jamais lieu : elle demeure de l'ordre de la lecture, non du processus géré par l'auteur ; les *diagrams* forment un piège à lecteur.

L'INTERACTIVITE DE REPRESENTATION

L'interactivité permet de construire une représentation symbolique du lecteur. Celle-ci prend une forme concrète différente pour l'auteur et le lecteur. Elle est réflexive et se manifeste notamment à travers le curseur de la souris pour le lecteur, elle correspond pour l'auteur à une implémentation d'un Lecteur Modèle, c'est-à-dire d'une stratégie générale de gestion des actions et des modalités attendues de lecture du lecteur. L'interactivité défaille lorsque l'action du lecteur ne suit pas la logique du Lecteur Modèle. Parfois, sans aller jusqu'à l'échec de lecture, le fonctionnement sémantique à la lecture peut présenter un écart avec celui simulé par l'auteur et qui a contribué à implémenter ce Lecteur Modèle. Un tel écart peut s'observer lorsque les modalités de l'interactivité s'éloignent des standards. Il a notamment été observé lors de lectures des *Stances à Hélène*. L'observation d'un lecteur agissant donne ainsi des informations sur les modalités de construction du sens qu'il utilise.

L'interactivité de représentation a été introduite avec *Icône*[71] qui opère, pour la première fois dans *alire*, un basculement au sein du texte entre une lecture purement cognitive et une lecture ergodique. Or ces deux modes de lecture sont antithétiques, l'une plaçant le lecteur dans une situation de récepteur, l'autre le plaçant dans une situation d'émetteur. Cette double modalité conduit à des effets analogues à la dualité des modalités de lecture des animations, dès lors que l'animation perdure durant l'interactivité. Cette dernière est forcée alors d'opérer sur une information incomplète, dans des fenêtres temporelles, en contrecarrant la lecture cognitive de l'animation. Cette antinomie entre une lecture cognitive et une lecture ergodique liée à l'animation s'observe dans *passage*[72] qui, en plus, réalise une interactivité en temps différé, reportant de plusieurs minutes une partie du traitement des informations entrées par le lecteur. Au total l'interactivité de

[70] Alire 10 et alire 11
[71] Ph. Bootz, 1990, alire 4.
[72] Ph. Bootz, 1996, alire10/~~DOC(K)S~~.

représentation opère un dialogue entre le lecteur et l'auteur, par l'intermédiaire du Lecteur Modèle qu'il a implémenté. Ce dialogue peut passer, pour le lecteur, par la prise de conscience d'une perte d'information. C'est le cas dans *passage*. L'interactivité de représentation agit alors comme piège à lecteur, dans la logique de l'esthétique de la frustration.

L'interactivité, finalement, ne vise pas tant à permettre au lecteur une navigation dans un espace d'information, ou à lui fournir une commande de processus esthétiques, elle est la condition instrumentale de la lecture. Dans cette optique, elle établit un pendant à la dualité lecture spatiale / lecture temporelle, en instaurant une dualité lecture cognitive / lecture ergodique. La double lecture en est alors évidente : lire le contenu (aspect cognitif) et " se lire en train de lire ", attitude qui correspond à l'aspect sémantique de la lecture ergodique.

CONCLUSION

Alire apparaît ainsi plus qu'un recueil d'œuvres, un lieu d'expression ou un vecteur de diffusion. Elle constitue un espace littéraire, quasiment un " salon ", dans lequel s'est élaborée et continue à s'élaborer une réflexion sur la place du lecteur et celle de l'auteur. Cette réflexion passe par le leurre et la manipulation pour les dénoncer, par l'invention de nouvelles formes littéraires comme l'animation syntaxique ou le poème à-lecture-unique, par la prise à partie d'une lecture qui se voudrait simple traitement d'information. *Alire* jette un regard critique sur les idéologies en œuvre dans le fonctionnement des nouveaux espaces de communication.

THE USER KNOWS BEST: REFINING A VR INTERACTIVE FICTION PROJECT

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Introduction

Creating interactive work is an iterative process. The artist/programmer needs to solicit user feedback and observe users in the system in order to check whether the goals of the project are being realized and to refine the interaction. This paper is a case study of this process as it unfolded during the development of a virtual reality, interactive fiction piece, *The Thing Growing*, built at the Electronic Visualization Laboratory (EVL), University of Illinois at Chicago, between 1997-2000. The goal of *The Thing Growing* is to create an interactive story in which the user is the main protagonist and engages at an emotional level with a virtual character, the *Thing*.

The Thing Growing was originally designed for the CAVE(R) or ImmersaDesk(TM), projection-based, virtual reality systems. [1] These systems include a wand equipped with a joystick for navigation and three buttons for interaction, and tracking sensors that are attached to the user's body to feed information about her position and orientation to the computer. Typically in the CAVE the user's head and one hand is tracked. We added a tracker for the other hand. In projected VR systems, like the CAVE, the user sees her own body in the 3D environment.

Earlier Versions of The Thing Growing

The Thing Growing originated as a short story I wrote aimed at exploring a protagonist's emotions in a relationship with a clinging, demanding but loved other, an entity called the *Thing*. The protagonist is physically invaded by the *Thing*, yet grows emotionally attached to it. The story ends with the protagonist having the option of becoming detached from the *Thing* - a process which would kill it - or living with it forever. On my first attempt at putting this story into VR, I made the *Thing* very amorphous, a collection of spheres that swirled around the user. I had imagined that I could convey the story just with the physical movement of this *Thing* and some sounds. It quickly became apparent that nothing of the story I wanted to tell was conveyed to the users unless I stood behind explaining what was happening. Some users never understood that the spheres were meant to be a discrete thinking and emotional entity. Feedback from this first experiment suggested that the experience had to be much more obvious if I wanted to convey my story, and that the *Thing* had to be more humanoid

The Thing Growing: initial plans

In Fall 1997, as I started work on the current version, I was therefore determined to create an experience that would be self-explanatory; an application smart enough to convey the story *and* explain to the user how they should interact with it. For this version I collaborated with Dave Pape, using XP (2) an authoring system for VR that he was developing at EVL. Among other things, the basic XP system took care of loading and transforming models; collision detection; navigation; triggering events; integrating sound and switching individual objects or whole scenes on and off. With Dave's help I extended the system to create the intelligence for the Thing, and the story environment as a whole.

I story-boarded a simple linear three act story to serve as the backbone of the experience. All the interactivity and any alternatives that were generated by the user's input were

organized around this core. In Act One the user finds a box in a shed. She opens the box. The box and shed explode outwards as rocks pour out of it. Then the *Thing* emerges from the bottom of the box, ecstatic to be free. It looks at the user and falls in love with her. In Act Two the *Thing* insists on teaching the use a dance that will express (in its eyes) the relationship between them. It becomes disenchanted with the user's attempts to dance and goes of in a huff. The rocks stalk and trap the user. The *Thing* frees her. The dancing begins anew. In Act Three, the *Thing's* four cousins interrupt the courtship, disgusted with the relationship they perceive between *Thing* and user. They imprison the two and threaten to kill them. The *Thing* passes a hidden gun to the user and implores her to shoot the cousins. When all the cousins are dead or have escaped, the *Thing* suddenly fears the user will shoot it. The user has the choice.

In this version the *Thing* has a body composed of multi-colored, semi-transparent, pyramids, one for the head, one for each arm, and several for the body and tail. Motion tracking is used to animate these pyramids and a strong illusion of a humanoid being with life-like gestures results. The *Thing* also has a voice. The voice became one of the most important tools in creating the experience. The *Thing's* speeches are used to tell the story and to interact with the user; the tone of the voice communicates the *Thing's* changes of mood; and we use these emotional changes to stimulate the user's emotions.

First Steps and First Problem

We started by building Act One, and the dance sequence for Act Two. The main problem was to create the *Thing* as a seemingly intelligent, autonomous creature, able to react quickly to the user. Based on the story board, we recorded hundreds of phrases for its voice. At times these phrases are in a scripted sequence - for example when it is freed from the box it is trapped in. But mostly it speaks in response to the user - for example when it is teaching the user to dance. For the dance section we recorded different versions of words of praise, encouragement, criticism, and explanation. We also recorded the different types of utterance in different moods; happy, manic, whiny and angry. Each phrase lasts a few seconds and is linked to a motion-captured gesture. The phrase and gesture together make up an *action*. We built up a library of such actions, and then needed to build a brain for the *Thing*, which would determine when to use each action. The job of the brain was to select an appropriate action, according to the point in the narrative; the user's actions; and the *Thing*'s mood. We had to build a structure of rules for the brain to follow in determining its selection.

The narrative became a very useful tool for constraining the kind of action the brain can pick, thus simplifying the rule structure we had to build. For example when the *Thing* is attempting to teach the user to dance, it has a basic routine to follow:

- demonstrate a dance step
- observe user dancing or dance with user
- check whether user is dancing correctly
- praise or criticize user
- repeat dance step or teach new step

At the end of each action, the Brain looks at this routine to see what type of action comes next.

It was fairly simple to implement this basic routine, but one of the steps was more difficult to program - *check whether user is dancing correctly*. Since information comes in from the trackers about the user's position and orientation, it is possible to check whether the movements of the user's arms, body and head correspond to the movements of the *Thing's* arms, body and head. I imagined that to check the accuracy of the user's

movement I would have to divide the CAVE space into a 3D grid and continually check which box in the grid the user's arms and head were in. I would have to build up a series of check points for each of the dance actions that would correspond to the user moving their arms in and out of the boxes of the grid. This solution seemed complicated and a lot of work as I would need an individualized checking routine for every dance step.

Networked Thing

We were scheduled to show the first part of the project at SIGGRAPH 98. However, as the show approached, I was still unsure how to build an effective checking system. EVL was bringing a networked VR system to SIGGRAPH consisting of two ImmersaDesks. We decided to circumvent the checking problem by building a networked version of the project. Someone at the second ImmersaDesk would be an invisible voyeur on the scene between the Thing and an avatar of the participant, watching to see how well the participant was dancing. This networked user had a menu on his screen and used it to tell the *Thing* if the participant was dancing well or not, and also to control its moods. In this scenario, although the *Thing* had its inbuilt routines of behavior it was also getting help from a much more flexible intelligence system - with a wealth of fine-tuned interactive experience!

We ran with this "Wizard of Oz" brain for about nine months. During this period of time we observed both the users and ourselves and noted that both fell into very standard patterns of behavior. As the Wizard of Oz we fell into typical ways of altering the *Thing's* moods. The dancing interaction lasts for 2-3 minutes. The finale is the Thing running off in a huff. Essentially the mood always changes from good to bad over time. If the user is uncooperative - refuses to dance, runs away a lot - the moods becomes whiny or angry quicker. If the users are very good at dancing, they get more over-the-top praise from the thing in manic mood but eventually the *Thing* turns on them too. Users also had standard ways of reacting to the *Thing*. They either tried to obey it - or refused to dance and tried to get way from it. Those that tried to dance, varied widely between people who would copy exactly and those too shy to move very freely. As the Wizard of Oz we tended to treat these alike to encourage the timid.

We decided that we could take advantage of what we had observed and make the portion of the *Thing's* intelligence dedicated to checking much simpler than originally planned. The checker we implemented assumes any arm movement that travels more than an arbitrary minimum distance at times when the user is meant to dance is an attempt to dance and therefore counts as "dancing correctly". Over time the *Thing* is programmed to become randomly pickier, criticizing and rejecting movements that earlier it would have OK'd. The *Thing's* mood changes are also based on time and the level of user co-operation. In the end it will always get mad. But it will get whiny or angry much more quickly with users who won't dance with it. Users that move with more sweeping gestures - whose arms travel a greater distance over time - are considered more co-operative and its more likely to praise them lavishly.

For us the process of using a Wizard of Oz brain as a test bed before programming the more complicated parts of the intelligence system happened by chance, however I think that it points to an important lesson: fake the intelligence before you build it, so that you pinpoint where it is needed and what is needed.

First Draft Problems

By the summer of 1999 we had a first version of the complete story working. However, feedback from colleagues indicated several major problems that needed to be addressed for the project to successfully communicate its story. Watching users interact with the

project also revealed what was not working, and helped us to identify key areas where we needed to get information across with more punch and clarity - whether it was information about the story, or information about the interaction. Some of these problems had existed from the very beginning, now was the time to address them.

Dancing Scene Problems

First, some users had difficulty discerning the *Thing's* body. It is a collection of detached pyramids "tied" together by the motion captured movement. We expected people to move their arms in the same way that the *Thing* moved it's arms. Some users, however, simply wriggled about like hypnotized snakes. After observing a number of these users, we realized that they were trying to copy the *Thing's* tail movements. Adding a verbal injunction to "move your arms and body like mine - don't worry about the tail," did not fully fix the problem. Dan Sandin suggested outlining the *Thing's* body and de-emphasizing the tail. We also added eyes to the head to make it more obviously a head. This new look helped people to correctly identify the *Things's* body parts and move their own bodies' accordingly.

A second and related problem was to clearly indicate to people that they had to move their *bodies* during the dancing sequence, and that the *Thing* "knew" what they were doing. Some users, especially expert users, thought that they should use the joystick and buttons to dance - this resulted in the *Thing* rushing after them and chiding them for moving away. They would then try to use the joystick to drive close to the *Thing*, which it would continue to interpret as "driving away" behavior. Confusion would ensue with the user muttering, 'I'm just trying to get close." Other users would only dance with one arm - although in the final version both arms are being tracked.

To solve these problems we inserted some new behavior at the very beginning of the dance sequence. The *Thing* announces that it will show the user how to dance, then says that they must "loosen up a little first." It instructs the user to wave her arms above her head. The program performs checks to see :

1. If the joystick or buttons are pressed - if so the user is instructed not to touch the buttons but to move only the body

2. If the user is moving both arms - if not the user is instructed to move both arms

3. If the user is trying hard enough, i.e.. are they waving there arms high enough - if so the *Thing* proceeds to teach the first dance step

This new sequence establishes at the outset the rules for the dancing and that the *Thing* knows what the user is doing.

Content Problems

Other problems were more to do with content than technical issues. In the first draft the *Thing* was simply too unpleasant and people nearly always shot it as soon as they were given the chance. Ideally we wanted the user to be more ambivalent. There was also a timing problem. In the second act the *Thing* danced with the user, then stormed off in a huff. The rocks on the plain then chased and trapped the user. The user had barely been released from that trap when the third act was triggered and the user was again trapped while the four cousins berated the *Thing*. This period of inactivity (in-interactivity) was too long and many users' attention wandered. The transition between the second and third acts was also too abrupt - people were confused about what had happened and did not understand who the cousins were. Some users believed that they had come to save them

from the *Thing*, rather than feeling that they were now on the same side as the *Thing* and in deep trouble.

The solutions for these problems were interdependent, but I will describe them as they happen chronologically in the story. First we added a new behavior in which the *Thing* now copies the user's movements and inserted this after the user is released from the rock. The *Thing* says, "Let's do something different - you dance and I'll copy." The user discovers that as she moves her arms and head the *Thing* moves with her (Basically we took the tracking data from the user and applied it to the *Thing's* body with a slight delay.) It is strangely flattering - because the *Thing* becomes a mirror of one's own idiosyncratic movement. The *Thing* becomes very seductive while this is going on and the user feels that she is finally in control. So this small new scene, lasting about 40 seconds serves two purposes. It makes the user "like" the *Thing* more - we like the thing that does what we want - and it breaks up the two periods where the user is trapped and unable to interact.

Second we added a more elaborate transition scene between the second and third acts. The user is now happily dancing with the *Thing* copying her. Suddenly lightning crashes across the sky, the sky darkens and a god-like voice out of nowhere booms, "What's going on here?" Another higher voice cries, "We must stop this evil!" A lightning bolt flashes towards the user, cracks appear in the ground and the user and the *Thing* fall through a red trench into a world below. This is the territory of the four cousins.

Third we revised the *Thing's* speeches and the four cousins behavior throughout the third act to clarify the back story- the taboo relationship which user and *Thing* have been caught in. Now as the four cousins approach, the *Thing* whispers asides that reveal that the dancing behavior that they were indulging in is heresy if it takes place between a meat-object, the user, and a *Thing*. As before the four cousins berate the *Thing*, but now they are more vicious and pull off its arm. This is to encourage the user to feel more protective of the *Thing*.

During the sequence where the user shoots at the cousins, all the *Thing'*s phrases were revised. Many of them give more information about the back story. The *Thing's* mood and behavior also alter more radically depending on the user. If the user can't or won't shoot the cousins, the *Thing* begs her to protect it, and finally becomes furious and abusive. On the other hand if the user does shoot the cousins, and the faster she shoots, the *Thing* begins to have second thoughts and begs the user to spare her family members. All this is designed to increase the user's ambivalence.

Adding the Intro Scene

Finally, we added a scene at the beginning that served to introduce the user to the system and teach her how to use it. A human helper is needed to help the user to put on the tracked glasses and get hold of the wand, but then the helper steps away. The user finds herself standing in front of an archway with a billboard in it which has a picture of the wand on it. The wands three buttons and joystick are identified in the picture. The billboard's text reads, "Press the left button to begin." When the user pushes the left button, the billboard slides away to reveal the Title of the Piece and names of the collaborators. Those too slide away and arrows appear on the ground. The user is told to use the joystick and follow the arrows. The arrows snake through the arch and across the ground and finally point through another arch into blackness. As the user drives through this arch, she drives into Act One. The introduction is designed to give the user the expectation that the system will tell her how to operate it, and to ensure that her focus is on the Thing and her relationship with it.

These fixes comprised a second draft of the project. Feedback from users, and observing

users in the application, suggested that this draft communicated the story much more successfully and that the users were much more comfortable with the interface.

Conclusion

User testing consistently pointed out weaknesses in both the form and content of this interactive fiction. Some problems had to be addressed two or three times, with successive revisions of the code, before they were solved. Every time we showed the piece we tried to leave users alone with the experience and not jump in to help them if they became confused. This strategy meant that it became painfully apparent when the instructions for the interaction - which were embedded in the narrative of the story - were not working, and made us realize it was crucial to demark any changes in the interaction. In this piece the user navigates through the VR world with the joystick, but is also expected to move her body when dancing with the thing. Communicating this change in interactive mode clearly and concisely was probably the most persistent development problem.

Remarks that the users spontaneously made to the Thing during the experience showed if they were immersed in and following the story, however, it was also important to question them to see if the points I wanted to make were getting across. (Because the story was so obvious to me, I was often surprised by the different interpretations that people came up with.) When these interpretations obscured the story we wanted to tell we made changes designed to clarify the story-line and to elicit from the user the kind of emotions that we wanted.

It was particularly interesting to discover how important the transitional sections were for the experience. Users became disoriented by abrupt scene shifts and it was important to signal or foreshadow an impending change in some way. An example of this comes between the Introductory Act and Act One - the user sees the arrows pointing through an arch into a black void - they don't know what is over the threshold but the threshold itself signifies a change. Another example is the transition from Act Two to Act Three - a foreshadowing of the four cousins power and disapproval was added at the end of Act Two to ready the user for the events of Act Three. Every single transition point in the story - in terms of the narrative and the interaction - had to be worked and reworked before it successfully did its job.

The general lesson of this experience was "Don't be afraid to be obvious." As VR becomes more ubiquitous, people will become more comfortable with it, but at present most people do not know what to expect, and what is expected of them. In order for the experience to win out over the discomfort with the technology, the technology has to explain itself and reassure the user; and the interaction has to be easy to grasp. Then the story can draw the user into a space that is playful but powerful, and which depends for its meaning on the amount the user is prepared to give of herself.

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VISUAL INTERFACES FOR SHAREABLE MEDIA

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Shareable Media is an effort to provide a coherent structure that will facilitate distributed collaboration and communication among filmmakers, storytellers, artists and audiences. The extensible architecture of the Shareable Media Project has the capability to deploy multiple applications targeted towards a variety of uses and audiences. The visual interfaces that have been developed for current Shareable Media applications, illustrate our intention to provide easy-to-use tools and effective content visualizations, that operate coherently together to form new and engaging video-based story forms. These applications facilitate users' creation of multiple sequences from a video clip database, and explore the juxtaposition of heterogeneous elements, the integration of video and text, and the description of edit structure. **PlusShorts** uses punctuation as an iconic system for describing and augmenting edited video, where the punctuation symbols are used to detail the structure of a video sequence and inspire dialogue about the essence of that structure. **Individeo** features a browser that visualizes the sharing of video content through a dynamic, sociable interface. **Individeo** also allows editing of video integrated with text, allowing media-based dialogs and collaborative cinematic productions. In combination with multifarious content, these interfaces provide prototypes of new story forms where the edited structure and the shared context are made explicit. We are partnering with several physical storytelling communities from different countries, and we wish to explore emergent storytelling techniques, virtual collaboration, community-oriented self-organization and global communication.

INTRODUCTION

A comprehensive and sustainable shared media system necessitates the development of an extensible infrastructure, compelling interfaces and an active, engaged community of users. The development of novel interfaces for collaborative co-construction will be the focus of this paper.

The visual interfaces for Shareable Media seek to transform the experience of creating, sharing and thinking about video and ultimately move towards the prototyping of new story forms. These applications broaden the generally understood definition of shared video from one of simply posting an edited video on the web and emailing your friends about it, to a more wide-ranging comprehension encompassing notions of recreation and re-appropriation of original content in a search for new and diverse meanings. The **PlusShorts** application exemplifies a focus on movie structure, where a symbol system is utilized to directly explain and describe the structural features of a video sequence. With **Individeo**, the explicit visualization of the sharing process introduces a contextual level of understanding, where meaning is derived not only from the individual clips, but also from their positioning both within specific sequences and in relation to other neighboring sequences. Both of these applications, in their design and their functionality approach a new type of story form, where the navigational tools for finding content, the visual display used for reconstructing content and the final playback mechanism, operate seamlessly together to inform and evidence the meanings produced by each component.

The next section of the paper will detail previous and related work to the visual interfaces for the Shareable Media Project, followed by descriptions of two current applications, **PlusShorts** and **Individeo**. The paper will conclude by describing some of the issues that arise as a result of this project and future research directions.

BACKGROUND

In articulating the vibrant relations between text, texture and context, folklorist Kay Stone provides us with a useful framework in which to survey variations in fairy tale, such as Snow White: " The text is the basic story of Snow White; its texture is the specific language (visualization in the case of film) of a particular story; context is any relevant personal, social, historical, and other influences. There might be countless oral texts of Snow White, each with its own texture and context. The storytelling event, or actual verbal composition of a story, is extremely sensitive to immediate contexts that might motivate changes in texture. Thus Snow White in oral tradition is multitextural and multicontextual. There is no single "original" or 'authentic' oral text. The story would never be told in precisely the same words even by the same person. A unique context for each telling produces different textures, and thus a variety of oral." [Stone]

Text-based story is naturally transformable. It costs almost nothing to produce your own version of Snow White, either orally or in writing. Many fairy tales are initially created anonymously and have been re-told over hundreds of years. People have the freedom to consider and interpret them from a number of personal, critical, cultural and theoretical perspectives. More recently, this past century has witnessed exceptional activities on transformable work within the video and audio-based story realms.

Beginning in the late nineteenth century, Cubism and Dada artists imported readymade fragments into original art works. As early as 1914, Marcel Duchamp exhibited his bottle rack, bringing a complete unmodified object into an art space for the first time. During the same time period, Plunderphonics was emerging as a variation of transformable music within music communities. Musicians or DJs took original pieces of music, varied the speed, reversed the direction of spin and mixed it with other tracks. In 1920, Stephan Wolpe used eight gramophones to play music at different speeds simultaneously. In 1939, John Cage brought a gramophone record, Imaginary Landscape No. 1, into a public performance [Cutler]. The found footage films of the post-sixties non-fiction cinema show film editors playing with notions of deconstruction to both question received understandings of documentary footage and create powerful new and challenging interpretations of this content. These early examples demonstrated how recontextualization of existing art works could be served as powerful basis for new creations.

In the broadcast media age, amateur media fans collect, select, inflect, re-circulate, amplify, parody, or recombine primary images and songs for re-creations. In *Textual Poachers,* Professor Henry Jenkins suggests ten ways, such as Recontextualization, Expanding the Series Timeline and Refocalization, employed by media fans to rewrite a television show [Jenkins 1992].

For example, media fans recontextualize broadcast material by writing short 'missing' scenes that can provide extra explanations for a character's conduct. Another fan managed to compile a five-minute show from a 30-hour collection. The methodology of story recreation and reuse employed by these media fans' inspires us to design a new generation of media applications aimed at a much broader society of users, including families, friends, artists and musicians.

The nature of digital content provides an efficient means for people to gather and distribute digital content. From 1982 to 1987, Professor Glorianna Davenport in the MIT Media Lab developed a "Shareable Video" project, New Orleans in Transition, on a UNIX workstation supported by a bank of videodisc players [Davenport 1987]. The purpose of the project was to give Urban Planning students an insider view into the process of change. Students using this material could make use of an editing tool which allowed them to take excerpts from the available segments, re-sequence and compile movies. Some related work has been developed in the web-based editing field from varying perspectives. VideoFarm.com is a Java-based Premiere-like editing software, which is developed mainly for online editing purpose [VideoFarm]. Mimicry allows users to create links to and from temporal (video and audio) media on the web regardless of the users' ownership of the Web pages or media clips involved [Bouvin&Schade 1999]. Unlike VideoFarm, Mimicry is created mainly from the audience's point of view.

During 1998 and 1999, Pengkai Pan focused on designing a system for asynchronous sharing of streaming video on the Internet and built a prototype, I-Views [Pan, Davenport 2000]. It allowed widely distributed groups of people to view, edit, compare, evaluate and discuss video material over the Internet. By offering shared authorship, tools and virtual environments, I-Views demonstrated a new story form: “Shareable Documentary.” From this research, we have developed a more refined architecture that supports the development of multiple applications based on the Shareable Media framework. PlusShorts and Individeo are two such demonstration applications that will now be discussed in detail.

PLUSSHORTS

PlusShorts is a web application that explores the use of punctuation as an iconic system for describing and augmenting edited video. This system allows for a distributed group of users to contribute to and collaborate upon the creation of shared movie sequences, where punctuation symbols can be utilized to detail the structure of that sequence and inspire dialogue about the essence of that structure. **PlusShorts** is implemented as a java applet that can be launched from the Shareable Media website. Within the applet there are three main activity areas: a newsgroup-type interface for browsing through and selecting sequences to play, a storyboard grid for manipulating sequences and a playback area for previewing and submitting sequences.

The motivation for considering punctuation as a type of visual markup language arises from observations of the experimental usage of punctuation symbols in other art forms such as dance, painting and literature. Authors, playwrights and poets such as Samuel Beckett, Harold Pinter and e.e. cummings have experimented with using punctuation symbols in a highly expressive manner.

r-p-o-p-h-e-s-s-a-g-r

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,grasshopper;
[Cummings 1991]

Users can browse through and select sequences to play using a newsgroup-style interface. Here, the user loads a video sequence into the storyboard area by selecting a specific sequence post within the hierarchical tree of video threads, which can be sorted by date, author or thread category.

Figure 1: PlusShorts Interface

A viewer can navigate down through a particular video thread, where s/he can begin to determine how the content, tone, rhythm and structure of the thread changes and evolves from each user created sequence to the next. This exploration of video content allows the user to conceive of multiple storylines and viewpoints, different editing methodologies and an evolutionary approach to video construction.

Users can construct, deconstruct and rearrange video sequences/threads using the grid interface, which is inspired by traditional storyboard models. The videos in the database are represented by thumbnail images that can be placed within the layout grid, where they will be played back in sequence according to a left-to-right, top-down rule. The punctuation symbols can also be placed on the grid between and on top of the clips where they are utilized in two different manners. Firstly, by placing them between and around the thumbnail images, they can be used to describe and define the story structure of the edited movie (e.g. any clips positioned between parentheses could refer to a character development segment or a colon could be used after a title to denote an introductory clip). Secondly, by placing the punctuation symbols on top of a thumbnail image, they can be used to directly affect the playback of the final sequence (e.g. a plus sign dropped on top of a clip will cause it to be played back at double speed or a period symbol can be used to insert a black frame).

A user can open a sequence created by another participant and move or delete any of its components, to create new meanings and understandings from the same clips. Alternately, a user can choose to search through the video database using keyword and/or visual searching to obtain new clips to add to the sequence. This reworked arrangement can then be posted to the database as a response to the originating video thread.

The **PlusShorts** application is an attempt to provide a space for engaging collaboration and experimental explorations of the entire filmmaking process. The conception of a video sequence as a variant instance within a larger story thread allows creators and users to adopt a playful, explorative attitude towards moviemaking, where there is no definitive final cut, but rather a series of investigative story developments.

INDIVIDEO

Individeo is a web-based tool for creating and sharing digital video narratives. The interface is composed of a media browser and a sequence editor, which allow the user to browse a large shared set of video clips and to build new video sequences using selected clips. The aim is to provide simple and sociable interfaces for browsing and editing, and to promote online communication and collaboration using digital video in the form of a playful and constructive experience.

Figure 2 : Individeo Interface

The **Individeo** browser allows the user to navigate through the content space of a large number of video sequences. Each video sequence is represented by the thumbnail images of the video clips within the sequence, arranged along a diagonal line signifying the sequence. Using the mouse, the user can select and view a particular sequence. The user can also select and focus on a particular clip within a sequence, and the interface will dynamically display all other sequences that contain the focus clip. Shifting the focus from clip to clip leads to fluid, animated modification in the visualized structure, as it creates real-time concordance views of sequences based on the focus clip. This visualization of reuse makes explicit the sharing of media by multiple users. The browsing activity becomes a constantly revealing experience rooted in and guided by the discovery of relationships among sequences. The sociable interface presents each sequence not as a result of solitary activity, but rather as part of a web of interconnections built by multiple storytellers.

The **Individeo** editor presents a storyboard interface for creating sequences with video clips and intertitles. The user can drag and drop desired video clips from the browser into the editing area in the center of the interface. The user can also add text clips to the sequence, which will play back as silent-film-style intertitles. The video and text clips can then be arranged freely within the editing area by the user. The playback order for the sequence is determined by the visual layout of the clips with respect to standard reading rules; the editor parses the layout similar to the way we might interpret the order of frames in a comic book. Instead of the precision-oriented traditional timeline interfaces, the editing area interface encourages casual rearrangement of elements, fostering a more playful, trial-and-error attitude. The intertitles help integrate the text and the video seamlessly within a sequence. The mix of text and video enables mixed-media communication, and dialog and discussion can occur in both media types.

Using a system such as **Individeo**, filmmakers could collaborate online on film productions. The footage could be shot in different locations at different times, then added to the Shareable Media system. Geographically separated filmmakers could explore various editing options by making and comparing alternative rough cuts with **Individeo**. They could ask questions or provide comments to other members' using the text clips.

One such current production is shot simultaneously in two cities and constructed using **Individeo**. The resulting film plays with notions of time and space shared by two characters who are played by actors in two separate locations. A reactionary collaboration model is also explored, where a filmmaker in one city might respond to video clips and sequences supplied by the other director, building a feedback loop of content and sequence ideas.

ISSUES

Community

Shareable Media applications could facilitate collaboration within existing and potential creative communities. Artists can take part in the Shareable Media community by contributing original material, experimenting with sequence and story ideas, and offering feedback to other users' creations. We are currently working with active filmmaking communities in locations including Ireland, China, and New York City. We anticipate the emergence of new communities of users, amateur videographers who may achieve a level of technical and creative fluency in software-based video editing though engagement with Shareable Media interfaces. A mix of practicing artists and casual videographers, both submitting and editing video, could lead to a fertile and active environment for all parties involved.

COPYRIGHT

Shareable Media applications foreground the free reuse of all submitted content, they foreground questions about copyright protection. Beyond the issue of corporate-copyrighted material, we are seeking an appropriate model for individual contributions of original content. We feel that an open model is the right model: all contributors grant other users of
Shareable Media the right to reuse the content within the bounds of the creative activities allowed within the interfaces. A micropayment mechanism based on the number of times a clip is viewed or reused could benefit contributors. We would like to frame Shareable Media as a prototype media space with an alternative model for intellectual property, one that prizes open sharing.

CONCLUSION

The **PlusShorts** and **Individeo** applications encapsulate our desire to provide easy-to-use tools and effective content visualizations to a broad range of users. Both of these applications, in their design and their functionality, approximate a new type of story format, where the multiple components of selection, navigation, construction and viewing, function together as a coherent unit. Both **PlusShorts** and **Individeo** present broadcast media as moving beyond the perfect realization of a story idea and towards instead a notion of dialogue or co-construction between a community of users, viewers and creators.

The next phase of the Shareable Media project involves evaluation and refinement of current applications, the development of new applications and a strengthened focus on the community development aspect of the project. As the current applications become more widely used, we will be employing statistical analysis of user activity and content usage to refine the search process and improve our recommendation system. New applications being developed will utilize mobile, wireless devices such as the Palm Pilot in an attempt to enhance the messaging and discussion element of the project. Evaluation of existing physical community usage of the system along with examination of emerging virtual video-sharing communities will also continue to inform and shape the future direction of our work.

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SYNTHETICS
THE ELECTRONICALLY GENERATED IMAGE IN AUSTRALIA

BY STEPHEN JONES

I am going to explore the evolution of electronically generated images in video and animation leading to the now ubiquitous use of computer generated imagery in feature film production. I am intending to cover the period from the early developments of computer graphics in the 60's through to the ascendency of the Quantel video graphics systems and SGI based systems in the 90's. This is effectively the first two generations of development.

This is a tale of two pathways, the analog and the digital, winding their ways through the forest of technology, sometimes crossing each other, sometimes running together for a moment, often influencing each other and finally the one almost consumed by the other but for the interest of a new generation in the ways of the old.

The two pathways are those of analog representations and digital representations. Analog representations reflect the actual value or amount of a voltage or a brightness while digital representations reflect some number in the range of possible values that the voltage might have, say from 0 to 255. For example, in video the analog of the brightness of a scene is the voltage of the video signal at that point of the image whereas the digital representation of it will be a number where say 0 represents black and 255 represents white. Obviously the difference in style is reflected in the different technologies that carry these representations.

In analog computers a variable is carried on the rotation of a knob or a slider whereas in digital computers a variable is carried as a binary number in a register or store (a memory) and is operated upon by mathematical processes treated as logic. An analogue voltage can be stored on tape and sent down a wire as a voltage and is manipulated in an operational amplifier of some sort, whereas a digital value is a number which can be stored directly in computer memory for manipulation by computer logic. A variable is carried as a symbol. The representation of a low value is not in any way physically less than the representation of a high value. The same 8 bits in memory space can store the value 0 as comfortably as they can store the number 255.

The history of computing is not the history of any particular technology but the history of the use and manipulation of symbols as values, often representing numbers, to do mathematics and to control other machines. The first computer graphics, if you will, (more correctly program-controlled graphics) are seen in the weaving loom controllers built by Joseph Marie Jacquard in France at the end of the 18th century. He took some ideas developed by earlier French inventors and made them robust and reliable so that they could control machines in factories that made ribbons and patterned fabrics with the weaving loom. (Much to the disgust of the weaving guilds of the time and especially to those whose work vanished before them.) Earlier in the century, Jean Falcon had developed a system of punched cards chained together and Jacques Vaucanson built a rotating cylinder cam-mechanism which triggered levers to drive the actions of an automaton. Jacquard combined these two mechanisms and attached them to the top of a standard treadle-loom so that they pulled up specific warps on the loom. This form of control also allowed the loom to produce pictorial images in fabric.

Weaving is a process of running colored threads horizontally through a warp of vertical threads to make cloth. A shuttle pulls the weft threads over or under the warps depending on whether it is to be seen or not at that particular point of the pattern or the image - the weave. The system is still used today though the warps lift mechanism is now largely

directly computer controlled rather than using the old lever mechanism. Certain Axminster carpets and in Japan the Obi or sash for the Kimono are still made by Jacquard looms.

In the contemporary language of computing the warps equate to the columns of pixels and the wefts are the lines of pixels on the raster. Thus a woven image is the logical equivalent of a monitor screen. But this story does not appear again until the latter half of the 20th Century.

Video Image Synthesis

Video synthesis was the visual equivalent of electronic music and one of the first truly electronic of the electronic arts. A sort of abstract expressionism gone mobile and fluid, patterns and colors shifting dynamically, driven by music or whim or, if processing camera images, by the image itself.

The history of video art and theory has always engaged two activities: the deconstruction of the role of television in the setting of meanings and agendas in daily life (in those days this was known as "demystification"); and the redevelopment of the visual image in areas where we have never looked, or been able to look, before (i.e. the manipulated image). The new technologies of media access (the porta-pak and low cost editing systems) and of image production (with the aid of the integrated circuit) could be applied to the televisual image and thus the magic (the capacity to carry meaning and the kinds of meanings carried) behind the image could be subverted.

Video extracted itself from television and refused to make the material of television. It saw itself as the primary critical and subverting reflection on television, making programmes that covered ideas and events that tv wouldn't cover, covering events in ways that tv couldn't and generating new styles of image that the engineering attitudes of tv couldn't possibly accept because they were too far outside the parameters of the electronics of broadcasting.

In Wuppertal, Germany, in 1963 Nam June Paik exhibited 13 TV monitors in which the scanning of the image had been disturbed and heavily manipulated by the addition of magnets to the outside of the box. This caused the image to swirl and wave in ways that TV images were simply not supposed to. "The primary, luminous quality of the image was emphasized, but its televisual appearance of an absolutely veracious and therefore unique image was literally thwarted." [1]

Erich Siegel, in the US, is probably the first to produce an electronic image manipulation device with his "Video Color Synthesiser" first exhibited at the Howard Wise gallery in New York in 1969. Also Nam June Paik and his engineering partner Shuya Abe developed their first video synthesizer in 1969. "Artificial images evolve purely synthetically without a camera, and all existing images can be manipulated and changed in every aspect. The leap into the immaterial has been made: the artificial images become ever less assailable. The apparatus does not give any idea of the images. The computer separates from its message." [2] This was rapidly followed by Stephen Beck with his "Direct Video Synthesizer" and his "Video Weaver". I am not going to pursue this any further because you can find it all in the Ars Electronica catalog *Pioneers of Electronic Art* curated by Woody and Steina Vasulka [3].

If Baudrillard ever really had any need to fear the dematerialization of the image and the materialization of simulacra here is where it began. The synthesized image comes out of "thin air" so to speak, and bears no *necessary* relationship to the "real" world. There is nothing already known to hang it on, from which to extract meaning. And thus dilemma starts, how do we inject meaning into this stuff? How do we use it? To what does it point,

refer? What does it signify when there is nothing being pointed at, just the electronic image pointing... It is almost a "one hand clapping" problem, signifier without signified.

The equipment used to produce the images in no way predicted the image or sound that was going to come out of it. Unless you had a thorough understanding of the circuit and what such circuits could do you had no means of knowing what the box might be capable of. Unlike a paint brush or a cello which somehow entails its productions, electronics is just electronics, circuits and wiring, the use of which could be applied to video, sound, computation and so on all with the same basic components and organization. It is this very fact which allows the analog computer to mutate into the electronic sound synthesizer and then the video synthesizer.

At about the same time as the technology of the video portapak appeared in the late 60's the kind of electronics technologies that became available (i.e. the first commercial appearance of integrated circuits) also allowed for a major shift in production processes for new electronic music, e.g. the audio studio test and maintenance facility was put into a box (in the manner of the analog computing facility a decade earlier) and became the music or sound synthesizer. The people experimenting with the new video capability were often also working in electronic music, so it was natural that some of the designers of audio synthesizers also started building video synthesizers. The original sound synthesizers were a mixture of the audio equipment testing laboratory and analogue computer technology. The video synth was really the same piece of equipment but with the output stages set up to drive video monitors and oscilliscopes in various ways.

One of the prime frameworks behind a lot of video experimentation was actually the production of "visual music", a kind of pictorial equivalent to the experimental music of the day. Having its antecedents in the synaesthesia of A.E.Hoffmann and the colour organ of Scriabin. [One supposes that it may also have had somewhat to do with the period of psychedelic drug use in which much was made of the visual patterns internally accompanying the music/sounds being heard.] In its new technological form, this non-referential synaesthesia is the dance of the electron across the screen being driven by the music, often independently of any kind of known visual source or natural image. It was proposed that the artificial image might have as much legitimacy as the electronically generated sound and that the two worked well together, being derived from the same source waveform, even if handled through quite different pathways. It was as though the visual image could be played in much the way one played an analog sound synthesizer. The patching of connections and the twisting and turning of knobs gave the feel of real-time control and the electronics became an instrument as much as any acoustical musical instrument. And this kind of control gave much the same feel for both sound and video synthesis.

Computers and Graphics

Computer graphics and video synthesis have at various stages had convergent lives, while at other times they have been quite independent. This is much like the development and demise of the analog computer as the digital computer was developed and then gained ascendancy. At the end of the 50's John Whitney began using mechanical analog computing technology to "elaborate circular abstractions that he called Permutations" [5, p98]. Audio and video synthesizers were developed out of electronic versions of this analog computer technology. They then slowly hybridized with digital technology becoming pattern generating machines (e.g. Beck's *Video Weaver*, Monkhouse's *Spectre*, Hansen's *Friden Video Synthesizer* or Jones' *pattern generator*).

Computer technology allowed the storage of the data of an image so that it could be played out to the monitor repeatedly without change; or with programmed changes, the

trajectory for which was completely predictable. But the gain in informational predictability meant a concomitant loss in real-time control or playability. An equipment which had been real-time and interactive gave way to the need to pre-programme and predetermine. Suddenly interactivity had to be allowed for, being no longer inherent as it was in the systems of analog synthesizers.

Digital computers were initially constructed to speed up the repetitive solution of mathematical problems, particularly the compilation of firing tables for military artillery during the 2nd World War. In the 50's (long foreshadowed by Ada Augusta [6]) the computer began to be used as a tool for making music. The Cathode Ray Tube (CRT), originally developed for electronic waveform display and subsequently adapted for television, was first used as a storage medium (known as the Williams Tube, [11]) in several early computing systems. The CRT was used as a means of storing data and instructions so that computing machines could have high speed access to instruction sequences and data sets, which would allow the supply of data to keep up with the speed of the electron tubes which did the work. Up to this point the first couple of electronic computing machines had been severely restricted as the program had to be set up on the machine by patch connecting modules and setting up rotary switches.

Computer displays were an offshoot of these attempts to create storage devices for early computing machines. With a CRT attached to the computer it was seen that the data display actually had pictorial elements and [I surmise] some bright spark decided to actually make the computer draw pictures. (At night of course, during the off hours.) Thus was computer graphics born, but it could not be said that they were interactive. Everything had to be laboriously pre-programmed, treating the CRT display surface as an addressable block of picture elements.

A turning point occured in 1962 with Ivan Sutherland's Ph.D. thesis "Sketchpad: A Man-Machine Graphical Communications System" [7]. From this computer graphics was given a consistent basis and many large corporations began to use computer graphics to design products and to simulate their behavior in what amounts to data visualization. The light pen, which allowed one to interact with the graphical display, appeared about the same time. Computer graphics could also be plotted and printed as Ken Knowlton and others showed. This was done by translating grey scale values from a scanned image into graphical "characters" which could be output onto a micro-film plotter [5, p99; 19]. Knowlton made the first computer graphic films with Stan Vanderbeek in 1964. In the early 70's, Charles Csuri developed 3D graphical displays of mathematical abstractions which he could draw and move around the screen using a light pen. About 1970 Sutherland invented the head-mounted display and virtual reality simulation was begun. For a useful description of the processes involved in making a computer graphics system of this period see Doug Richardson's report "Computers in the Visual Arts" [8].

The work in the 60's was done on what is known as a vector display: in which many line segments can be drawn by directly shifting the electron beam in the CRT. Complex images could be drawn by dividing up a curve into a series of short straight lines, trading off curve accuracy with drawing time and computer power. In the early 70's the changeover to the raster display (the television type display process) enabled character graphics type displays (images based on character blocks). Later, as memory became cheaper, faster and larger, bit-mapped color graphics and much more complex images could be produced. The desktop kit computer of the later 70's, with a tv attached, brought about much greater accessibility to computers and made for a sudden explosion in the exploration of computer graphics.

The electronically generated image in Australia

The electronically generated image had its first appearance in Australia in the last years of the 60's, depending on what one might actually call the electronic image. I'm allowing a pretty wide basis here. One can trace the use of electronically generated imagery in experimental video to Mick Glasheen's 1970 production *Teleological Telecast from Spaceship Earth*, perhaps the first experimental video-production made in Australia. This work demonstrates an approach to the video post-production that sees the system as a "synthesizer" of images though here it's is more about the combination of imagery accompanied by the electronic pattern generator (the video wipe in a vision mixing desk) than it is about the direct electronic generation of the video image. At about the same time Doug Richardson, and no doubt others, were experimenting with the computer generation of images, in the development of scientific visualization, particularly at Sydney University.

Interest in these two streams, represented on the one hand by Mick's experimental video making and on the other by Doug's early computer graphics, met in the setting up of the Bush Video group in 1972. It was in Bush Video that so much of the first real experimental video was produced in Australia.

So, in introducing the early work to you I will start with Doug Richardson.

Doug Richardson

Doug's family immigrated to Australia from the US in 1961 while Doug was still a school student. He went on to study science at Sydney University, with computer science in the last year of the course.

In 1967 he was asked to write the programs to convert the results of a mathematical model of the behavior of gas molecules against a moving aerofoil in a low density atmosphere (ie. in a rarefied atmosphere at the edge of space). This work was part of early R&D work on precursors to the Space Shuttle done at the Aeronautical Engineering Department of Sydney University. The usual means for studying the flow of gases over a wing - using smoke streams in a wind tunnel - doesn't work under very low atmospheric pressure, so it was necessary to present the data as a visualization.

Once the mathematics had been done on the university's mainframe (an English Electric KDF-9) the results were visualized on a DEC PDP-8 minicomputer with a vector line drawing display (the DEC 338 display). The visual display was then recorded to film frame by frame, with the color being produced by exposing the film to a fast phosphor screen through a set of color filters which were switched in front of the lens by the PDP-8. This was Australia's first computer animation (as far as we know).

Doug then started playing with mathematical visualizations of various kinds on the PDP-8, representing different formulae as waveforms by arranging lines on the display. Some of this work was shown to various people including the head of the Fine Arts Department at Sydney Uni, Prof Donald Brook, who encouraged him to make a system that artists could use.

For the most part artists and computers didn't mix in those days. This was largely because computing consisted in writing a program, converting it to punch cards and handing it in to the computer operators. They would run it as a batch at some later time, and if it worked at all, you would get your results back the next day. Not exactly compatible with the artistic process. So Doug's approach was to try and get over this problem by building a system of hardware and software that would draw on the display screen and allow the artist to manipulate it in real-time.

He built a system in which the computer-time consuming functions (the multiply function and the analog-to-digital conversion of the input controls) were handled by specially built hardware. Also the 338 display was capable of direct access to the PDP-8's memory to get the numbers that it then digital-to-analog converted for voltages to drive the deflection coils which pull the display beam, as vectors, across the screen. He built a couple of special input control devices as well. One could patch various sliders or input connectors to control values in the software so that images could be moved about the screen in real-time under the artist's control. So images were drawn with a light pen on the screen and then pushed around the screen under manual or audio synthesizer control. Doug called this machine the Visual Piano and invited various artists to come and try it out. He also ran a course for artists to learn to use the system. The results were mixed but some people did take to it well. These included:

Frank Eidlitz who built up images from a few geometrically placed lines which were then moved about the screen to produce essentially wire-frame shapes. These were photographed to large format transparencies and collaged onto colored papers to make up the final colored image.

Peter Vogel, who went on to establish Fairlight Instruments and build video synthesis devices including the Fairlight Electric Paintbox (which was a colouriser) and the Computer Music Instrument (CMI), used the system to explore video feedback.

Ariel

Ariel was a member of Bush Video at the time. He used Doug's system to build up a collection of moving mandala and yantra shapes based on the Hindu tantra which he, and subsequently others including myself, used in multitudinous ways in video mixes which he made in the Bush Video studio.

Ariel was mainly interested in the electronic generation of video images while with Bush Video. Along with various audio oscillators that he built he also built a sort of emulation of the Rutt Etra rescanning video synth using a standard monochrome monitor and eplacing the deflection coil signals with amplified audio to twist and curl the video image according to music and audio synth waveforms.

The other synthetic image process available for Ariel and the Bush Video group was video feedback. With a CoxBox colouriser that was occasionally available and many an evening spent with cameras and a small video mixer many kinds of performance and synthesis processes were explored.

Ariel then went on to develop his own computer graphics system based on an Imsai S-100 buss, system using a Z-80 as cpu and 32Kbytes of static ram under the CPM operating system. The graphics display used three Matrox ALT-256 video boards

Australia '75

In Australia all this happened in the same period as the re-inspiration of modern dance, a strong interest in experimental and independent video production and a period of great fecundity in the presentation of new and electronic music as well. The combining of the various forms was a desirable and elegant thing to do.

In 1975 Doug Richardson set up an exhibition of called "Computers in the Arts" at *Australia '75*, a big arts festival held in Canberra. He managed to draw just about all the people actively involved in technological arts together into the ballroom of the Noah's International Hotel for a week. Plus, he talked various companies, particularly computer

companies, into putting their equipment into the site for us to play with. And these were the days of large mini-computers. The desktop machine was still really only science fiction, especially for graphics.

The *Computers in the Arts* exhibition turned into the single most important meeting place for all the people involved in electronic arts in Australia (other then the Fairlight people, peter Vogel, who couldn't make it). Doug organized it and showed some of his work, Bush Video, including Ariel and myself, was there, John Hansen and Stephen Dunstan came up from Melbourne. The ANU Department of Engineering Physics (the first computer science group within ANU) were involved, Philippa Cullen and her dance company, Stan Ostoja-Kotowski showed off his Laser Chromoson and there were several other people with various synthesizers and computer music composition devices also there.

I remember entering a darkened cave full of the screeches and rumbles of electronic music, the hum of computers and the luminous evanescence of video displays, dancers working the floor and the floor driving the computer to control the sound (this was a very special floor). Bush Video had a wall of monitors, Philippa Cullen and her company were the dancers, and John Hansen had his video synth and his electronic jewellery. "The place to jive in 75" And then we had the coup and support for all this experiment went down the gurgler. It might not have been till TISEA in 1992 that anything this wonderful happened again in Australia.

John Hansen

John Hansen had built a video synthesizer based on the concepts utilized in the Pong TV game coupled with various device gleaned from the video mixer.

Stephen Jones

I had met the Bush Video people in 1973 and then after I finished Uni I spent about 6 months with Bush Video in 1974 and became deeply involved in experimental video as a result> I was interested in Cybernetics and they were the only people I'd come across who knew much about that at all. Uni had not been helpful here. I was introduced to video feedback and the other synthetic imaging processes that they were using and became intrigued. I'd always been interested in electronic music and these video processes seemed like just the thing to go with it.

Later I learnt about technical processes in video and then electronics and went on to build several video synthesizers. This lead to doing the work with Severed Heads and also to setting up a small post-production facility called Heuristic Video were I modified lots of equipment and assembled quite an interesting editing/mixing facilities with various computer graphics and analog synthesizer capacities.

Post-1980

But as things developed the generated image, this image without signified, this image which referred only to itself, became intolerable to many artists. As was said to me by people looking at some of my early work, "Great effect, now what are you going to do (or say) with it?" Thus the desire arose amongst artists working with electronic forms for greater figurativity and meaning in the imagery. What had in its earliest days been considered a formal medium only, seen in the same way as experimental music, now had to become a carrier of content, a vehicle for the expression of ideas, no longer simply the expression of certain ideas in itself. More control was needed, especially over the shape of the result and so emerging desktop computer technology was readily embraced.

The further development of the electronic visual image could be characterized as a search for ways of adding meaningfulness to the essentially disembodied image. The generation of more realistic images and the use of the synthesized image as part of a more complex collaged semi-realistic image conveying layers of meaning can be followed through the use of devices like the Commodore Amiga and the Fairlight CVI. A language of visual fragments can be seen, as in all collage work where the image, as a partial, is re-contexted by its neighbors, its surrounds. New signifieds are extruded from the cross-connection of meanings carried in these fragments, to stimulate new thoughts in the viewer or, at least for some videomakers, to show the cross-currents of thought already abroad in the world through the similarity of this collage form with the nature of TV as montage of non-sequiter meaning, news about one thing and then another leading to a string of commercials leading to some melo-drama. All for the entertainment of an increasingly confused audience. The video collage is a kind of compressed evening's tv viewing, so much appropriation being remodeled and recombined for the work.

The Synthetics symposium

dLux Media Arts initiated two days of seminars on this history, which were held at the PowerHouse Museum in Sydney on July 19th and 26th, 1998. As curator of this event I invited eight of the people who were greatly involved with the development of electronic images in Australia to talk in these sessions. The contents of this exhibition derives from those talks.

Doug Richardson developed what is probably the first computer graphics system for artist's use at Sydney University in 1969-74. He made his system as easy to use and as available as a room full of complex mini-computer equipment could be.

Ariel was a member of Bush Video and used Doug's system as a source of video images and then went on to develop his own computer graphics systems with S-100 Buss kit computers. He then branched through arcade computer game enhancements into multi-media production.

Stephen Jones was led to image synthesis through Bush Video and then built several devices with help and advice from Ariel and John Hansen. I set up the post-production facility Heuristic Video in 1982 where many people came and went using whatever electronic facilities I could get hold of.

John Hansen was working in Melbourne building electronic sculpture and a couple of video synthesizers which hybridized in to computer graphics systems. He developed the Conjure system which was Australia's first (and only?) locally developed computer graphics system.

Warren Burt was also working in Melbourne at the Latrobe University Music Department and bought the English video synthesizer Spectre to Australia. Warren was intricately engaged in composing music and image which had the same harmonic bases.

Sally Pryor went from commercial computer progamming to 3-D computer animation via Swinburne Institute of Technology in Melbourne and Cranston-Csuri productions in the U.S. She was one of the founding members of the Video Paint Brush Company, which was the place were commercial computer graphics for television really took off in Australia.

Peter Callas is a video artist who perhaps more than anybody else made the Fairlight CVI show what it was really capable of. Taking off from there he has been making complex graphical "video comix" with Quantel's PaintBox and Silicon Graphics equipment and is Australia's most internationally respected video artist.

Tom Ellard is the mainstay of Severed Heads. He started playing with the domestic end of computing, the Commodore Vic 20, in the early 80's and went on to devbour the Amiga and 3-D animation. He and I combined to produce the visual feasts of Severd Heads live performances through the 80's.

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Primer of Image Synthesis

For the purposes of this show, my definition of electronically generated images is, basically, anything that contains electronically generated image material that was made largely for display on a monitor screen of some sort.

Computer graphics and video synthesis had, for a while, somewhat parallel lives. This was similar to the development and demise of the analog computer as the digital computer was developed and then gained ascendency. Video synthesizers were basically developed out of the analog computer technology. They then slowly hybridized with digital technology becoming pattern generating machines.

Digital computers were initially constructed to speed up the repetitive solution of mathematical problems, namely firing tables for military guns during the 2nd World War. In the 50's (long foreshadowed by Ada Augusta) the computer began to be used as a tool for making music.

The Cathode Ray Tube (CRT), originally developed for electronic waveform display and subsequently adapted for television, was first used as a storage medium in several early computing systems. Early in the 60's, Ivan Sutherland invented a CRT display called "SketchPad", and the light pen, which allowed one to interact with the graphical display, appeared about the same time.

Computer graphics could also be plotted and printed as Ken Knowlton and others showed. This was done by translating grey scale values from a scanned image into graphical "characters" which could be output onto a micro-film plotter. Knowlton made the first computer graphic films with Stan Vanderbeek in 1964.

Many of the big US industrial corporations started using computer graphics for design and engineering development. In the early 70's, Charles Csuri developed 3D graphical displays of mathematical abstractions which he could move around the screen using a light pen to draw and move the drawing around the screen. About 1970 Sutherland invented the head-mounted display and virtual reality simulation was begun.

The monitor screen

A Cathode Ray Tube (CRT), and any of the display devices which evolved from it, is essentially a glass bottle containing a vacuum.

An electron beam is generated by a "cathode" or piece of wire in the neck of the bottle which is heated to produce a stream of electrons. The base of this bottle is covered with a surface of material which produces light (photons) when stimulated by an electron beam. By placing a positive charge on this "photo-electric" material the electrons from the cathode are drawn towards it. The base thus becomes the face plate, or screen, of the CRT which is used in the oscilliscope, the television screen, the radar display and eventually the computer display. Electronic voltages are sent to densely wound coils of wire around the neck of the bottle. These coils direct the electron beam around the screen thus producing images on the face plate. By modulating the currents which control the coils or the electron beam various kinds of displays can be produced.

There are basically two classes of display:

1. Vector type displays such as the oscilliscope, the radar display and early computer displays and
2. raster type displays such as the television screen and modern computer monitors.

1: Vector displays are those in which the beam directing coils are driven by varying electronic voltages and push the beam around the screen. This is the basis of an oscilliscope. When driven by, say, an audio synthesizer these produce the kind of display known as a "Lissajous figure" [this is how ABC TV's logo is made]. The vector display also forms the basis of the first computer graphics displays in which strings of numbers from the computer are translated into voltages by a digital-to-analog converter and used to drive the deflection coils of the display. We also saw them in use in some early video games such as "Asteroids".

Fig.n: Oscilliscope display showing a video (feedback) waveform

2: Raster displays drive the deflection coils with a specific waveform which moves the electron beam from side-to-side progressively down the whole surface of the screen. The image is then generated by changing the current at the cathode thus modulating the brightness of the electron beam and the scanned image. These are the ubiquitous television and computer monitor.

Video Synthesis

The first of the video synthesizers were video image manipulation devices which worked with the images of television and then scrambled and videotape images in various ways. Eric Siegel developed his first video colouriser and Nam June Paik and his engineer Shuya Abe developed their first video synth in 1969. They were closely followed by Stephen Beck with his Direct Video Synthesizer.

Several levels of synthesis and image manipulation exist:

1: Lissajous figures are generated by applying varying voltages to the "X" and "Y" coils of an oscilliscope to drive the beam into line drawing (vector) type images. These are among the earliest forms of image synthesis and could easily be produced in the sound lab by analog audio synthesizers. Lissajous figures have to be rescanned by a video camera to be used for video production.

Fig.n: Lissajous figure from Jetlag by Severed Heads

2: Direct manipulation of the video display by adding extramagnets to the display tube or by mixing audio signals onto the deflection waveforms. The image will twist and squirm

over the screen producing strange distortions of the tv image. These effects have to be reshot to bring them into the video production process. This is where Nam June Paik started in his earliest tv manipulation installations (in 1963). The most sophisticated version of this approach was a system known as the "Scanimate". Ariel also produced a monitor that worked this way.

3: Video feedback is generated by pointing a camera at a monitor which is receiving the output of the camera as the signal for display, ie. the camera is looking at its own output but delayed slightly by cable length and electronics. Spinning, looping video oscillations which have a self-sustaining "life" result. Rotating the camera with respect to the monitor produces rotated and multi-petalled feedback patterns. The camera output can be mixed with other camera or video-tape images to make very complex patterns and echoes of the source image.

Fig.n: Highly intricate single camera video feedback made for Greater Reward by Severed Heads

4: Colourising: The varying brightness (or luminance) of a video image can be used to control a color modulator giving glowing pure color transforms of the original image. The first video synthesizers were essentially colourisers. See the notes on the Cox Box and Fairlight Instrument's Electric Paintbox.

Fig.n: The main electronics pack of the Cox Box

5: Pattern generationand direct synthesis of the video signal. The basic video pattern generator is a set of oscillators running at frequencies which are consistent with the scanning frequencies of a video monitor. To get stable patterns the oscillators are synchronized (restarted) by every vertical (frame) or horizontal (line) synchronizing pulse. These oscillator signals are then mixed together (summed or gated) and the whole signal switched out during the blanking between the lines and frames of video. To get colors from these signals some patterns could be assigned to the red channel, some to the green channel and some to the blue channel of the monitor or into a color encoder.

Fig.n: Stephen Jones' video synthesizer, colouriser, Serge audio-synthesizer and vector monitor at Heuristic Video

Computer Graphics

Computer generated imagery also takes two forms. The earlier was the sort of system developed by Doug Richardson in which the computer does calculations in real-time to draw lines on a vector display (a sophisticated version of the oscilliscope). Using early minicomputer systems such as the DEC PDP-8, artists were able to use vector displays to draw connected series of straight lines on the screen to produce drawn images. This is also the beginning of computer aided design for engineering and architecture in the design of 3D objects.

When IC level digital technology became more available a hybrid of the video synth and computer became common. Various synthesizer builders started using chip memory to store more complex patterns in, and by playing out this memory pattern at different speeds more complex patterns could be produced. Some aspects of this are seen in the EMS Spectre used by Warren Burt, and in John Hansen's synthesizer.

Computer generated imagery went over to the raster display in the mid seventies. As raster monitors became more available and chip memory became cheaper, the frame store (or screen memory) was developed. This device allowed the storage of a full frame

of a video image which could be readily modified by a computer and could be endlessly re-read for display on a monitor. This is the basis of computer graphics. At bottom most computer graphics software consists in algorithms for drawing lines and surfaces coupled with a vector-to-raster converter which writes the image or pattern into the frame store. The first commercially available frame storage devices for computers were the Matrox (ALT-256) which were 256 pixel x 256 line by 1 bit deep video storage planes which could be made up to 8 bits deep by buying 8 cards.

Fig.n: Matrox ALT-512 S-100 buss graphics card

Originally designed for scientific image processing work they became available on the S-100 Buss format in the late 70's. This is what Ariel used for his earliest work with his own S-100 Buss kit computer (the Imsai). The Matrox boards (produced in Canada) improved as chip memory became cheaper and more dense. They were followed up rapidly by boards from other companies and with the advent of the IBM PC and its clones the first generally accessible graphics systems appeared.

Initial developments in graphics software were driven by two needs: Computer aided design (CAD) in engineering and architecture; and Image Processing in scientific analysis (eg. electron microscope analysis). CAD systems needed to have discrete image primitives like lines, rectangles and circles which could be readily moved about the screen and resized. This was derived from the vector style drawing of the earliest systems. Image Processing didn't really start till the raster display became available because its need was to know where something was in relation to other things on the screen and how many there were and how to detect them.

The most interesting equipment that came along combined the best of these approaches. This is represented here by the Conjure system from Vision Control in Melbourne. The design of Conjure took the CAD approach and combined it with some image processing capability, such as the capacity to fill areas with color, and placed it on a raster system which also had the great advantage of being able to be turned into a video signal. You can see a similar approach taken in Corel's Draw software.

For the poorer artists without the capacity for roll-your-own hardware or leasing arrangements things didn't really get going until the appearance of domestic computers which presented their display on your tv screen. These are the Commodore machines such as the Vic 20 and the Commodore 64. Tom Ellard talks more about the pleasures of the Commodore 64 in his article. Of course, the Commodore Amiga suddenly got it right. An architecture which used main computer memory as graphics memory and a custom chip set which would display the graphics from wherever the computer felt like putting them. In real-time and with a sequence of frames placed in memory it would animate your graphics as well. Alas the Amiga. It got everything right including real multi-tasking and nobody except the aficionados would buy it.

Meanwhile Kia Silverbrook at Fairlight Instruments was developing a purpose built computer video synthesizer called the CVI. It was based on a very flexible display memory system which could be written to and read from alternately during any pixel. The address generators for the display memory could start at any point on the screen and count up or down as requested by the operator. To make it usable to non-technical people it had a control panel of switches and sliders which controlled the color treatments and address generation for the display. It also had a drawing pad through which images could be drawn onto the display. These images could then be moved about and coloured. Pattern making was easy and fast. This was the system that Peter Callas used for many of his works.

Eventually the Mac and the IBM clones got good graphics capability though it took years for the VGA output of the IBM architiecture to be capable of recordable video. This is largely because the desire for high resolution, flickerfree images meant that frame refresh rates are far to high for video signals.

The commercial market took up with computer graphics for television through making clips for bands and through the vast amounts of money that advertisers seem willing to pay. So the Quantel PaintBox appeared and subsequently Harry and Henry. One of the first companies in Australia to use Quantel's Paint Box for commercial and art production was the Video Paint Brush Company in Melbourne and later Sydeny. Sally Pryor, Andrew Quinn, and Jill Scott were some of the first users of this facility. VPB Sydney later became Animal Logic which now is one of the main film computer graphics houses in Australia. Following Quantel other computer graphics system makers started to get into the act, much to Quantel's annoyance. Silicon Graphics made huge inroads via the production of computer animation for the movies using Alias, Wavefront and SoftImage software. Flame was developed in Melbourne by Garry Tregaskis and sold to Discrete Logic of Canada. But all of this is another story which I shall not pursue here.

FROM COMPUTER ART TO DIGITAL ART TO NEW MEDIA

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Before any discussion of the history of New Media can take place, one has to define the terminology. There has to be a consensus as to what falls into this category. The title of this talk, “From Computer Art to Digital Art to New Media” indicates the lineage of the term. These terms have changed but not the definition. As the terms have evolved they have not become more distinct but broader and more difficult to define.

Computer Art was a term that was used at the beginning of this art form. It evoked the mechanical, bringing up the question of whether people could produce art with a machine. The word digital has evolved to express the process of the machine. It is digital because it comes from discrete bits and bytes. It is digital because the computer interpreted the images, the audio, or motion in a discrete format. Today most all media is digital or manipulated digitally.

Of the three terms used in this title, New Media is the most general and ambiguous. ‘New’ is relative. Every day there is something new. In the 1970’s the term ‘new genre’ was used to describe a new art form that involved video. Is this still the new genre? Is New Media the new genre?

The term New Media has been used to refer to electronic media which has been in existence since the 1940’s. Sixty years later and into a new century, I think it is time to redefine this term. The definition I like most involves interactivity, the very item that makes it unique to the computer medium, and most specifically in today’s world, interactivity on the Internet.

The new media are oriented toward action, not contemplation; toward the present, not tradition. Their attitude to time is completely opposed to that of bourgeois culture, which aspires to possession. Hans Magnus Enzensberger, “The Constituents of a Theory of the Media”, in John Thornton Caldwell, Electronic Media and Technoculture, Rutgers University Press. Originally published in 1970, the New Left Review.

New Media (interactivity on the Internet) has evolved from large-scale interactive installations that artists have been creating since the invention of the computer. These large-scale interactive installations are the ‘history of new media.’
An interactive system is a machine system which reacts in the moment, by virtue of automated reasoning based on data from its sensory apparatus… Interactivity implies real time. Simon Penny, “From A to D and back again: The emerging aesthetics of Interactive Art.” http://www-art.cfa.cmu.edu/Penny/texts/AtoD.html. First published in Leonardo Electronic Almanac, April, 1996.

The computer was in full operation in the 1950’s. In America this was a time of renewed prosperity. People returned from a world war, women were sent home after being in the work force to become wives and mothers again. New communities of suburbs were being built. These were homogeneous neighborhoods with rows and rows of the exact same house. At the same time, a subculture was growing to counter this establishment. This subculture grew to new heights in the 1960’s, and changed the face of the culture permanently. The conservative establishment via the military industrial complex and the anti-establishment subculture, by way of a small group of techno-enthusiast, advanced the development of computer technologies. The counterculture wanted to break all of

society's rules. Actively challenging the norms as opposed to passively accepting in silence. This activist stance affected the art world as well. Be-ins and events replaced the 'object of art'. To experience became more important than to possess, in direct counterrevolution to the prosperity of this time.

In the 1960's artist Robert Rauschenberg and electrical engineer Billy Kluver initiated a series of events to bring about collaborations between artists and engineers. "9 Evenings: Theatre and Engineering," in 1966 was the first. Experiments in Art and Technology (E.A.T.) Organization was formed after this landmark event and sought to link artists and engineers in collaborative projects.

Documentation on the E.A.T. organization can be found in the Getty Research Institute web pages http://www.getty.edu/gri/htmlfindingaids/eat.html. More events followed. Some of these included linking people in public spaces in different countries by the use of telephone, telex and fax equipment. Other collaborative projects manifested into cybernetic sculptures.
Through information science and cybernetics a whole new situation is created: artworks can be conceived as automata which evolve their own activity or react to welcome interventions from the public. Such objects are considered to be cybernetic art. Herbert W. Franke 1979 Prologue in Ars Electronica Facing the Future. 1999.

Edward Ihnatowicz created the Senster in 1970. The Senster responded to people's voices and their movements, which it detected by means of radar, and was the first sculpture to be controlled by a computer, according to New Scientist May 4, 1972. Wen-Ying Tsai created such sculptures as Victory (1971), Semisphere (1972), and Tuning Fork (1974). His work Cybernetic Sculptures, 1975, were composed of moving fiberglass rods illuminated by strobes. The movement of the strobes responded to sounds made by people around them. The rods would move slowly when the environment was quiet, frantically when it was noisy.

During this time Myron Krueger, at the University of Wisconsin, experimented with interactivity in a Virtual Reality setting. Krueger, with a computer science background, collaborated with artists. In 1970, he exhibited an environment called metaplay in which participants interacted with a video projection screen, which combined computer graphics with live video. In 1971, Psychic space used a sensory floor to perceive the participants' movements around a graphic maze. Videoplace, first created in 1974, allowed people to affect movement of images on a large screen projection. Interface was important to Myron Krueger. He wanted to get away from archaic devices such as the keyboard and have people interact in a more natural way with the computer.

Another artist, working in the 1980's, who placed a high importance on interface was David Rokeby.
…the rush to stuff content into interactive media has drawn our attention away from the profound and subtle ways that the interface itself, by defining how we perceive and navigate content, shapes our experience of that content. David Rokeby, "The Construction of Experience: Interface as Content" in Digital Illusion: Entertaining the Future with High Technology edited by Clark Dodsworth, Jr, Addison-Wesley Pub.

He is known for his installation, A Very Nervous System, which responded with audio (not visuals) to human movement. This system was an intelligent system that could track the dynamics of one's movement and because the audience was directly responsible for the quality of sound, the piece invited interaction. This was a seductive and provocative experience that truly made the audience part of the piece.

I want to mention a few works created in the 1990's, not very historical but significant in involving social interaction from human to machine and back to other humans. Multi-user systems were created by both Perry Hoberman and Toshio Iwai.

Perry Hoberman, once an art director of Laurie Anderson's performances, started working in interactivity in 1990. With the creation of Bar Code Hotel, he uses as his interface the symbols found on consumer products. The multiple participants scan bar codes to select computer-generated objects on a large stereoscopic projection. People work cooperatively to compose the visuals.

Toshio Iwai in *Composition on the Table* 1999 blends virtual interfaces with physical ones. Four tables with multiple buttons, dials, or sliding panels are adjusted by participants to affect audio, along with visuals that are then projected back onto the table tops. Social interaction is highly demonstrative. People stand in close proximity with each other and their personalities are exposed. Some dominate the play, some comply, and others actively oppose the domination. With another group of people there can be more of a cooperative spirit.

A significant development in Virtual Reality is a room size, multi person, interactive installation called the CAVE. This is a successful attempt in creating a VR community space instead of a lone, individual experience. Developed in the Electronic Visualization Lab, at the University of Illinois, Chicago, in 1991, this technology has since been used by artists in a variety of museums and art shows. One significant piece entitled *World Skin* by Maurice Benayoun is " a photo safari in the land of war… where the audience removes parts of memory, taking photos in the virtual world. They leave the virtual land of war with the printed shots, material witnesses of the lost memory." Maurice Benayoun, "Experiential Computer Art," Siggraph Conference Abstracts and Applications, 1999.

Multimedia

Another example of artists collaborating with computer scientists brought about the birth of multimedia. Nicholas Negroponte documents this in his book entitled Being Digital, 1995. The American military asked the Advance Research Projects Agency, ARPA, at MIT, to investigate electronic ways in which American commandos could get the kind of training that the Israelis had to launch an extraordinarily successful strike on Uganda in 1976. The Israelis built a physical model to scale of the airport. Using the computer allows for removal from the physical world. A full photorealistic environment was needed and the Aspen Movie Map was created. This was created by Andrew Lippman and his group at the MIT Architecture Machine Group, including artist Michael Naimark. The project used videodisc technology to allow participants to drive down the streets of an entire town. Every street was filmed, and every turn was filmed in both directions. The project, completed in 1978, used the computer to track movements and responded by playing the correct video for that portion.

This was not only about mixing multiple media but about control on the user's part. It was about interactivity. Interaction is implicit in multimedia, leading towards selection of information and outcome.

Artists experimented with videodisc technology in the 1980's and still use it today. This required an analog video signal recorded onto the disc that was controlled by the computer. Full frame video was utilized. Lynn Hershman became one of the first artists to use the videodisc technology in her work entitled Lorna, 1979-1984. A woman fearful of the world after watching television news, trapped herself in her room. Viewers could access buttons on their remote control unit to find out information about Lorna and her situation, and control her destiny by selecting one of three possible endings.

In the late 1980's early 90's, computer companies started experimenting with digital video on the computer. This gave artists the ability to create CD ROM multimedia projects. Computers were not fast enough to display full frame video therefore small video clips were used. Published by Voyager multimedia publishing company *She Loves It, She Loves It Not: Women and Technology* was created by Christine Tamblyn, Marjorie Franklin, and Paul Tompkins at San Francisco State University's Faculty Multimedia Research and Development Center in 1993. It is a parody of how women are represented in a technological age and of how women might use technology differently.

Interactivity as an on-line phenomenon on the Internet

The world wide web allows the public to become active participants. Viewers can be active in two ways; both as publisher, and through sites created for user participation. The more innovative New Media sites on the Internet are ones where one can give input or where there is an exchange. Artists explore interactivity on the web not merely as a point and click phenomenon but as an exchange of ideas. Artists are creating intelligent systems to respond to decisions being made by the participant, allowing the participant to be actively involved in the creative process.

A unique project that utilizes existing web cameras' live images from multiple sites is Amy Alexander's The Multi-Cultural Recycler.
Ordinary people and places around the world are instantly subject to becoming part of the mass culture and are potentially also subject to cultural recycling. It examines the meetings and collisions of all of these disembodied representations out in cyberspace. The live images will be captured from their web sites, and processed through one of roughly twenty image processes. Creating a collage which is a document of their relationship as fragment of web culture and of their chance meeting in cyberspace. The Multi-cultural Collider, Cyberarts, ARS Electronica 97.
http://shoko.calarts.edu/~alex/recycler.html

The cooperation of a world wide community is needed to cultivate the TeleGarden, first online in 1995. This is an Internet example of social interaction in virtual space.
The TeleGarden is a tele-robotic installation which extends out from the web site. It allows participants to view and interact with a physical garden via a robot arm. "Internet behavior might be characterized as 'hunting and gathering'; our purpose is to consider the 'post-nomadic' community, where survival favors those who work together." Co-directors: Ken Goldberg and Joseph Santarromana (UC Irvine).
http://queue.ieor.berkeley.edu/~goldberg/garden/Ars/

Another large-scale communication sculpture controlled through the Internet is Thomas Lehner's Clickscape98. This ambitious project was a one week event. Users from all over the world had the ability to affect text, visuals, and sound in three separate physical spaces. The text of LED lights scrolling across a building, the lights in windows of a high-rise, and sound through 16 speakers on the Nibelungen Bridge in Linz, Austria, all were controllable by the input of a mouse click.
http://www.servus.at/clickscape98/

The potential of what Thomas Lehner's piece and others represented is enormous. These projects utilize the medium in most compelling ways, and utilize the computer and network systems to the fullest. It opens up many possibilities for a digital future. What lead to the creation of this high level of interactivity on the web were the large-scale interactive installation of the present and the past.

MUTATIONS DISCIPLINAIRES DANS LES ARTS ET LES NOUVEAUX CHAMPS DE CREATIVITE : LE CAS DES ARTS AFRICAINS

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L'art africain de l'an 2000 n'est pas l'art africain de 1950, et ne sera pas l'art africain de l'an 3000. En introduisant par ce truisme ma communication, je veux souligner des évidences, malheureusement souvent sources d'interprétations diverses, parfois contradictoires. C'est comme dans ce qu'on appelle globalisation, ou mondialisation, dire que des changements se produisent, est devenu la chose du monde la mieux partagée.

Mais cette communauté d'idées apparente cache bien d'interrogations lorsqu'il s'agit de proposer des attitudes, des comportements artistiques. Que veut dire par exemple cinéma africain, ou musique africaine, lorsque les Artistes dans ces formes d'expressions utilisent les outils nouveaux offerts par la science qui n'a pas de patrie ? Où est l'africain, quand la kora est amplifiée, le sabar intégré dans la grosse caisse d'une batterie ? Où s'arrête l'africain chez un critique d'art qui utilise l'ordinateur pour faire ses questionnaires, développer ses communications et évaluer l'état de la création artistique mondiale ?

Des interrogations qui traduisent une situation plus complexe qu'on ne le pense. C'est pourquoi, il me paraît essentiel de s'intéresser à quelques réponses apportées à ces questions. Lorsque d'aucuns mettent sous le compte d'une domination culturelle occidentale qui écrase l'Afrique et tend à tout niveler, cette utilisation par les Africains des outils scientifiques, d'autres considèrent qu'il faut plutôt parler de capacités d'adaptation des cultures africaines face à toute pratique ou théorie nouvelle. D'autres encore expliquent cette identité des arts d'Afrique par la fascination des civilisations occidentales, américaines notamment.

Cependant, ces points de vue, quels qu'ils soient, ne résolvent pas pour autant le problème des interprétations sur ce qui est africain et ce qui ne l'est pas, encore moins la question de cette logique de mutations qui s'empare des disciplines artistiques en Afrique. Les artistes installent le public et les critiques dans une sorte de désarroi où l'on ne trouve pas les critères pour apprécier correctement les productions et où la réflexion reste bloquée sur des clichés assez éloquents de la fragilité des opinions sur l'Afrique artistique actuelle. Ce sont les clichés du genre : " l'art africain se cherche un guide ", " les artistes africains risquent de perdre leur âme en touchant trop à l'électronique et aux nouvelles technologies ", " l'art mondial est condamné à être américain ou à ne pas être ", etc.

Il me semble que la réponse à ces interpellations de la production artistique est à chercher plutôt à trois niveaux. D'abord au niveau de l'évolution socio-historique qui est partie de l'art nègre pour aboutir à un art africain contemporain. Comment comprendre un tel changement conceptuel ? La question de fond est-elle simplement conceptuelle ? N'y aurait-il pas, plutôt, une évolution forcée, des pratiques factices ne correspondant à aucune réalité artistique et culturelle ?

Le second niveau permettra ensuite de découvrir ce qu'apportent les nouvelles technologies dans l'identité des arts africains. Nouvel art africain ? Art africain occidentalisé ? Art occidental africanisé ? Ou simplement non-art qui naît en Afrique ?

Avec le troisième niveau de réponse, la réflexion posera les situations artistiques et culturelles liées à la présence agressive du numérique. Ce qui ouvre tout naturellement l'interrogation sur le devenir des arts d'Afrique, sur les conditions de leur être ou de leur non-être, et en fin de compte sur la notion même d'art dans un univers où la science se veut artistique et l'art de plus en plus scientifique.

DE L'ART NEGRE A L'ART AFRICAIN CONTEMPORAIN

Il est impossible de parler des mutations en cours dans les arts d'Afrique, sans se reporter auparavant à ce qu'on peut appeler leurs identités d'hier. C'est une question de logique élémentaire pour voir ce qui a été à la base de ces mutations, et comment elles ont créé un art enrichi, appauvri ou simplement autre.

Pour ne pas remonter aux premiers contacts Afrique/Europe, il y a plus de quatre siècles, on peut dire que deux faits historiques ont été à la base des changements de perception de l'art africain. D'abord la rencontre au début du 20ème siècle entre des artistes d'Occident et l'art africain. Plusieurs anecdotes expliquent comment cette rencontre a eu lieu et toutes tournent vers 1905 et 1907 où dans un bistrot parisien, les Vlaminck, puis Matisse, Picasso, Braque et les autres découvrent les premiers objets d'art nègre. L'africain c'était le nègre vice-versa.

L'objet d'art nègre par excellence était la statuette aux formes bizarres aux antipodes des canons esthétiques gréco-latins. Les spécialistes de l'art nègre d'alors, pour la plupart des ethnologues s'époumonaient dans des caractérisations plus fantaisistes les unes que les autres. Quand à Paris on s'extasiait face au " charme innocent et naïf " d'un masque ibo, à Londres, c'est le modèle du visage d'une sculpture fang qui était présenté dans son " expressionnisme enfantin ". À Berlin, c'était " l'extraordinaire baroque " d'un appui-tête Ba-Luba qui justifiait des pages et des pages de commentaires audacieux.

Ce n'est pas pour rien que l'historien de l'art Jean Laude, appréciant cette cacophonie dans la lecture de l'art nègre, rappelait avec ironie ce jour à Mérimé se moquait de Stendhal qui prêtait des sentiments à des vierges de Raphaël.

‘‘ De quelles railleries, s'exclamait-il, en s'adressant aux très sérieux experts, ne devrions-nous pas être justifiables lorsque nous interprétons les arts africains ! Maintes fois, l'aspect, " terrifiant " de certains masques a été attribué au climat d'insécurité dans lequel vivaient les populations qui en usaient. C'est là, déterminer le sens d'une expression présumée en référence à des modèles dont le code et les systèmes de valeurs sont différents " (in LAUDE, Jean (1966). Les arts de l'Afrique noire. Paris, Libraire Général française, p : 251)

S'il faut reconnaître la pertinence de la remarque de Laude sur l'inconsistance des lectures faites sur l'art nègre, il faut relever qu'il différencie arbitrairement lui-même, africain et nègre. Dans certains de ses écrits, il affirme que l'art nègre s'arrête à 1914, et delà tout ce qui suit est africain ! Au nom de quoi ? Les Nègres seraient-ils tous morts en 1914 pour laisser le continent envahi par des Africains ? Ensuite dans son excès de sympathie pour l'Afrique, il certifie qu'‘ en Afrique, la psychologie n'existe pas ", " l'art africain est insoucieux de l'effet qu'il doit produire sur celui qui le regarde ", " il n'y a pas de sourire dans l'art africain ". Il y a là des exagérations qui tentent de créer un art africain que n'ont jamais connu les Africains eux-mêmes.

Ainsi, au lieu de chercher à comprendre puis à parler de l'art nègre comme il est, ethnologues et historiens occidentaux se sont complus à en dire ce qu'ils voulaient que le public saisisse : un ensemble de formes d'expression que l'Occident peut tolérer comme art mais qu'il faudra voir comme art tout à fait particulier. De là, ces envolées généreuses sur l'âme nègre auteur de ces statuettes, sur les maladresses des musiciens et sur l'absence de sentiment esthétique chez les Nègres qui " font l'art sans savoir pourquoi ".

Ce procédé qui consiste à parler de l'art nègre positivement ou de façon superficielle conduit – dans des proportions certes assez différentes - aux mêmes effets : la déformation de la vérité historique et l'infantilisation des arts d'Afrique. Malheureusement, cette propension à sous-estimer ou surestimer les valeurs nègres se poursuivra jusqu'en 1966, date qui a vu Dakar abriter le Premier Festival Mondial des Arts Nègres et qu'on peut considérer comme le second événement historique dans l'évolution des perceptions sur l'art des Africains.

Ce fut la première consécration des théories sur l'identité forte de l'art nègre, et la révélation de nouvelles disciplines artistiques dans lesquelles les Nègres s'installent. L'esthétique nègre est enrichie par les thèses de Léopold Sédar Senghor sur le parallélisme asymétrique, sur la force du rythme dans la créativité africaine. La peinture, la tapisserie, le cinéma s'expriment en africain : on exploite les enseignements de l'Occident pour les dépasser avec ce souffle long de la savane africaine, avec ses espaces infinis d'un environnement que le béton n'a pas encore dépecé.

Cela donne au cinéma, des longueurs infinies dans des séquences et des répétitions dans les échelles de plan. Que de discours en faux-sens, que de verbiage en contre-sens la critique occidentale a développé sur ces " longueurs ennuyeuses qui font perdre du temps" du film africain, sur ces " redondances inutiles qui gaspillent de la pellicule". La critique occidentale avait simplement oublié que le temps en Afrique ne se perd pas, ne s'échappe pas. Le temps appartient à l'homme qui le régente, qui le fait revenir, qui le conserve. Chacun y a le temps d'aller voir l'autre, de rester chez autrui tout le temps qu'il veut. Le spectateur a ainsi tout le temps pour regarder et apprécier le film réalisé par un de ses fils qui sait le temps qu'il fait chez lui.

Il faut dire que la conscience née de la seconde guerre mondiale qui a permis au nègre de comprendre que le blanc et lui ont vécu les mêmes peurs, les mêmes risques et par conséquent ne sont en rien différents, s'est consolidée avec les indépendances africaines en 1960. Le nègre exige qu'on l'accepte tel quel. Il est devenu Chef d'état moderne, il développe une nouvelle politique artistique et culturelle et impose un autre regard sur lui.

C'est ce qui a donné l'Ecole artistique de Poto-Poto, celle de Dakar pour désigner des initiatives visant les arts plastiques. Le Français Pierre Lods s'installe au Congo, à Poto-Poto et appuyé par le gouvernement local, il enseigne un "art africain vrai, débarrassé de toute influence extérieure ". Il choisit ses élèves parmi les domestiques et tous ceux qui ne connaissent ni de près, ni de loin l'art occidental. L'enseignement de Lods consiste à laisser son élève gribouiller comme il l'entend sur la toile et ce qui en sort, dit-il, est " typiquement africain " ! Tout un public de coopérants français acquis aux thèses de Lods acheta ces œuvres de ces nègres vierges de toute souillure artistique.

Inutile de dire que Pierre Lods ignorait que la négritude n'est pas enfermement ou refus de tout apport extérieur, et que l'art qu'il voulait nègre authentique n'était que l'expression par personnes interposées, de ses propres fantasmes d'ancien soldat affecté en Afrique et qui préféra rester sur place à la fin de son service militaire.

Senghor lui, savait parfaitement cela. Mais dans un souci de démarrer l'Ecole de Dakar avec quelqu'un qui avait déjà le culte du particularisme nègre, il fit appel à Pierre Lods. Ce furent les mêmes pratiques et les mêmes résultats. Mais l'Ecole de Dakar ne vécut que l'espace d'une intention. Et aujourd'hui, il est difficile de trouver à Poto-Poto, ou à Dakar des réalisations de disciples de Lods.

La fécondité de la production artistique africaine dans diverses directions a sans doute était pour quelque chose dans le dépassement de la vision qu'enseignait Lods. Des directions qui étaient encouragées le dynamisme de certaines maisons d'éditions intéressées à la diffusion des cultures nègres : Présence Africaine, Clé, L'Harmattan, P.J.Oswald, etc. Il y a eu aussi des lendemains au Festival de Dakar, avec les Festivals des Arts africains d'Alger et celui de Lagos. Les universités aussi s'impliquent à travers des colloques sur l'art et la critique : Yaoundé, Dakar, Paris-Sorbonne, etc.

La conséquence : l'Occident découvre l'art nouveau d'Afrique, qui n'est plus seulement la statuette, le masque illisible, mais la peinture sur le jazz, les tapisseries sur la vie quotidienne, le cinéma et la littérature présentant une critique des mœurs sociales et politiques. Des critiques d'Europe se surprennent à trouver du Goya chez des peintres sénégalais, du Rodin dans les sculptures modernes. Évidemment, ils ne savent pas qu'en procédant ainsi, ils appauvrissent l'art. Car dans chaque artiste, il y a plusieurs individus et réduire un peintre à un autre c'est ignorer leurs plurielles personnalités. Ensuite, lorsque les artistes parlent de l'homme dans sa vérité éternelle, qu'il s'agisse du nègre ou du chinois, il y aura toujours rencontre et non influence d'un tel sur tel autre.

Et puis, les artistes africains contemporains qui ont vu Londres, New-York, Tokyo, ne peuvent plus faire comme leurs pères et grands pères. Ils ne regardent pas passifs le monde, ils se l'approprient dans toutes ses richesses. Ils brouillent ainsi les repères des experts qui avaient produit depuis longtemps des grilles cataloguant ici l'art africain, là, l'art européen et américain, et là-bas, l'art asiatique et l'art océanien. Ils sont encore plus perdus quand ils rencontrent les artistes africains leur dire : " l'art africain n'existe pas ! "

On sait que c'est le peintre sénégalais, Iba Ndiaye qui a le premier lancé la boutade " l'africanité n'existe pas ". Pour ce doyen d'âge des artistes africains contemporains, " l'africanité, on la porte en soi. Je ne me la pose pas comme un dogme. Elle ne me pèse pas, elle est en en moi. Je ne m'interroge même pas. Pourquoi d'ailleurs ? Je la transporte en moi, je la véhicule, je la vis. Je ne me demande plus ce qu'elle est, ce qu'elle doit devenir. Non. Elle se transformera naturellement ; chaque Africain la transporte en soi. Il ne faut pas qu'il se questionne sur son existence ou son inexistence car s'il le fait, cela veut dire qu'il ne la possède pas. C'est la sûreté de savoir qu'on est africain qui fait que cette africanité n'est pas un problème. Pour moi, elle n'existe pas. Elle est en mois ".(in Iba Ndiaye, Dakar, NEAS, 1986, P.65).

Un souci clairement affirmé d'identité esthétique qui n'a de compte à rendre qu'à la forte personnalité de chaque artiste africain, à la fois ancré dans le sang de son terroir et ouvert aux souffles du temps. Il faut rappeler ici que Iba Ndiaye (qui est l'un des oncles homonymes de l'auteur de ses lignes) a été invité par Senghor alors Président du Sénégal, pour animer l'Ecole de Dakar avec Pierre Lods. Iba accepta, mais dû quitter quand il a vu l'orientation de l'enseignement de Lods aux antipodes d'une affirmation de l'artiste nègre à partir de ses propres choix enracinés certes dans son africanité, mais ouverts à tout ce qui correspond à l'expression vraie de son intimité d'artiste.

Iba Ndiaye résume bien dans son propos la marche en avant des arts et des identités. L'africanité comme l'arabité ou la francité se transforme " naturellement " avec le temps. Une invitation à fuir tout ce qui est factice, folklorique, sans rapport aucun avec la sincérité de l'homme.

Ainsi de l'art nègre à l'art africain contemporain, on passe d'un art voulu comme tel par le regard occidental, à un art assumé par des artistes africains qui se veulent citoyens du monde, hommes pareils aux autres. Au plan conceptuel toute caractérisation est acceptée si au bout du compte l'art fait par les nègres d'Afrique est perçu dans son passé et dans son présent, comme n'importe quelle production majeure, riche de ses propres ressources et des apports extérieurs assimilés.

MUTATIONS IDENTITAIRES A L'ERE DES NOUVELLES TECHNOLOGIES

Avec l'événement des nouvelles techniques de l'information et de la communication, l'art africain postmoderne aborde un autre tournant. En effet, si l'idéologie coloniale a imposé des façons de voir et de dire l'art des Africains, si l'ère des indépendances a coïncidé avec l'apogée d'une affirmation culturelle, le progrès des sciences et des techniques s'accompagne par de nouvelles façons de théoriser et de pratiquer l'art.

Le postmodernisme est un néologisme pour situer chronologiquement l'époque actuelle, comme faisant suite au modernisme et au contemporain. Pour moi, moderne et contemporain recouvrent la même acception, car l'art refuse toujours de se situer dans les mêmes intervalles de temps que l'économique, le politique ou le social. Parce que quand les politiques imposent telle ou telle attitude, l'artiste a la possibilité de réagir, de dire non par ses œuvres, ou de penser une autre époque aux lois moins rigides. Ensuite, dans le domaine de l'art, on juge par la tendance, par le mouvement plus ou moins suivi par les créateurs.

Le postmodernisme peut être compris ainsi non pas comme une date fixe ou un intervalle précis commençant en... et se terminant en..., mais comme un ensemble de théories, de pratiques esthétiques marquées ayant en commun le rejet de la critériologie classique. Ce qui se traduit par des innovations, des réinventions et par conséquent une pluralité des disciplines artistiques. Personne ne peut dénombrer les formes d'expression qui se font jour. Le désordre des critères atteint un tel degré de flou qu'on s'interroge sur la pertinence même de la notion de critère. À quoi cela sert d'en parler quand chaque artiste en invente, chaque critique en crée ?

C'est parce qu'aussi les nouvelles technologies offrent des espaces et des outils de création autres pour les artistes, et de nouvelles possibilités de vision pour les critiques et le public. Personne ne sait par quels critères communs à tous, distinguer l'art mathématique avec des êtres graphiques formés par des calculs sur ordinateur, de l'art électronique qui n'offre pas des objets d'art au sens ancien, mais met en évidence des systèmes. S'y ajoute que la T.V. devenue aussi banale que le robinet de cuisine, forge une culture de l'image qui nous rend plus exigeants. On veut voir chaque objet sous tous les plans possibles, on veut revenir à un point donné et l'examiner au ralenti comme la T.V.. nous y a habitués. Tout se passe comme si, le postmodernisme était le temps du chacun pour soi artistique, et de la mort de tout critère.

Mais à y regarder de près, on constate que l'absence de critères ou la surabondance de critères, n'est ni synonyme de stagnation de la production, ni disparition de toute possibilité de réflexion critique. Les artistes sont devenus plus imaginatifs et plus féconds. Mais la théorisation d'une telle situation tarde à avoir le même dynamisme. D'aucuns se sont contentés de parler de la crise du discours sur l'art, sans se préoccuper d'expliquer une telle crise, encore moins de proposer des chemins pour y remédier.

Cette situation propre au postmodernisme artistique en général, est aussi vécue par l'Afrique. Un examen approfondi de l'état de la réflexion théorique et de la production artistique dans le continent permet de dégager trois raisons de cette crise des critères. La

première concerne la vie à trois vitesses dans le monde de l'art. Alors que des artistes demeurent féconds, et exploitent (même si c'est à tort et à travers) tous les outils qu'ils soient anciens, modernes, contemporains, postmodernes qui leur tombent sous la main et bouleversent ainsi les genres artistiques classiques, la réflexion qui devait les accompagner s'appuie sur une critériologie datant de Platon, si elle ne se contente pas de répéter ce que dit l'artiste. Le public local, dans une vitesse nulle, se plaît dans une indifférence amusée face à ces occupations insolites de certains de ses enfants.

D'où le vide qu'on peut constater dans la communication artistique : l'artiste-émetteur travaille sur des longueurs d'onde que ne connaissent ni la critique ni le public. Il faut lire dans les Annales et Revues des Universités africaines et Européennes des articles dits spécialisés sur l'art africain actuel, pour se rendre compte que le débat en est encore à tout apprécier sur la base des critères classiques. On compare à la Renaissance italienne, on juge par rapport au cubisme ou Marcel Duchamp et on oublie que l'art connaît des mutations identitaires profondes dans ses formes et contenus et dans ses critères d'évaluation.

La seconde raison qui explique cette crise de la critériologie est dans la quasi nullité des supports à la création et à l'éducation esthétique. L'Ecole et l'Université accordent aux arts la portion congrue : aucun programme dans les lycées et collèges, aucune chaire en esthétique pour le cas précis du Sénégal. Au niveau étatique le folklore qui entoure les Grands prix, n'est pas suivi d'effets promotionnels pour les lauréats. Dans un tel environnement, l'artiste cherche tout naturellement son futur vers l'ailleurs. Puisque personne ne semble vouloir de lui, il va là où l'on peut l'écouter, l'entendre, le voir, l'aimer.

On ne compte plus les allers-retours des artistes africains vers l'Europe, l'Amérique, l'Asie, le nombre de résidences avec leurs collègues d'autres horizons. L'inter influence, parfois la volonté de faire le jeu du marché contribue à des bouleversements au plan disciplinaire : les genres sont éparpillés dans une même œuvre ; figuratif, abstrait n'ont plus aucun sens lorsque les toiles sont cassées par des sculptures en métal lorsque les installations acceptent la présence d'être physique, lorsque l'électronique s'impose pour élaborer des esquisses en architecture, et guider la peinture.

A partir de leurs nouvelles expériences, les artistes prennent leurs distances avec tout ce qui n'intéresse pas le marché international. Pour eux l'horizon c'est la maîtrise des arts électroniques dans ce qu'ils apportent des possibilités de dialogue dans un langage universel. Ils ont essayé, cela a rapporté pourquoi s'arrêter en si bons chemins. L'écart se creuse avec ceux qui restent rivés aux réalités locales et qui ne conçoivent l'art que sous forme d'objet fixe, matériellement identifiable.

La troisième raison de cette crise du discours est à trouver dans les tentatives d'imposition d'un discours qu'on veut, le discours sur les arts postmodernes. Sous prétexte de globalisation, on fabrique de toute pièce une documentation avec mode d'emploi pour pays d'Afrique. La conséquence : la paresse intellectuelle s'installe, quand tout est servi. C'est là, où il faut trouver les clichés et sempiternelles argumentations sur l'art. D'énormes moyens sont déployés pour convaincre de l'homogénéité et de l'universalité de la production et du discours sur l'art africain. Faute d'agressivité en réaction, et devant l'absence de moyens équivalents, le discours standardisant domine.

On le voit les mutations dans les disciplines artistiques en Afrique se font sans que le public ne s'en émeuve et sans que la critique ne se situe dans une position d'accompagnant au moins. Parce que la critique peut, par ses audaces et la profondeur de ses analyses devancer la création en proposant des chemins nouveaux aux artistes. Elle peut aussi, comme c'est généralement le cas, accompagner positivement ou négativement la création par des propositions de lecture faites au public et par des

observations à l'endroit de l'artiste. Mais, c'est un autre spectacle qu'offre la critique des arts d'Afrique : au lieu de susciter l'engouement du public, et de fouetter le débat sur l'esthétique africaine postmoderne, elle se laisse écraser par la puissance novatrice introduite par les nouvelles technologies dans la création.

La solution ? Retourner à l'école de la société, au cœur des préoccupations des artistes, prendre suffisamment de recul par rapport à la production prête-à-porter. La critique comme l'art meurt en faisant du surplace et en restant incapables d'assimiler les apports nouveaux. Il faut ajouter que la stagnation de la réflexion sur l'art peut avoir des effets négatifs dans la création. L'absence de feed-back ne permet pas à l'artiste de savoir jusqu'où il est allé et s'il est en mesure d'aller au-delà, et de revenir ensuite. Inversement aussi, si la création piétine, le discours critique peut manquer de matière première pour être elle-même.

Ce qui est possible, ici et maintenant, c'est de lire attentivement les œuvres produites par une élite consciente des leviers scientifiques et structurels des mutations, de voir comment les artistes se meuvent, et comment la critique pourrait s'approprier cette situation et se renouveler. Toutefois, les mutations dans les disciplines artistiques africaines n'ont pas la même intensité que celles vécues en Europe, au Canada et aux U.S.A. sous la pression de l'électronique. Là-bas l'objet d'art est fragmenté en composantes d'un réseau dont l'ordinateur est le principal instrument. On élabore, on visualise à l'écran, avant de donner forme définitive.

Ici, par contre, l'objet demeure, mais c'est son identité disciplinaire classique qui est bousculée. À cet effet, la peinture sous verre au Sénégal pourrait être citée. Les choix figuratifs de la génération des aînés, Gora Mbengue, Babacar Lô, font place à plusieurs pratiques nouvelles ayant en commun, la recherche d'effets nouveaux à partir d'une domestication de l'électronique. Anta Germaine Gaye est un exemple dans ce sens avec son souci constant de faire accompagner ses œuvres par l'électricité. Non seulement elle fait des alliances de support, comme on crée des alliances de mots, pour suggérer la fragilité de l'instant, ou l'aspiration à l'amour. Verre et fer, Présence et néant, sont des facettes d'une technique qui veut apprivoiser la transparence du verre.

On pourrait dire cependant, que le seul usage de l'électricité dans une œuvre ne suffit pas pour en faire une œuvre électronique. Certes. Mais pour ceux qui savent regarder et voir une œuvre d'art bâtie dans le verre, pour ceux qui connaissent les caprices du verre exigeant des changements de perspective pour mettre des couleurs ou fixer des signes, les niveaux d'éclairage de verre qu'offre Anta, situent son œuvre hors des schémas antérieurs. Elle exploite les données nouvelles dans le champ de vision pour donner à ses œuvres des valeurs pluridimensionnelles. La profondeur qu'elle suggère est dans les espaces de néant qui ceinturent le cœur de l'œuvre, la distance est dans les autres vides que captent les couleurs, le volume est relevé par la poudre dorée qui dégage les contrastes. Ainsi, le fer loin de casser le verre, le soutient, l'attire, le tient en amour.

On est plus en peinture, on est proche de la sculpture, mais on s'installe sûrement dans l'architecture. Personne ne peut dire si les œuvres de Anta sont peintes, sculptées ou dessinées. Avec elle, les disciplines sont éclatées non pas pour fusionner, mais pour dialoguer en vue de créer peut-être une nouvelle discipline, peut-être pour préparer d'autres champs pour d'autres innovations encore indéfinies.

En regardant les œuvres primées lors de la dernière Biennale de l'art africain contemporain, Dak'Art 2000, on se rend compte que Anta n'est pas seule dans ses innovations. Il y a le marocain Mounir Fatmi avec son installation intitulée Liaisons et Déplacement. Il s'agit de câbles d'antennes de dimension variables. On pourrait mettre un

nom portugais, japonais ou thaïlandais, l'œuvre aurait gardé le même aspect. Parce qu'elle n'est pas faite pour un seul public, mais pour tous les hommes qui voient le symbole de la communication et des échanges transfrontières à travers ces câbles de plusieurs dimensions.

Son compatriote Hassan Darsi a présenté un Cube : une installation fonctionnant à l'aide d'un dispositif électrique : aspirateur, souffleur et éclairage. Le côté du Cube est de 164 cm. En plein dans les arts électroniques, Darsi met l'accent moins sur la symbolique du cube que sur le sens de la vie, partout et toujours : lumière, souffle. Là aussi comme chez Anta, et Fatmi, Darsi se pose comme homme de son temps et crée tel que les faits et son propre feeling l'inspirent sans aucune autre considération.

On peut ajouter l'œuvre Sans titre de la Sud Africaine Bernadette Searle. Elle a choisi, elle aussi, l'installation comme mode d'expression. La beauté de son œuvre est dans la variété de plans de l'image d'un nu de femme. Sur d'énormes cartons, on pénètre dans l'espace de l'installation où l'éclairage fait scintiller les images, comme pour donner un univers hors réel. Un visiteur ne s'est pas privé de dire qu'il aurait souhaité posséder cette femme en réel ! Pour dire que la préoccupation centrale de Bernadette était de montrer la beauté d'une forme (qu'elle soit féminine ici importe peu, n'en déplaise à notre visiteur) et la manière dont l'apport de l'électronique peut la rendre fortement expressive.

Il y a aussi la tapisserie métallique de Bounama Sall Ndiaye du Sénégal. Avec lui, la tapisserie faite sur toile et destinée à être accrochée sur un mur, fait place à une tapisserie faite sur bronze et destinée à être portée par un chevalet. Le titre Le prix de l'Hymène rend compte d'une pratique culturelle africaine qui voit, au moment du mariage, la femme trouvée vierge par son heureux mari, recevoir un bonus de ce dernier, ajouté à la dot. Sans doute cette œuvre de Bounama n'est pas électronique dans son aspect final (il faut d'ailleurs relativiser ce jugement, parce que le métal a été traité avec des méthodes modernes électroniques avant de faire l'objet d'un montage final), mais elle illustre clairement les bouleversements disciplinaires.

On a là des exemples édifiants sur les mutations dans l'identité des arts africains. Du Maroc à l'Afrique du Sud, les artistes du continent semblent s'être donné le mot : exploiter à leurs manières ce qu'ils ont vu à la T.V., ce qu'on leur a enseigné à Paris, Londres, Washington, ou ce qu'ils croient être le goût futur. Il reste à se demander si une telle situation est effectivement l'avenir, ou s'il ne s'agit là que de réactions passagères.

L'ART NUMERIQUE AFRICAIN... POUR DEMAIN ?

Ce n'est pas une gageure de poser le caractère africain de l'art numérique en cours. Non pas que la science et la technique puissent avoir une quelconque nationalité, mais la manière dont la génération actuelle fait l'art, sous l'influence du numérique mérite cette réflexion. Il y a en effet une appropriation tellement forte qu'on est en droit de se demander ce que sont devenus les contes et légendes qui berçaient l'enfant africain du berceau à l'accès à la case des hommes. Aujourd'hui, il passe en moyenne quarante heures par semaine à l'école pour près de soixante heures devant le petit écran entrain qui est devenu le seul divertissement.

Ainsi la civilisation des satellites est entrain de forger une génération d'Africains consommateurs passifs de feuilletons français et de séries américaines. S'y ajoute que l'absence de productions locales de même qualité que ce qui est montré ne permet aucune résistance. Par l'image, les frontières sont balayées, et les contacts deviennent des formes de domination et non de rencontre fraternelle.

Ce qui veut dire que le numérique africain actuel est forcément de l'africain occidentalisé, ou de l'occidental africanisé. On retrempe à la sauce togolaise, gabonaise ou malienne, ce qu'on reçoit. Pour l'heure le continent noir ne peut faire autrement pour des raisons objectives liées à son sous-développement scientifique et technique. Son état de sous-équipement en informatique est une source de retard plus prononcé. Le matériel est très cher, les infrastructures de télécommunication qui remontent souvent de l'époque coloniale sont obsolètes.

On peut aisément constater cela en jetant un regard sur des chiffres qui parlent. Au Soudan par exemple, avec 29 millions d'habitants, il n'y a qu'un seul fournisseur d'accès comme au Lesotho avec ses 2, 5 millions d'habitants. En Ethiopie, il y en a 4 pour 62 millions d'habitants, et 75 pour l'Afrique du Sud et avec ses 45 millions d'habitants. L'Egypte en compte 40 pour 66 millions d'habitants, le Sénégal 12 pour 9 millions d'habitants.

Par ailleurs, le Rapport sur le développement dans le monde, 1998/99 publié par la Banque mondiale montre que dans la répartition géographique du marché des nouvelles technologiques l'Afrique, l'Europe de l'Est et le Moyen-Orient réunis font tout juste 2,6 % du marché en 1995, contre 43,5 % pour l'Amérique du Nord, et 28,30 % pour l'Europe de l'Ouest. Et dans le million d'internautes qui vivent en Afrique, 700.000 sont en Afrique du Sud, et partout sur le continent le coût de la connexion est prohibitif avec environ 65 dollars par mois, contre 20 dans les pays du Nord.

La lecture qu'on peut faire de ces données, est que l'Afrique reste encore dans la périphérie d'une mondialisation qui a la particularité de ne pas mettre tout le monde sur le même pied d'égalité. Ainsi, ceux qui n'acceptent pas de mettre des moyens gigantesques dans les nouvelles technologies de l'information et de la communication, ou qui n'ont pas les moyens de le faire, courent le risque de se voir écartés du savoir moderne.

Malheureusement pour l'Afrique, Internet et les enjeux du numérique sont encore perçus et vécus comme une affaire de privilégiés. Et les rares artistes qui s'y intéressent sont ceux qui fréquentent les Biennales, les symposiums et autres rencontres internationales. Le public dans son écrasante majorité n'en fait pas une priorité parce que l'on continue de considérer que les NTIC sont une affaire de pays développés, et que l'argent qu'on pourrait y mettre pourrait régler des problèmes cruciaux de survie : éducation pour tous, médicaments, hygiène, nourriture, loisirs sains.

Évidemment, c'est là une compréhension tronquée des chemins du développement, une mauvaise appréciation des NTIC qui peuvent être des raccourcis pour aller vers le mieux être, parce qu'intégrant les pays qui se situent dans cette perspective dans la voie d'échanges, et surtout d'appropriation effective des acquis scientifiques. Néanmoins cette opinion voulant que les NTIC soient l'affaire exclusive des pays industrialisés, est révélatrice des difficultés de l'acceptation des arts électroniques. On préfère encore le figuratif en peinture et sculpture, le mbalax en musique à la place de productions sur le web ou la musique électronique.

Non seulement ceux qui agissent ainsi sont convaincus que c'est comme ça, mais plus grave encore les états ne prennent aucune option résolue – ne serait-ce qu'en encourageant des investisseurs privés dans ce domaine - pour faciliter l'accès aux serveurs, la production d'ouvrages de sensibilisation sur la question, la réalisation de CD-ROM, de vidéo, l'installation de structures de montage d'ordinateurs, etc.

Personnellement, je ne vois comment dans un très proche avenir la situation va évoluer dans une Afrique marquée par les rivalités politiciennes dans un même pays, par des guerres de misère entretenues par des états pygmées. La question des NTIC n'est

pas prête pour passer au rang de priorité pour des acheteurs de canons. Et le cercle vicieux se consolide : moins on met de moyens dans les NTIC, moins on est sensible à leur utilité dans le développement et plus l'écart se creuse avec le monde moderne. Le monde de l'art en pâtit le plus, car le goût esthétique, l'attachement de tous les artistes et du large public aux arts électroniques est une question de culture, d'éducation, de fréquentation. Moins on est informé, éduqué sur une question, moins on sera en mesure d'y répondre.

La production artistique made électronique pour l'Afrique, comme les masques nègres pour l'Europe est une question de fréquentation. L'art numérique africain par les Africains pour les africains et pour l'Homme est bien du domaine du possible si la question culturelle en Afrique n'est pas réduite à une copie de ce qui se fait ailleurs, ou à un pur émerveillement face aux progrès des sciences et des technologies. Cela demandera du temps sans doute, le temps que se dissipent les appétits de certains chefs politiques, le temps que le projet en cours d'unité africaine se réalise ou passe à une vitesse supérieure.

Ma propre expérience de critique d'art, d'enseignant chercheur à l'Université me permet de rester confiant malgré tout : les artistes africains de plus en plus suivent ce qui se passe dans le monde de leur profession et beaucoup d'étudiants s'intéressent à l'évolution des NTIC. L'absence de moyens est supplée par une volonté farouche d'être à l'écoute du monde et d'être à l'heure de l'histoire. Ce qui permet de dire que le rapport des arts d'Afrique aux nouvelles technologies, précisément au numérique, passera inévitablement d'un rapport de curiosité amusée, d'indifférence, à une relation de sympathie.

Inévitablement ? Parce qu'Internet et l'usage du numérique n'ont aucun sens s'il n'y a pas de production à véhiculer, si une culture de l'immatériel n'est pas développée au niveau des consommateurs. Or, l'Afrique dans son identité profonde est principalement immatérielle. Elle ne fixe pas sa mémoire par des textes. Elle met l'accent sur le visuel, l'audiovisuel, le plastique pour tout dire. Car contrairement à ce qui a été longtemps développé, l'Afrique n'est ni orale, ni écrite.

Elle est plastique. Pour mieux le dire, l'Afrique privilégie dans sa quotidienneté le dialogue par paraboles, par métaphores, par allégories. Les arts d'Afrique interpellent le visuel, et provoquent la raison par les divers traits de l'irréel et de l'invisible suggérés. La plasticité est là, dans cet appel à la vue, au toucher, à l'ouïe pour sentir l'art africain.

Internet dans ce qu'il est le réseau des réseaux pour développer le dialogue audiovisuel à une dimension planétaire, semble ainsi paradoxalement être fait pour cette culture nègre friande d'images fortes, et d'échanges visuels. Et les artistes africains ont là une opportunité pour offrir une production riche du caractère altruiste de l'art africain, et forte de sa variété plastique. Pourvu simplement qu'ils fassent l'effort d'être africains et hommes de leur temps. Car, en offrant des possibilités de dialogue avec une humanité sans frontières, en utilisant le numérique pour bousculer les horizons de l'imaginaire et du possible, Internet est une opportunité de jouvence pour l'Afrique artistique.

Les atouts culturels sont là pour ce continent qui a renouvelé la créativité artistique occidentale en panne au début du 20ème siècle. Aujourd'hui encore la rythmique africaine inspire l'Europe, de même que le stylisme et la danse. Il suffit de compter les procès pour plagiat, ou les innombrables invitations d'artistes africains pour produire des œuvres de commande.

Plus précisément on peut revoir les résultats de la belle initiative de l'Inter-Société des Arts Electroniques (ISEA) qui a formé une vingtaine d'artistes sénégalais, à la

création d'œuvres multimédias, lors d'un atelier à Dakar, en Février 1999. Ces artistes, pour la plupart n'avaient jamais approché un ordinateur, encore moins utilisé un clavier. C'était pour eux une véritable alphabétisation. D'extraordinaires produits ont été réalisés sur la base du fond culturel propre aux artistes. Cette expérience est éloquente sur les capacités de créativité et d'insertion harmonieuse des Africains dans le cyberespace avec leur propre identité.

La revendication d'une mondialité synonyme d'échanges mutuellement avantageux et respectueux de la pluralité des identités est sans nul doute la voie obligée pour que l'Afrique soit à l'heure du monde. C'est aux artistes, créateurs d'éternité et souffleur d'énergie créatrice pour les peuples, qu'il revient l'honneur et l'action impérieux de s'engager dans cette voie.

Comment ? C'est toute la question qu'il revient à la critique de théoriser en des termes susceptibles non seulement d'apporter l'adhésion des artistes, mais aussi et surtout celles des décideurs politiques. Entreprise difficile dans une Afrique de métamorphoses rapides et fréquentes du treillis et du képi militaires en costumes et cravates de qualité exquise ! Entreprise possible tout de même si l'on accepte de partir de l'un ou l'autre des champs de créativité ci-dessous proposés :

- Le premier est ce qu'on pourrait appeler le champ du réel où les seuls choix possibles pour l'Afrique sont clairement affichés : stagnation et progrès, ou répétition de ce qui est, et ouverture. C'est l'idée de complémentarité qui est ainsi exprimée. Les artistes ont là des sources inépuisables pour produire non pas de l'africain, mais de l'humain. L'histoire de l'humanité, on le sait est fertile en exemple où les artistes attentifs aux théories des critiques ont montré la direction aux politiques et aux populations. Le classicisme français est là pour révéler comment l'idéal esthétique théorisé par la critique s'est affirmé par la suite dans des chefs d'œuvre universels.

Le réel donc, c'est prendre le parti de l'Homme dans ses différends, dans ses insuffisances, dans sa soumission à la machine, mais aussi dans sa grandeur, et dans ses soifs d'éternité. Plus l'Afrique produira dans le cyberespace, plus le monde verra la différence des horizons culturels, plus chacun apprendra à compter avec l'autre. Le wolof le dit bien : nit nittey garabam (le remède de l'homme, c'est l'homme, plus précisément l'homme qui sait écouter l'homme). Ce qui implique que les artistes qui veulent agir sur le réel, doivent commencer par apprendre le réel dans ce qu'il a été, et dans ce qu'il est.

- Le second champ est celui du virtuel, c'est-à-dire, de ce futur de l'immatériel. Il s'agit d'un monde à construire qui sollicite l'inventivité de tous et nul n'a le monopole de l'imagination. D'où l'action de l'artiste pour offrir l'image d'un monde non encore pensé, mais acceptable par la pensée puisque fondé sur des identités complémentaires entre hommes. Et puis, qui sait de quoi demain sera fait ? La seule certitude n'est-elle pas dans ces ruines, ces morceaux de bois et de pierre qui ont été réalisés par les artistes et qui survivront comme reliques d'une époque ?

Des interrogations qui autorisent à dire, simplement que rien n'est perdu pour l'Afrique. Demain n'appartient à personne, et après-demain sera sûrement aux plus audacieux et aux plus persévérants. Il me plaît à cet égard de rappeler ici, les propositions que j'ai faites au Colloque ISEA de Montréal d'Avril 1999, parce que toujours actuelles. Il s'agit de conjuguer les efforts pour que l'Afrique, l'Europe, l'Amérique, l'Asie et l'Océanie construisent en même temps le même demain pour tous, pour que leurs rencontres soient enfin complémentarités. Il faut donc, ensemble :

1. Mettre sur pied une Association Internationale pour le suivi de la production artistique sur Internet

2. Susciter ainsi un réseau capable de stimuler la création artistique dans le prolongement de ce que fait actuellement ISEA
3. Prendre des initiatives pour tenir assez régulièrement ce genre de rencontre et d'échanges
4. Avoir dans cet esprit la biennale de l'art africain contemporain DAK'ART comme repère pour la prochaine rencontre, pour y poser la problématique des nouvelles technologies dans l'art selon des modalités à discuter.
5. Diffuser les Actes de ce Colloque comme premiers éléments de réflexion à faire partager.

Il faut conclure en soulignant que l'art africain ne disparaîtra pas. La notion d'art aussi reste actuelle et n'est dérangée par aucune innovation, même si les disciplines qui l'expriment connaissent des mutations. Il ne s'agit donc pas pour l'Afrique de baisser les bras ou de se considérer la dernière de la classe à vie. La civilisation du numérique qui se construit est la conséquence de réflexions, de remises en cause, d'actions depuis des millénaires. Toute l'humanité y a participé, certes dans des rôles plus ou moins glorieux.

C'est dire qu'aujourd'hui, chacun peut s'approprier le progrès scientifique et technique et revendiquer sa place dans les sociétés de demain. Il faudra simplement que cette place soit honorable à défaut d'être la meilleure. L'Afrique millénaire avec ses arts, ne saurait donc accepter de se confiner à exhumer son passé, à recopier les autres ou à s'arrêter. Dans sa détermination à vivre, elle est condamnée à se tourner résolument vers l'avenir et participer pleinement à l'édification en cours de la civilisation de l'immatériel. Ses enfants, artistes et critiques en tout cas, n'attendent aucun messie. Ils ont choisi d'être de leur millénaire, de leur temps.

THE MULTI-TEMPORAL EXPERIENCE OF PLATE SPINNING

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ABSTRACT :

Increasingly our experience of the internet is transforming from a diet of digital books and choice making from grey embossed buttons, to a dynamic experience of multiple times and spaces as we open more browser windows and a paper based culture begins to embrace network technologies. As we inhabit so many web pages simultaneously, 'smarter' sites are beginning to tell us that we are not alone in cyberspace.

Beyond the chat sites where we direct our communication, network software is beginning to extract information about ourselves and distribute it to others as we are online. Software such as Meta-Spy (http://www.meta-spy.com) and Raindance (http://caiia-star.net/speed/raindance) both acknowledge the presence of others in a passive manner. As a new culture emerges away from the domination of the broadcast model adopted from traditional media, our awareness of the community around us grows as our vista on cyberspace takes on a new seat that offers an ability to see further and see more. A position where social navigation can once again be observed as though the internet was becoming an inhabited environment beyond the one to one relationship we have with our desktop monitor.

In highlighting the value of this emerging point of view the author presents his paper alongside the performance of a 'plate spinner', as a model for the potential of this technology and the multi-temporal nature of our experience of it. In observing the skilled performance of a 'classic' circus act, and reflecting upon the audience's consciousness of multiple times that each embody a beginning and end, the author draws our attention to our faith in multiple narratives and the possibility for a transformation of the western understanding of the teleological frameworks that underpin so many of our cultural processes and artefacts.

Keywords: ***Temporality, Network, Meta-Spy, Community, Social Navigation***

Introduction

This paper explores the idea that as we increasingly use interactive network technologies, and as they increasingly affect our lives, we are forced to modify a particular understanding of the world. The author is particularly interested in the affects of the technology on our temporal consciousness and uses this paper to explore how we can reveal this through the metaphor of plate spinning; the traditional circus act.

Identifying the Community of the Internet

By referencing an emerging range of new web technologies such as MetaSpy (http://www.meta-spy.com) and Raindance (http://caiia-star.net/speed/raindance) we can begin to acknowledge a landscape of the internet that is increasingly making us more and more aware of the community of the internet. A community that was previously hidden from us as we explored the web on our own and was only ever revealed to us through email and chat. For the first time we are beginning to 'see' our fellow surfers as website's hold histories of visitors, are affected by others and are even reorganized by visitors.

MetaSpy was introduced as part of the fallout of the development of the popular MetaCrawler search engine. Very simply it provides visitors to its web site the opportunity to observe what other people are submitting at that very moment to the WebCrawler search interface. A simple idea that compresses all of the surveillance and voyeuristic potential that the 'network' always promised, but never delivered. To watch ten entries appear every ten seconds is like a side ways glance across the activity that we are all so engrossed in, revealing so many people, all with the same desire to suck from the web what they can, few ever noticing the simultaneity and community within the process.

Raindance is primarily a data visualization tool that illustrates how many people are visiting sites on a server. In this way Raindance simply to enables a virtual community of viewers to become more aware of itself by picturing the current activities of the whole system. If cyberspace was like real space, when we arrived in a particular street or homepage we would be able to base our decisions on where to go within that space according to the visible traffic of other visitors. Some spaces like bars maybe very busy whilst others like specialist shops maybe quite quiet.

The next generation of web tools and software will undoubtedly make much that was invisible of the internet visible as we shift from television's broadcast model to a flatter network model that is appropriate to the technology and nature of the medium. This process of finding out that we are not alone when we visit websites and that the 30 million people online are really there, transforms a model we have for actuality. As a result of this it is possible to suggest that in finding others, we find different times and spaces. Times and spaces across the planet that do not fit our understanding and do not run at the same speed as ourselves. Indeed whilst we struggle or succeed to utilize this our previously mono-temporal consciousness that was defined by our interactions with so few and so locally, will be and is being dramatically split. This split may become a fracture as we struggle to hang on to the structure of narratives that allow us to define our roles and activities in the world, or it may become a conscious redefinition of our time as we share resources with places that are running at different times.

The Multi-Temporal Experience of Record Spinning

This multi-temporal consciousness is manifested in the performance of a plate spinner, that will accompany the presentation of this paper as a means of exemplifying the multiple time/spaces that we are increasingly being forced to read. In this case the audience will be caught between the narratives of a single plate to a large number within the plate spinners

performance, or to the author's delivery of the paper, or if possible all of them. It is in this complexity within the moment of making sense of multiple narratives that we can feel the a loss of total perception of the situation, that is increasingly happening to us as 'we reach at a distance,[and] feel at a distance' (Virilio[73]).

In an attempt to find further reference to describe the impact of this state, the author presents the work of Janek Schaefer[74], a contemporary composer and musician who explores audio pieces through modified technologies. Schaefer's work recognises the technical vocabulary of making, transposing and amplifying sound through its various technologies, in particular the record deck, and rebuilds and recombines it's component parts to modify the structure of made sounds.

Schaefer's 'Tri-phonic Turntable' (Fig 1.); described as 'a three tone arm, two direction, multi-level, micro vari-speed vinyl manipulator' is the first of two pieces referenced that explicitly explore some of these ideas. The re-construction of a traditional record deck simply enables a musician to apply three needles to one record simultaneously and amplify their sound. The resultant audio is described as 'emotive soundscapes [that] inhabit the architecture of the mind's eye.' Which the author interprets as a reference to the multi-temporal experience of environments that we usually filter so readily to sift out the stronger narrative for our own orientation. Schaefer's 'Tri-phonic Turntable' constructs an environment that is too complex to sift, forcing us to submit to the three narratives working simultaneously.

Fig 1. The Tri-phonic Turntable

Shaefer's second piece is presented to provide a further space of reflection upon our desire to find and follow the most significant narrative is entitled Shifted Centre Vinyl (Fig 2.). A vinyl record in which 'the spiral groove is repositioned off centre on the vinyl surface to invoke a very pronounced fluctuating wow sound as the tone arm sweeps from side to side on the turntable'. The intervention into the traditional printing process of vinyl generates an opportunity to stand outside of a predictive narrative and provides us not with a single track of sound that we may follow, but a simultaneous slice through multiple tracks as if they coexist within one sound.

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73 Speed and Information: Cyberspace Alarm! *Le Monde Diplomatique,* August 1995.
74 Janek Schaeffer can be reached through http://www.audioh.com

Fig 2. Shifted Centre Vinyl

Schaeffer's work whilst occupying a critical space within its own field enables us to find evidence of a cultural practice that is/was defined by single temporal speed – the single groove in the record, but that is now moving in search of multi-temporal explorations of its own media.

Multi-Temporal Fallout

In the search for further evidence outside of research but in actuality for our struggle with new technologies and strategies that force us to manage more and more time spaces, the author also looks to where the apparent 'fallout' of the effect may be found.

In England over the last decade we have become used to the concept of 'road rage', largely through a media that has focussed very closely on these extraordinary manifestations of frustration that turn to violence as an individual struggles to control themselves in intense traffic situations. The author suggests that whilst much of this can be explained due to a post-capitalist environment where consumers are cultured to defend their individuality and their 'right' to control situations, another reading in context with the breaking down of mono-temporalities is useful. The author proposes that 'road rage' is a symptom of the transition between a society that interprets life in one time - *pace*, and one that fails to recognise the complexity of multiple times – *running at many paces*. Becoming angry or outraged at a situation that is not running at your pace, may be the struggle between reading from mono-temporal perspective and the difficulty in ourselves comprehending a multi-temporal reality.

The idea of a reality that largely follows one narrative is of course at the centre of many of societies beliefs. Established in the teleologies of Western religion's grand narratives that are reinforced through much of the socializing of your average citizen of the West, provide us with a process for filtering actuality into realities of narrative – major or minor to enable us to fit them within a grander scheme within which we are content. Consequently our reluctance and indeed the inability of ourselves to identify spaces which are constructed from multiple temporalities, the author sees as a significant problem for the present and future.

The author suggests that this struggle can be identified in many local Government's keenness to suppress activities that don't run at the speed of a constructed space. Skateboarding is such a practice and one that increasingly changes the space/time of place through its alternative speed, acrobatics and use of architecture. The author introduces Ian Borden's recent text upon 'Skateboarding and Henri Lefebvre: Experiencing Architecture and the City'[75] and in particular its reference to the 'Spatial Censorship' that occurs within the city, as skateboarders are 'increasingly repressed and legislated against, not by national or federal laws but by a series of local reactions aimed at suppressing that which is different (and misunderstood).' The author identifies this 'misunderstanding' as the struggle between a desire to hang on to a mono-temporal space whilst the pressure to recognize multiple temporalities becomes greater. Indeed understanding that car parks, handrails, seating and even out of use swimming pools can have alternative functions is indicative of a society that struggles with multiple use.

Closure

By presenting the paper simultaneously as a plate spinner demonstrates their skills it is hoped that the complexity of a multi-temporal conscious moment is exemplified to the audience, and indeed reading this paper outside of that context is only mildly effective. However although the concept may be an unusual way of contextualising much new activity the author hopes to hint toward a future awareness that we may need to pay attention to as space slows and times increase as our vista on the media landscape broadens through cyberspace.

Of course we've been talking about multi-tasking for a long time and we are well aware of the complexity of daily activity in the workplace or at home, but somehow there was always a central belief system that there was only one narrative. But as we see more and learn of more narratives synchronously and asynchronously a multiple models of time are inevitable. Last year British television demanded its audience to suspend a number of 'real life' narratives in different time zones; from Castaway that documented a year of a community set-up on a small island off Scotland through bi-monthly programmes, to the very immediate Big Brother game show that allowed us to observe ten people live on the internet. Indeed around the same time as Big Brother caught the publics imagination, the Mike Figgis film 'Timecode' was released, a film shot from four camera perspectives and simultaneously presented in a 2 by 2 matrix, that all play at the same time describing the plot from four different perspectives. A simple idea that forces the audience to follow a narrative through different perspectives, choosing of course to view only one of the cameras view point at a time, whilst missing out on the other three. Multi-temporality embraced and exploited in a similar way to Schaeffer's audio interventions.

In closing the author will remind the reader/audience of the nature of the multi-temporal presentation and the value in the metaphor of the plate-spinner as an entertainment medium that agitates our adherence to mono-temporality into a fascination of the complexity of the multiple.

[75] Published in the proceedings of Habitus:A Sense of Place conference, Curtin University, Perth, Australia September 2000.

TACTILE RENGA - A PROCESS OF REDISCOVERY OF COLOR

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Tactile RENGA is an ongoing project of three Japanese artists, Takayuki Mitsushima, Rieko Nakamura and Toshihiro Anzai. The first series of Tactile Renga was carried from January 1998 to October 1998 producing 14 images by three artists. Tactile Renga 2 has started in September 1999, and is continuing with the same members. In this paper I will analyze the project and discuss what the process meant for the artists. Works can be seen at http://www.renga.com/

- **outline of the Project**

Tactile RENGA is an experimental art project carried by three artists including one who is visually impaired. Applying RENGA method which will be described later, two artists Anzai and Nakamura who digitally paint, exchange images with Mitsushima who paints using tactile sense.

In RENGA method, an image produced by an artist is sent to another artist to be modified into another image. By repeating the process a series of digital paintings are created. Each painting is the result of interaction between an artist's imagination and those of others who preceded.

Digital technology is indispensable in RENGA. Telecommunication and digital image manipulation make possible to extend the limit of traditional art making, as well as extending the limit of the visionary world of an artist. Issues such as the changing notion of originality and identity in art has been raised through the RENGA project.

While there have been a series of RENGA experiments carried with different technique and different guests, a session that involved with tactile paintings was the first case.

Through the session which continued for 10 months, 14 images were produced. Each artist discovered the difference between seeing and touching, and started exploring the limit. At first black and white images were mainly used. Consequently they developed a conversation, literally, on the meanings of color - both via images and email they exchanged.

The session, which was both a collaboration and a challenge between professional artists to bring up images one would not otherwise conceive, eventually became a process of re-discovering the meanings of color. Color started to play important roles in visualizing and communicating one's imagination. Color also became a key for retrieving a lost memory and developing it into an image. (Fig. 1)

In fact, discovery is the essence of RENGA method.

Fig. 1 Memories from the Age of Seven by Mitsushima

2. The method and technology used for Tactile RENGA

Tactile RENGA started with two images sent from Mitsushima to Anzai and Nakamura respectively. This project was conceived as two parallel sessions; one between Anzai and Mitsushima, the other between Nakamura and Mitsushima. Actually the two lines started to mingle later.

Mitsushima made drawings in his style. He cut figures out of adhesive thin sheets of plastic with a knife, and attached them on a piece of paper according to the composition the artist had in his mind. Thin plastic tapes, also adhesive and vary in color and width, would be added to "draw" lines. (fig.2-3) Mitsushima also uses colors according to the concept. These tactile drawings were physically sent to the other artists via normal mail delivery service. Using flat bed scanners these images were digitized. Anzai and Nakamura respectively worked on these images on their computers, inspired by the original drawings and seeked for their own imagination that arose from them. In the process Mitsushima's drawings were decomposed and used in different contexts, or certain part of his image developed into something else.

When digital images were finished, they were translated to tactile forms. Two systems were used for this purpose.

A handy computer-controlled plotter/cutter for design use cuts the same kind of plastic sheets that Mitsushima uses. The hi-tech machine precisely cut the line that separated figures from background, without cutting the lining sheet. A very low-tech work for a human being (namely Anzai) to peel the background off the lining followed. The resulting sheet with figures attached to the lining allowed Mitsushima to "see" the image as well as to use the figures for his work, by peeling them off from the lining.

Fig.2
Fig.3

Figure 4 Tactile RENGA between Mitsushima and Nakamura

The other was a thermal copier which produces black and white embossed prints. A compact low-cost model was used both by Anzai and Mitsushima. As a plotter/cutter output would be destroyed as Mitsushima takes the figures from it, the embossed copy plays the role of a reference copy. Nakamura did not have any of these machines. Her images were sent to Anzai via internet to be processed.

The adhesive plastic sheet and its embossed copy were sent to Mitsushima. Email explaining about the image followed. Usually the conversation was based on telecommunication since they live in different cities.

This process was repeated. As one can see from the images produced, the session which started hesitatingly gradually became more dynamic. Colors and textures started to appear. Mitsushima answered in blue images of brailles to Nakamura's mistaken brailles. Blue is the color Mitsushima knows. Encouraged by the use of color by him Nakamura started to follow her instinct on the use of color.

Fig. 5 Tactile RENGA between Mitsusima and Anzai

3. What happend during Tactile RENGA

Modifying another professional artist's work is psychologically hard for any artist. However, such conflict between respect and challenge makes RENGA interesting. Digital technology allows artists to play - and think - at the border of original and copy.

In this project, the translation from visual form to tactile form was essential. Nakamura felt like the image she made on her computer was the original piece, while the plastic or embossed outputs were just tactile copies for Mitsushima. That was one reason why she started using colors and texture more freely, while Anzai was aware of the final output and remained cautious in using colors. (fig.5-6)

However, when she used colors for the pair of socks because she did not want to compromise after all, she had to explain the colors and their meanings.(fig.7ÅjShe even painted some texture on the heart in the same picture which came from the peach skin, of the peach she ate on the train.

Fig.6 by Anzai
Fig.7 by Nakamura

Fig.8 by Anzai

As she tried to explain she discovered that what she meant with these colors were not merely colors. The pair of socks with vivid colors her grandmother knitted for her, or the soft skin of sweet peach she ate on the train - they are memories accompanied with excitement and warm feelings, also with tactile sense as well as visual or other senses. It was a new way of seeing colors for her. Also, after this experience, the issue of original and copy in different forms (visual and tactile) came back to her. It is also about the relationship between the creator and the appreciator in art.

After Nakamura "violated" the rule, Mitsushima totally surprised Anzai by applying color in a manner that cannot be represented on the 2D screen of a computer (fig.1). Plastic cut-outs are attached to a transparent sheet instead of a piece of paper. The moon is in three layers. A white full moon and a waned moon in his memory before he completely lost sight, are on the different sides of the transparency. Between them is the blue moon, which he knows from stories.

Drawing or seeing a picture by touching is a time-based process, Mitsushima says. It is something he realized through this project by working with other artists, and what now seems important to him. It is a different process from seeing an image.

The three moons in layers in Mitsushima's drawing realize the time-based moon in his memory. The layers have different meanings when seen, touched, and understood as a story.

One can see that images become more and more free with rich contents. Mitsushima also starts using his medical tool to give additional texture. The conversation between visual images and tactile sense went further to liberate one's imagination, triggered by colors.

4. Seeing colors and imaging colors

After this experience, Mitsushima feels his horizon as an artist has expanded. His recent personal works reflect his new approach to memories, and especially to colors.

Perception of color is primarily a physical and physiological phenomenon. But color is also personal, since there is no way of seeing a color in the way another person does. It

is personal from another point of view as well. What a color triggers in one's mind depends on one's memory and the social code. In that sense, color is also a social phenomenon. Tactile RENGA revealed such roles of color in the artists' unconscious way of using it. Furthermore, by re-discovering color in one's mindscape, artists found new expressions of their imagination.

ESTHÉTIQUE ET RHÉTORIQUE DES ARTS TECHNOLOGIQUES
LES MACHINES INTERFACES

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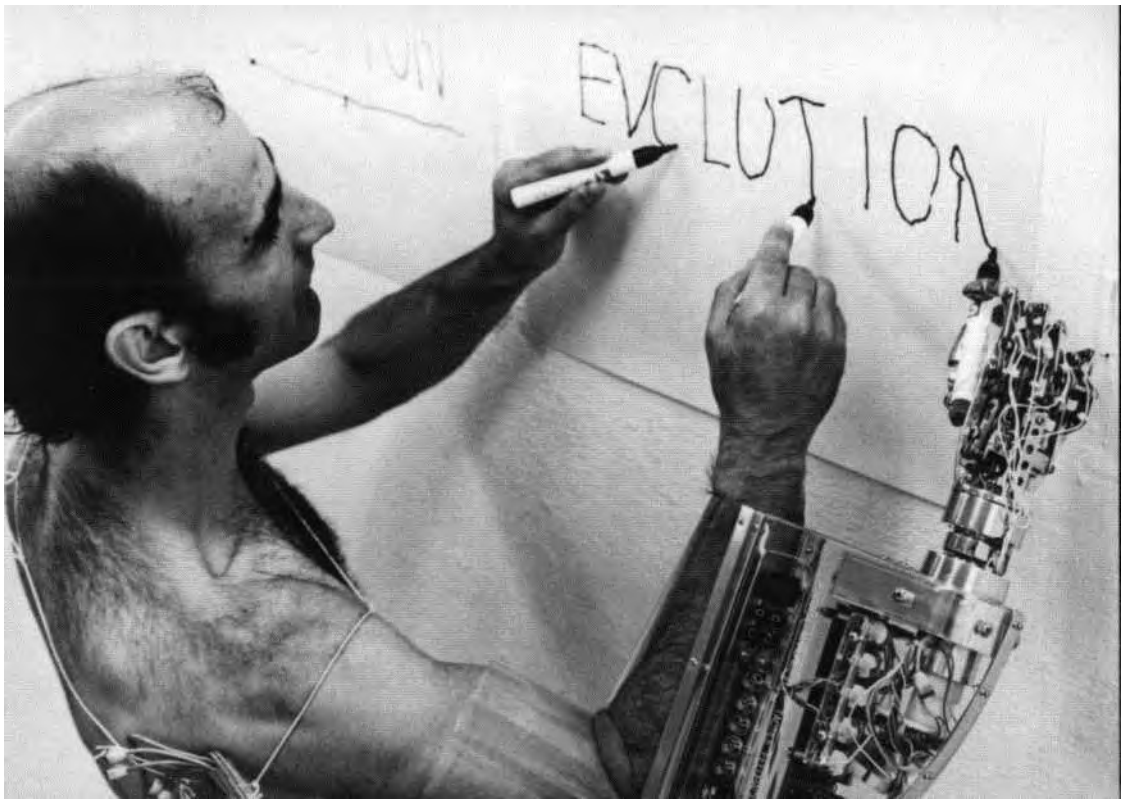

Stelarc - http://www.stelarc.va.com.au/third/third.html

Résumé

L'art tout au long du XX^{ième} siècle à évolué vers une place de plus en plus grande accordée à l'interactivité, la performance, l'installation et la participation du public. L'émergence d'une esthétique des Arts Médiatiques où les réseaux, les machines - interfaces, les capteurs jouent un rôle de plus en plus important dans les processus de création pose les questions du statut de l'artiste et de la nature de l'œuvre. Effaçant les anciennes catégories esthétiques et culturelles les interfaces technologiques, principalement dans les domaines des arts plastiques, se disséminent selon des modalités sensorielles et extra - sensorielles, utilisant des processus multi-modaux où la proprioceptivité, la tactilité, l'émotivité, les attitudes, deviennent formes, nouveaux indices du retour des sens. Les installations multimédias ne reposent plus sur un médium, mais sur des processus en action, en rétroaction, en devenir. On assiste alors, à une disparition du support, du substrat matériel. Où est passée la Peinture, quand les machines se mettent à peindre ?. Que devient l'œuvre d'art à l'ère de sa production numérique ?. Comment ces formes d'art concourent-elles à l'émergence d'une nouvelle esthétique ?. Cette communication répond aux diverses interrogations posées par l'usage des interfaces numériques dans les arts technologiques, au travers de pratiques artistiques contemporaines.

Un constat

À de grands intervalles dans l'histoire de l'art, le mode de perception des sociétés humaines se transforme en même temps que leur mode d'existence. La façon dont le mode de perception s'élabore, le médium dans lequel elle s'accomplit ne sont pas seulement déterminés par la nature humaine, mais par des circonstances historiques, des mutations conceptuelles, des sauts technologiques, des ruptures épistémologiques. La façon d'envisager la matière, l'espace et le temps a considérablement évolué depuis le début du siècle. L'évolution de l'art moderne étant elle-même étroitement tributaire de ces modifications, il convient actuellement d'interroger les relations entre champs artistique, scientifique, technique et technologique. Au seuil du XXI^{e} siècle, les cultures historiques subissent une mue décisive. En dépit d'une longue tradition, les arts classiques ne semblent plus répondre entièrement aux changements de notre société. Pour la première fois émerge un nouveau type de culture, hautement complexe : la culture médiatique et la techno culture, qui combinent le changement des télécommunications, les nouveaux traitements de l'espace et du temps et les mutations épistémologiques et philosophiques, pour susciter l'hybridation de nos systèmes de pensée et de création artistique. Changement de paradigme, le rapport à l'espace-temps se transforme. Bien qu'encore liées à des laboratoires universitaires ou corporatifs, les expérimentations artistiques associées au domaine des nouvelles technologies et du " virtuel " deviennent de plus en plus accessibles au grand public. De productions collectives, ces expérimentations se sont métamorphosées en productions individuelles. Leurs caractéristiques et intentions originelles, privilégiant la participation et l'animation, font maintenant place à une médiatisation axée sur la circulation et l'interactivité entre le lieu, l'artiste, le spectateur et l'œuvre. Contrairement aux installations des années 70 et aux parcours in situ, nombre de ces installations actuelles offrent une panoplie d'expériences sous formes de manipulations, sensorielles et de communications en temps réel.

Ces nouvelles pistes d'exploration et de déterritorialisation s'inscrivent dans une trame qui préfigure des rencontres de plus en plus chaotiques et de plus en plus imprévisibles entre corps et langage, entre lieu immédiat et média, à titre d'espaces communicationnels investis. Ces mutations au sein des fondements mêmes de l'installation ont à voir avec des qualités d'instabilité et de nomadisme, puis avec les potentialités que lui offre le domaine de l'intelligence artificielle. Depuis quelques années déjà, bien des artistes explorent le cyberespace. Ils découvrent des intérêts nouveaux pour des environnements sonores multimédias (sound ecology) ainsi que pour ceux plus métaphoriques des espaces de création partagée. De telles zones apparaissent non seulement comme des espaces de métissage où le corps en action (en performance ou en manœuvre) prend en compte les spécificités d'un site ou d'un milieu de création, mais également comme de nouveaux " territoires " propres au développement d'unequincaillerie numérique'. Ces zones hybrides permettent la construction en temps réel de " machines - interfaces " dont la finalité n'est plus l'installation mais la communication.

Hypothèse

Le savoir et les technologies changent de statut en même temps que les sociétés entrent dans l'age numérique et les cultures dans l'age cybernétique. Cette transformation commence dès le début des années 80. C'est au cours des années 90 que l'on constate une accélération du développement des interfaces numériques. On assiste en effet depuis une vingtaine d'années à un changement de paradigme. Les savoirs scientifiques, technologiques et culturels portent désormais sur le langage. Aux révolutions technologiques d'après guerre qui ont permis la mise en place d'une société de consommation, succède la mise en place d'une société de l'information et de la communication, société post-industrielle où le travail, le savoir faire compte moins que le faire savoir. Les sciences et les technologies portant sur la théorie de l'information, la génétique, les algèbres modernes, l'informatique, les théories linguistiques, les problèmes de traduction des langages et de communication homme/machine via des interfaces témoignent de l'évolution culturelle de notre société. L'incidence de ces transformations technologiques sur la culture et la création artistique est

considérable. Les arts technologiques développant une pratique, un usage des processus interactifs, ils permettent ce jeu sur les formes (œuvres) et le sens qu'on appelle rhétorique.

De l'esthétique en général, des esthétismes en particulier

À tous les stades esthétiques se renouvelle l'antagonisme entre l'irréalité de l'image et la réalité du contenu historique, entre l'imaginaire et le réel. Dans les arts traditionnels, les images esthétiques ne sont pas immuables, ce ne sont pas des invariants archaïques. L'expérience subjective du créateur produit des images qui ne sont pas des images de quelque chose mais des images d'essence collective, bien que ce qu'il nous laisse voir semble, apparence des choses, une forme substance. C'est ainsi que l'art est en relation avec l'expérience des faits, prenant corps dans la réalité technologique du monde où la détermination des œuvres par l'esprit, l'imaginaire est liée à leur définition comme phénomène apparaissant. Rendre visible l'invisible, tel fut le parcours de l'artiste. Rendre invisible le visible et vice-versa, tel, est le parcours actuel de l'artiste contemporain, usant des nouvelles technologies, substituant à la dialectique classique opposant réel et imaginaire une logique ternaire ou le virtuel prend toute sa place. On assiste ainsi à l'ouverture de l'esthétique. À l'esthétique de la forme et du contenu de Hegel, Nietzsche, Wölfflin, Focillon à Greenberg en passant par Panofsky, Ehrenzweigh, s'adjoint des esthétiques relationnelles, communicationnelles, situationnistes, des esthétiques de processus. Ainsi dans les domaines de la création artistique, les princeps esthétiques ne sont plus la forme, le contenu, la mimésis, la vérité, le sensible, le visible, l'unicité, l'état affectif du spectateur et - ou de l'artiste, mais la communication, la surface, l'immersion, l'hybridation, la synthèse, le rhizome, le réseau, le temps événementiel, le temps accéléré, l'uchronie, le flou, le transitoire, l'éphémère, l'ambiguïté, l'identité, l'invisible, la reproduction, le collectif, le nomadisme, la diversité, l'installation, la performance, l'interactivité, la multi-modalité, l'échange, la participation, la circularité.

Esthétique de la forme - Esthétique des processus

Jusqu'à une époque récente, celle des années 60, toutes les modifications esthétiques ont été des manifestations, et manifestes de nouveaux aspects matériels adaptés, transformés, transmises par l'art. Jusqu'à l'époque où la peinture figurative déclina, l'objet représentait une forme, y compris dans le cubisme. La forme est certes médiatisée en soi par le contenu, tout comme le contenu est médiatisé par la forme, mais le contenu d'un tableau n'est pas seulement ce qu'il représente, mais tout ce qu'il contient d'éléments de couleur, de structures, de rapports. De même le contenu d'une œuvre multimédia n'est pas seulement ce qu'elle représente mais tout ce qu'elle met en jeu, de structures, d'interfaces, de distances, de mémoires, de pratiques, d'interactivité, de virtuel. Le concept de forme constitue la tache aveugle de l'esthétique, car l'art tout entier lui est tellement attaché qu'il défie toute tentative pour l'isoler. Cela étant, pas plus que l'art ne peut-être défini par quelque autre aspect, il n'est simplement pas identique ou réductible à la forme. Dans les œuvres modernes hautement élaborées, la forme tend à dissocier son unité, mais reste sous-jacente. Bien avant l'omniprésence de la crise actuelle il y a eu des formes ouvertes, mais jamais dans l'histoire de l'art, la mise en question de la forme n'a été formulée avec autant de force et d'acuité. À l'encontre de la démarche formaliste qui a jusqu'ici prédominé, il convient donc de pratiquer une sorte de phénoménologie des apparences. (Cf. Merleau-Ponty)

Contrairement à la pensée de Hegel, le contenu et la matière ne sont plus sujets à cause de la disjonction factuelle du support par le biais des processus et de la multimodalité. Ce qui est désormais médiatisé dans l'art et qui fait que les œuvres sont autre chose qu'une simple représentation, doit nécessairement être médiatisé par le moyen des interfaces multimodales. Seules de telles relations établissent des corrélations dans le champ des arts médiatiques. L'esthétique relationnelle, partie de l'esthétique communicationnelle se double d'une esthétique des interfaces et de situation, d'un situationnisme où installation et performance s'associent selon des modalités spatio-temporelles variables. Les interfaces technologiques effacent les anciennes catégories esthétiques et culturelles fondées sur la forme et les sens, visuel, auditif, et tactile,

principalement dans les domaines des arts plastiques. Les installations multimédias ne reposent plus sur un médium, mais sur des processus en action, en rétroaction, en devenir, potentiellement présents. Classer ces œuvres d'art selon les media qu'elles utilisent : Vidéo, holographie, images de synthèses, équivaut à mettre en place une taxinomie de la forme et du contenu et développer de fait une esthétique traditionnelle.

Le lieu des interfaces

Depuis des millénaires l'homme à conceptualiser les notions de temps et d'espace sur lequel il ne peut interagir que suivant des lois physiques immuables. La réalité virtuelle lui permet de s'extraire de la réalité physique pour changer virtuellement de temps, lieu et type d'interaction (interaction avec un environnement simulant la réalité ou un monde imaginaire ou symbolique). Cette approche spatio-temporelle interactive nous permet non seulement de développer une taxinomie fonctionnelle des applications de la réalité virtuelle, mais également aux travers des interfaces utilisées, d'en déduire des esthétiques différentes selon les modalités d'actions et d'usage de celles-ci. Le virtuel n'est qu'une modélisation éphémère, n'ayant pas de substance propre, concrètement une base de données numériques, ayant une certaine interactivité avec l'homme. Le virtuel n'a de réalité temporaire qu'au sein de la machine informatique et des interfaces. L'espace virtuel peut-être euclidien mais non nécessairement. Il peut être paradoxal. En particulier l'unicité de lieu est remise en question par la télé virtualité, où plusieurs utilisateurs distants peuvent se retrouver à partager un espace virtuel commun, sensoriellement et cognitivement... Celui-ci pouvant entre autres, être perçu différemment par chaque personne comme dans la réalité concrète. Réel et virtuel s'entremêlent, fusionnent grâce aux "machines - interfaces", définissant de nouvelles formes interactives où le réel, l'imaginaire et le virtuel s'expriment. Ces nouveaux espaces de représentation, liant le visible au caché, nous les trouvons notamment dans des œuvres plus traditionnelles des années 70, celles notamment des artistes du Groupe Supports Surfaces, comme celles de Buraglio qui nous montrent la duplicité de l'image, mais également dans des œuvres contemporaines : *"Le salon des ombres"* de Luc Courchesne, *"Shadow server"* de Kenneth Goldberg et *"Télénoïa"* des Quarks.

"Le salon des ombres", théâtre interactif créé en juillet 1997 met en scène quatre personnages virtuels. Dans *"le salon des ombres"*, les spectateurs pénètrent à l'intérieur d'une pièce sombre dans laquelle flottent, comme des fantômes, quatre personnages, quatre amis réunis dans une galerie d'images vidéo, projetées du plafond et apparaissant dans l'espace, réfléchies sur des plaques de verre. Chaque personnage correspond à un poste d'interaction.

Au début de la représentation, les personnages discutent entre eux, sans se soucier de l'audience, jusqu'à ce qu'un spectateur intervienne en posant une question à l'un d'entre eux par l'intermédiaire d'un écran tactile. Le personnage lui répond oralement, puis peu à peu le débat évolue vers de grandes problématiques existentielles, où chaque personnage, réel ou virtuel, prend position. La performance dure quelques minutes, au bout de laquelle les personnages disparaissent, ayant pris conscience de la virtualité de leur existence. L'enjeu de cette installation étant de créer une véritable "synergie de groupe, une microsociété démocratique" où les affaires politiques sont débattues en temps réel. *(Cf. Luc Courchesne, "Le Salon des Ombres", Nov'art, "les états généraux de l'écriture Interactive", février 1997, page 8-9).*

* Cette question de la réalité, ou de la vérité, est au cœur de *"Shadow server"* http://taylor.ieor.berkeley.edu . Créé en juillet 1997 par l'artiste américain Kenneth Goldberg *"Shadow server"* est un *"délivreur d'ombres"*. Il renvoie à l'allégorie de la caverne de Platon. En Californie, une boîte contient divers objets éclairés par des dispositifs lumineux. Le public peut agir à distance, par l'intermédiaire du web, sur les sources lumineuses et produire ainsi des ombres différentes qui s'affichent alors sur son

écran. Quelle est la nature de ces "choses" que nous avons sur le web ? Que croyons-nous avoir : des choses ou seulement leurs ombres ?

"Shadow server" est une œuvre remarquable à plus d'un titre. *"Shadow server"* retourne le questionnement et les mots d'ordre de ces dernières années dans l'art électronique. Elle ne rend pas "visible l'invisible", mais rend invisible ce qui normalement est visible, n'offrant que des ombres. La "chose" elle-même est cachée. Ce qui est important, c'est l'ombre. L'ombre devient la chose. Goldberg renforce ici la disparition de l'objet dans l'art, amorcée au début du siècle. Ces images font penser aux photogrammes de Moholy-Nagy. Elles captent la lumière de manière subtile et la porte sur l'écran. Elles réintroduisent la contemplation dans un média où le flux et le mouvement sont les bases de la création.

* L'interactivité, entre plusieurs personnes et la création collective, est une autre dimension explorée par les arts médiatiques. Télénoia (Mind at large) œuvre collective, créée le 31 octobre 1992, initié par Roy Ascott, fut entrepris à partir de collectifs d'artistes : V2_Organisation (Hortogenbosch), Café électronique (Santa Monica), Mac Luhan Center (Toronto), Zeronet (Vienne), GRAM (Montréal), CAIIA (Bristol), N.York, Vancouvert, Virtualistes, et les Quarks du GRIP (Paris). Bien que l'évènement ait généré des quantités de données sous formes d'images, de fax, de musique, celui-ci était largement interactif en faisant intervenir plusieurs artistes dispersés à travers l'Europe et l'Amérique. À cette occasion, une *"peinture en directe"* de grand format fut réalisée par l'intermédiaire d'une machine à peindre en réseau http://www.ensad.fr/~longa/fete, dans le prolongement du *mail art* où plusieurs artistes de la vidéo et des arts médiatiques ont formé des réseaux interurbains et internationaux. Certains ont utilisé des véhicules classiques telle la poste ou le téléphone. D'autres ont prospecté du côté de la transmission par satellite ou par câble. Sherrie Rabinowitz et Gene Youngblood ont organisé des performances se déroulant simultanément aux états Unis et en URSS, reliées par satellite pour l'évènement. Doug Bag, Norman White et toute une équipe ont développé à partir de Toronto plusieurs formes de réseaux.

Le temps des interfaces

Tout comme, l'interface s'installe dans un lieu, elle s'inscrit dans le temps. Le temps de la réalité virtuelle est une dimension importante mise à disposition du créateur. Il peut ralentir, accélérer le temps pour mieux l'appréhender (simulation de croissance des plantes ornementales en vue d'une étude esthétique ; simulation du vieillissement ou inversement). Les interactions dans le monde virtuel des objets, des entités se font par leur forme visuelle, tactile, auditive, principalement. Elles sont de types sensorielles et comportementales. Nous pouvons ainsi par notre corporalité, notre attente, nos attitudes, troubler ce monde virtuel et 30 ans après, donner tout son sens à cette belle exposition " *Quant les attitudes prennent formes* "

Avant d'être technologique l'interface est essentiellement un lieu, une marge, une zone d'articulation de communication, d'interrelations spatiales et temporelles entre deux conceptions du monde, une zone de friction et d'échange de deux espaces dont la rencontre oblige à faire l'expérience étrange d'une dissociation de soi-même comme en 1972 dans l'installation '*Interface'* de Peter Campus. L'image du spectateur qui s'approche au centre de la pièce dans la zone de lumière se reflète sur une grande vitre placée dans un espace obscur. En même temps son image vidéo prise par une caméra placée de l'autre côté de la vitre s'y projette. La vitre devient à la fois miroir et écran. Elle est le lieu d'une coexistence entre deux représentations. Elle est l'interface.

Cependant les interfaces se sont diversifiées avec le développement des technologies numériques. Les artistes explorent non seulement les espaces réels mais également les espaces virtuels où les spectateurs s'immergent totalement dans l'univers recréé. Comme l'exprime Nam June Paik dans '*quelques notes sur les médias interactifs*' - *Revue virtuelle n°12, novembre 1994-janvier 1995*, commentant la très belle œuvre d'Edmond Couchot '*Je sème à tout vent*' " le visiteur peut souffler

dans un petit trou et voir à l'écran une fleur de pissenlit se disperser en fonction de l'intensité du souffle … .L'œuvre de Jeffrey Shaw consiste en une bicyclette couplée à un écran vidéo. En fonction de l'impulsion donnée sur le pédalier, le visiteur, promu promeneur cycliste, se déplace dans un décor mouvant….. " Ces interfaces paraissent faciles d'accès et naturelles, car l'artiste utilise des éléments ordinaires qu'il place dans un décor naturel. L'interface devient transparente. L'interface participe de la transformation du regard, de la valeur d'exposition, comme de la valeur d'échange. Son rôle est tel, que l'interface choisie peut avoir selon Anne-Marie Duguet, " …des conséquences radicales comme l'abolition du cadre avec des lunettes de visualisation, annulant de ce fait la notion même d'image au profit de celle de scène… "

Face à la multitude d'applications potentielles, une **taxonomie fonctionnelle** des interfaces est nécessaire. Elle s'inscrit dans un contexte d'échange d'informations entre monde réel et virtuel de propriétés spatiales, temporelles et interactives. Elle se caractérise par des typologies définies à partir de leurs propriétés physiques et valeurs d'usage comme le suggère Annick Bureaud proposant :

- Les interfaces d'accès aux œuvres (le web), utilisant la technologie disponible sans questionnement artistique particulier : - **Waxweb** de David Blair
- Les interfaces utilisant la technologie disponible avec un questionnement artistique : **Shadow Server** de Kenneth Goldberg
- Les œuvres construites autour de leur interface. - **A-Volve**
- Les interfaces conçues spécifiquement pour une œuvre : **Machine à peindre**

Taxonomie des interfaces

Cette taxinomie basée sur les fonctions intrinsèques de la réalité virtuelle, domaine d'application des interfaces numériques, nous permet de mieux comprendre les esthétiques mises en jeu au travers des installations et performances ou autres proposées par les artistes.

Trois possibilités de changement induisent des états différents dans le domaine spatial, temporel et interactif. Ce postulat fait allusion à l'exigence inverse des auteurs des tragédies du XVII^{e} siècle prônant la règle des trois unités de temps, de lieu et d'action. Ces potentialités théoriques, non utopiques permettent de comprendre non seulement les esthétiques associées aux œuvres dites de nouvelles technologie, mais également de mettre en place une rhétorique des interfaces.

- Déconnecté du temps présent T_0, l'utilisateur peut se mouvoir dans le passé T_- ou le futur T_+
- Il peut désirer se projeter soit dans un lieu inaccessible - lieu géographique ou espace microscopique par exemple $L_{\neq}$, soit s'associer à plusieurs dans un lieu virtuel L_U. La notation L_0 indique que le lieu est inchangé ou indifférent pour l'application envisagée.

- La réalité virtuelle crée des interactions soit dans un monde simulant la réalité I_r, soit dans un monde imaginaire ou symbolique I_i, la notation I_0) indique que les interactions se font dans le monde réel.

La réalité virtuelle implique des interactions I_r ou I_i. Il en découle que la télé présence et la télé opération (interactions à distance avec un monde réel (1_0* T_0* L_0) ne font pas intrinsèquement partie de la réalité virtuelle, même si elles exploitent des interfaces de mêmes types. Une remarque identique s'applique aux télécommunications par téléphone, visiophone ou vidéoconférence classique (I_0* T_0* L_U) pour lesquels une esthétique particulière de la communication est envisagée (*Cf. Manifeste pour une esthétique de la communication* - Fred Forest ± 0, N°43, 1985). Il y a théoriquement $2x3^2 = 18$ combinaisons possibles pour les deux classes I_r et I_i, mais l'association de plusieurs utilisateurs L_U ne peut se faire qu'au présent T_0, d'où 4 combinaisons qui ne peuvent être envisagées :(I_r+I_i)*L_U* (T_-+ T_+).

Nous distinguerons 12 formes esthétiques correspondant aux productions artistiques actuelles, selon leur insertion :

Dans un monde simulant la réalité

L'objectif de ces applications est d'offrir la simulation de la réalité pour mieux l'appréhender. Les canaux sensoriels exploités dépendent de l'application souhaitée.

- $I_r*T_0*L_0$ **Activité virtuelle :** Le lieu et le temps étant différents, le spectateur agit physiquement sur une scène virtuelle pour son plaisir, ses loisirs. L'utilisation du multimédia est suffisante, le lieu et le temps étant indifférents.
- $I_r*T_0*L_{\neq}$ **Transfert virtuel :** Le spectateur est transporté dans un lieu ayant une scène simulant le réel pour ses loisirs, ses activités. Le temps est indifférent.
- $I_r*T_0*L_U$ **Télé-association virtuelle :** L'association de plusieurs personnes dans un lieu virtuel permet à celles-ci de se rencontrer. (Téléconférence avec outils de réalité virtuelle, ville virtuelle)
- $I_r*T_+*L_0$ **Conception virtuelle :** La réalité virtuelle permet de concevoir et d'expérimenter des situations - Architecture virtuelle, conception de vêtements, d'objets, de sculptures...
- $I_r*T_+*L_{\neq}$ **Aménagement virtuel** : Même possibilité que pour la conception virtuelle, mais concernant les espaces à aménager. Conception d'environnement urbain, paysagiste, pictural
- $I_r*T_-*L_0$ **Exposition virtuelle** : Il s'agit dans cette application de recréer et d'observer des objets qui n'existent plus.
- $I_r*T_-*L_{\neq}$ **Evénement virtuel** : En recréant d'anciens événements, on permet à l'utilisateur de mieux les appréhender, les comprendre.

Dans un monde imaginaire ou symbolique

L'objectif de ces applications est de proposer au spectateur, soit des mondes imaginaires à des fins ludiques ou artistiques, soit des mondes symboliques pour concrétiser des phénomènes, des concepts grâce à des métaphores.

- $I_i*T_0*L_0$ **Création virtuelle :** La réalité virtuelle permet de créer soit des œuvres d 'art éphémères et en interaction avec le spectateur, soit avec des métaphores - Art virtuel, vie artificielle…..
- $I_i*T_0*L_{\neq}$ **Musée virtuel :** Regroupement d 'œuvres d 'art virtuelles. Création d 'un musée virtuel
- $I_i*T_0*L_U$ **Télé virtualité :** Relation entre plusieurs utilisateurs par l'intermédiaire de clones - Communauté virtuelle
- $I_i*T_+*(L_0+L_{\neq})$ **Science-fiction virtuelle :** L'utilisateur est projeté dans un monde réel futur. (Œuvre virtuelle, jeux virtuels)
- $I_i*T_-*(L_0+L_{\neq})$ **Passé imaginaire virtuel :** L'utilisateur est projeté dans un monde irréel et passé

Typologies des interfaces

Spontanément l'image qui vient à l'esprit, lorsque l'on parle d'interface numérique, c'est celle d'une personne équipée d'un visio-casque et d'un gant de données, ou d'une manette de jeux, reliés par des câbles à un ordinateur. Cette image est véhiculée principalement par les médias. Cette représentation de l'interface n'est pas tout à fait exacte, mais elle a le mérite de nous montrer qu'il existe entre l'homme dans sa réalité quotidienne et les mondes virtuels, des ensembles, des techniques fondées sur l'interaction. L'interactivité n'est pas nouvelle, ce qui est nouveau, ce sont les processus mis en jeu au travers des interfaces comportementales de type multimodale pour nous permettre l'immersion en temps réel dans une réalité augmentée associant le réel et le virtuel. On classe les interfaces multimodales selon leurs caractéristiques sensorielles (capteurs) qui informent l'utilisateur par ses sens de l'évolution du monde virtuel, ou leurs caractéristiques motrices (effecteurs) qui informent l'ordinateur des actions motrices de l'homme sur le monde virtuel.

Les interfaces matérielles de la réalité virtuelle, ou interfaces comportementales, peuvent êtres classés en Interfaces Sensorielles (IS) et Interfaces Motrices (IM). Mais un seul type d'interface sensorielle ne correspond pas simplement à chaque sens. Certaines interfaces matérielles peuvent coupler une interface sensorielle avec une interface motrice : ce sont des interfaces mixtes. Nous retiendrons la classification suivante :

Interface sensorielle (IS)

- Vue : Interface visuelle (écran et visio-casque)
- Ouie : Interface de synthèse sonore - Interface de synthèse vocale
- Sensibilité cutanée : Interface à retour tactile, à retour thermique
- Proprioception : Interface à retour d 'effort - simulation de mouvement

- *Remarque : Les trois domaines de la proprioception ou sensibilité profonde sont les sensibilités à la position dans l 'espace, au mouvement et aux forces exercées sur les muscles. Les deux premiers domaines correspondent au sens kinesthésique*

Interface motrice (IM)

- Localisation : Capteur de localisation
- Localisation de la main : Gants de données
- Localisation des yeux : Oculomètre
- Locomotion : Interface délocalisation du corps et combinaison de données.
- Parole : Interface de commandes vocale
- Action musculaire : Capteur d'effort

Importance de la transmission des informations

- La transmission des stimuli sensoriels et des réponses motrices affectent les interfaces dans leurs fonctions selon que la transmission est avec support matériel (a.s.m) ou sans support matériel (s.s.m). Deux catégories dépendent de l'organe sensoriel concerné :

Interface visuelle

- IM : Mouvements de la tête détectés par les ondes électromagnétiques, acoustiques (s.s.m) ou mécaniquement (a.s.m)
- IS : Ondes lumineuses captées par les yeux (s.s.m)

Interface auditive

- IM : Mouvements de la tête détectés par ondes électromagnétiques, acoustiques (s.s.m) ou mécaniquement (a.s.m) - Parole (commande vocale) transmission par l'air des ondes acoustiques (s.s.m)
- IS : Sons et paroles (synthèse vocale) transmis aux oreilles par les ondes acoustiques (s.s.m)

Interface à retour tactile

- IS : Transmission mécanique sur le peau (a.s.m)
-

Interface proprioceptive *(retour d'effort et simulation de mouvement)* :

– IS : Transmission mécanique sur le corps (a.s.m)

Interface de localisation :

– IM : Mouvements corporels détectés par ondes électromagnétiques, acoustiques (s.s.m) ou mécaniquement (a.s.m)

Les interfaces à retour tactile, à retour d'effort et à simulation de mouvement du corps soulèvent des difficultés techniques importantes pour leur réalisation car elles doivent transmettre les informations sensorielles par l'intermédiaire de supports matériels. L'usage de ce type d'interfaces induit une esthétique comportementale de type Installative et - ou _Performante

Conclusion

Lyotard, naguère, rappelait que la fonction de la critique ou de la théorie consistait à transformer " les toiles " ou tableaux en " mots ". Il insistait ce faisant sur la fonction créative de la théorie esthétique qui ne se contente pas uniquement d'inventorier et de répertorier, mais reconstitue le monde, à sa manière qui est celle du langage. Cette fonction semble désormais dévolue aux artistes contemporains qui utilisent et manipulent les interfaces technologiques mises à leur disposition. Leurs matériaux comme les formes sont des processus et langages. Critiques autant qu'artistes, leurs œuvres hybrides sont autant d'esthétiques qui interrogent le monde. Une nouvelle histoire de l'art semble s'esquisser. "*Une autre histoire de la peinture est possible, disait R.Barthes, qui n'est pas celle des œuvres et des artistes, mais celle des outils et des matières ; pendant longtemps, très longtemps, l'artiste, chez nous, n'a reçu aucune individualité de son outil : c'était uniformément le pinceau ; lorsque la peinture est entrée dans la crise historique, l'outil s'est multiplié, le matériau aussi ; il y a eu un voyage infini des objets traçants et des supports ; les limites de l'outil pictural sont sans cesse reculées….*".(*L'Obvie et l'Obtus, p.194-195*). Il s'agit désormais de transformer en mots, une matière dense, charnelle, épaisse, et de participer ainsi à sa mise en scène, jusqu'à cette invisible pureté du concept par des allers et retours liant le réel au virtuel.

Les artistes de cette fin de siècle ne se distinguent pas particulièrement des plus grands noms des siècles passés. Les plus marquants ont été précisément ceux qui ont pu introduire des techniques et des matériaux nouveaux. Tout comme le souligne justement Mario Costa, ¨*L'histoire des arts est essentiellement l'histoire des moyens techniques, de l'émergence de leurs possibilités spécifiques de rendement, de leur capacité multiforme d'hybridation, de leur influence et de leur réaction réciproques, de leur triomphe et de leur décadence*¨. Les ressources technologiques d'une époque déterminent des épistémès mais aussi bien des formes artistiques. Les nouvelles technologies ne sont pas du tout étrangères à certaines préoccupations dominantes en art : elles favorisent la communication, elles sont souples et adaptables à des considérations subjectives, tout comme elles permettent d'atteindre un large public. Mais, surtout, leur nature polymorphe favorise la créativité. Le domaine des arts, historiquement si proche du pouls d'une civilisation, ne peut rester imperméable aux transformations du cadre instrumental, matériel, immatériel et logique, qui caractérisent notre époque.

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A MONTAGE OF AN INTERACTIVE MOVING IMAGE

A Study at the Crossing Point of Film Theory and Art Philosophy in the Framework of Pragmatism

BY MARIKKI HAKOLA

THE FIRST STEPS OF INTERACTIVE MOVING IMAGE IN A CHANGING MEDIA CULTURE

The technical solutions of producing and distributing the digital moving image are developing fast globally. At present, interactive cinema is taking its first steps in information networks, and digital television, with its new services, will replace the analogue television system entirely before long. The borders of traditional media are disappearing, as seen both from the technical and communicative perspective. The consumer will use more and more information and media services, such as interactive cinema services available in the digital information networks in future.

The cinema as an audiovisual form of art will undergo significant changes in the next few years. Today in the Internet we find only the first experiments based on interactive cinematic expression. The development of interactive cinema is far slower in its cultural process than in its technical development. Changes in the contents, form and narration of interactive cinema require extensive changes in the cultural and social media sense on the deepest levels of conveying, expressing and understanding messages interactively.

In the long run, it is essential for the film spectator that interactive cinema offer markedly more interesting and fascinating experiences than the traditional, linear moving image. So far, we can only estimate what kinds of changes the new information technology and cultural phenomena will bring to the consuming conventions of the cinema audience. We can assume that these changes will be significant. With the development of interactive cinema, the spectator becomes an active participant, who at his or her best affects considerably the contents of the movie, editing the audiovisual experience in the direction s/he wants.

The opportunities of expression and the new kinds of cinema services of digital network technology also change significantly the status, role and tasks of a filmmaker in the production and consumption value chain of the moving image. The challenges set for the filmmaker, as well as for film research via digital information technology, seem to be of the same scale as the challenges of newborn cinema over a hundred years ago.

The filmmaker’s central ideas and actions focus on developing and producing new cinematic content and expression. This is also the main job description of the interactive filmmaker. There is no advance knowledge or experience to help with the work of interactive filmmaking. Ultimately, the filmmaker can only proceed by making different kinds of experiments and assessing the results on the basis of the consciousness and criteria developed through other cultural and social activities. No development of a cultural phenomenon starts from zero, but inevitably relies upon a previous, already existing cultural manifestation. This applies similarly to the development of interactive film.

The interactive moving image is taking its first steps relying on linear, classical forms of cinema, TV culture and the conventions of expression and experiencing related to them. Professor Lev Manovich has shown with his research that the formal expression of digital media culture is in fact a continuum of the conventions familiar from film narration[vii]. However, we can assume that gradually the expression of interactive cinema will expand to directions not experienced as of yet, the essence of which we cannot even imagine today.

The makers of experimental, interactive moving images are important forerunners in developing new expressions and contents of interactive cinema. The form of interactive cinema cannot be developed without brave, sometimes even irrational, experiments and prototypes. Those who experiment with interactive forms may have a crucial role in the broader general development trend of digital media culture.

New, effective concepts related to the structure, narration and form of interactive cinema are filtered through the interaction of the audience and cultural evolution from different experimental projects.

THE MONTAGE OF AN INTERACTIVE MOVING IMAGE

In my research, I study film montage in the special case of interactive moving image and as a creator of cinematic meaning. The development and analysis of new forms of montage enable us to understand the central issue of interactive expression in a broader sense – interactive narration. The issue of new forms of montage expands to a challenge to develop a theory of new interactive and non-linear film narration.

In a book *Film as Art* Rudolf Arnhem introduces principles of montage[viii], which also include the main points of early Russian film makers and theorists Pudovkin and Timoshenko. In linguistic semiology pointed out by Jean Mitry and Christian Metz[ix] i.e., montage is defined as organizing individual audiovisual, cinematic elements into a linear unity. Through montage, the individual cinematic elements form together understandable, cinematic language. Montage is regarded as a kind of syntax of film, in which the organization of the audiovisual elements corresponds to sentence analysis or the linguistic code of a natural language.

These linguistic theories of montage do not, however, extend far enough to cover the new forms of film narration due, on one hand, to the interactivity, on the other, to the non-linearity. Linguistics is an inadequate basis for studying the form of cinema expanding from time-related continuum to time and space-related and active experience. The research that concentrates on the linguistic essence of cinema and formation of meaning, is not enough to explain the complex cognitive action of interactive cinematic experience. It is not possible to outline the basis and motifs for the concrete action of the spectator, which is essential in understanding the interactive experience according to linguistic semiology.

If the concept of montage is used to describe the formation of cinematic meaning in interactive and the non-linear moving image, the concept of montage must be studied from a new perspective, expanding the concept to cover the problematics brought with the theory of interactivity.

An interactive film may be both linear and non-linear in its presentation form. Even though the cinematic material was organized in a non-linear form for the spectator, the experience of watching is always a linear process in time and space. On the other hand, human experience is always interactive by its nature. I study those forms of the interactive moving image where the existence or action of an audiovisual work of art is dependent upon the

spectator's active physical participation, participation that surpasses that generated only on the level of mental experiencing.

The theory of interaction applies not only to the moving image, but to all forms of human expression and communication. The question of interaction is at the same time a larger question of human consciousness. This philosophical point helps us to study and develop the theory of interactivity in a larger cultural context, which is more important considering that different forms of expression are in a strong mutual integration process.

Neither the theory of cinema nor the theory of interactive cinema can be studied solely in the discourse of film theory because it most probably leads to a too limited definition of potential viewpoints regarding its future development.

PRAGMATISTIC SEMIOTICS

An important support to my process of studies on the field of interactive cinematic narration is given by philosopher Charles S. Peirce. Peirce´s work, in my opinion, plays a significant role in developing a theory of interactivity. Peirce's pragmatism, semiotics and epistemological views open new, interesting perspectives on the study, especially regarding the cognitive and semiotic character of interaction and its relationship to the question of consciousness[x].

I have been studying Peircean pragmatism under the enthusiastic guidance of Peirce-scholar, philosopher Pentti Määttänen, whose work is of great significance to my studies. According to Määttänen, Peirce´s goal was to enlarge the concept of experience by means of action[xi]. In Peirce´s pragmatism beliefs come from our habits. The human being and the surrounding world are not separate entities from each other, but human existence occurs in a constant interaction between the human being and the world.

Also experiencing is not merely the perception of phenomena in the phenomenological sense, but is cultural action, on both a mental and a physical level. According to Peirce, the boundaries of consciousness are defined not only through perception, but also through action. This presumption is significant and interesting from the viewpoint of interactivity. Peirce's idea about action, as a marker of the boundaries of consciousness, is a fundamental condition for interpretations of information.

From the viewpoint of art theory, Peirce´s assumptions mean that a work of art is not only an object of perception and that the experience is not only an inner, psychological reflection, but that experiencing a work of art is a psycho-physical, cognitive activity. Furthermore, experiencing art is not solely a private, relative interpretation of an individual consciousness, but a collective, cultural and social co-experience, where both the artist and the audience are involved.

Peirce's writings have also had a strong influence on those of philosopher John Dewey. In 1934 Dewey published the book *Art as Experience*, in which he extensively studied the essence of work of art from the pragmatist philosophical point of view. According to Dewey, a work of art is not a separate object from the spectator. Dewey thinks that each art has its own medium and that medium is fitted for one kind of communication and language[xii]. Dewey asks where art actually happens and claims that art exists not in the object of art. Art is not oil on canvas or notes on a sheet of paper, neither is it light and shadow projections reflected on a white surface. Dewey thinks that art happens in the process of experiencing art.

The conclusion is that the art experience is the actual work of art, and the work of art

happens in an interaction between the human being and the object of art. The interpretation of an art experience is ultimately always a process happening within the spectator. There is, however, a great difference between the work of art whose existence requires physical and concrete activity through a human-computer-interface, and the work of art where the spectator's physical performance is not needed.

Hyperformat multimedia works are primarily a result of the user's concrete, physical action. Without this physical experience, the mental experience would not be possible either. An interactive cinema producer has to take into account, besides the mental interaction, also the physical performance and involvement of the spectator.

HYPERMONTAGE

Following the ideas of Peirce and Dewey, we can argue that the formation of interactive cinematic expression, and the spectator's interaction with the work, happens in the first instance through montage. Montage is, in a semiotic sense, an essential key to the formation, processing and interpretation of cinematic meaning. The question is, what kind of concept of montage is needed when montage becomes an essential part of a human-computer-interface?

I have applied a new concept of montage, which I call *hypermontage*, to express the enlargement of tasks and the character of montage functioning in multimedia. Hypermontage is a concept for construction and modeling audiovisuality in a virtual space, and a semiotic interpreter of the cinematic human-computer-interface. Hypermontage is a formation of meaning in a non-linear information context.

Hypermontage works both in time and space. In a non-linear moving image, the content is organized by the means of hypermontage into a kind of action-space. This action-space forms the cinematic architecture of multimedia. It may contain time-based, cinematic elements, as well as other forms of information, such as spatial elements and text. The action-space awaits and allures the spectator into interactivity. The spectator’s physical action is a fundamental condition of interaction with the work for establishing the levels of experiencing and interpreting it.

Hypermontage is a tool for producing and processing the cinematic meaning of the moving image in a complex, multi-layered multimedia. The maker of the non-linear moving image is no longer "the master of the universe" of her/his work. And the spectator is not anymore just the one watching or perceiving the work of art. Depending upon the character of the work and the diversity of interaction, the spectator – or interactor – is more or less the co-author or co-maker of the work. This does not mean that the responsibility of the artist is diminished. It means rather that the artist's role, tasks and challenges are changing radically from those of the individual thinker or "art transmitter" to those of one elaborating the levels for participation in a social experience of art.

NOTES

[1] Manovich, *Cinema as a Cultural Interface*
[2] Arnhem, *Film as Art*, p. 94.
[3] Aumont, co., *Aesthetics of Film*, p. 142-43.
[4] Määttänen: *Filosofia*, pp. 199-201.
[5] Peirce, *Peirce on Signs*, ed. James Hoopes, 1991.
[6] Dewey, *Art as Experience*, p. 106.

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INTERCONNECTIVITY AND RELATIONAL EMBODIMENT IN ART AND DESIGN

BY ELISA GIACCARDI

In this paper I will argue that, within the scenario of the ever more pervasive use of computers, the aesthetics of user experience and the relational paradigm experimented within interactive arts enable new categories of human-computer interaction to be imagined and investigated and fresh and creative new approaches to design to come up. A non-substantial development of human-computer interaction gives to the design of interactive systems the scope, depth and complexity demanded by a society that will become more and more involved with information technology and network connections.

Envisioning interconnectivity

In a world of inhabitable and wearable computing, made of wireless connections, smart and transparent interfaces and molecular technologies, interconnectivity[76] will bring us towards a reality composed of multiple and connected space/time, materials and entities. Whereas other technologies will change our body (our genetic, physical and perceptual being), the technology of interconnectivity will change the way in which we experience a new 'natural' environment, the human social world, and the self. Interconnectivity, modifying our relational mode of being, will change the way in which we enactively produce our world and our consciousness.

This paragraph addresses interconnectivity in the light of the scenarios for networked applications enabled by pervasive computing, "environments created when computing power and networked connectivity are embedded in virtually every device humans use"[77]. According to David Messerschmitt[78], networked computing can be summarized in the following three trends:

- mobility (computing anywhere)
- ubiquity (computing everywhere)
- embedding (computing within)

This means that networked computing is becoming more and more pervasive; "unobtrusively sprinkled throughout the physical environment"[79] and increasingly available when and where needed. It means that most everyday products and materials (from appliances to fabrics), and most everyday environments (from home to urban areas) will have computing, network connections and artificial intelligence or artificial life forms within.

Sharp Electronics Corp. has recently announced a convection microwave oven that downloads recipes and automatically sets the time, adjusts the power, and cooks the food. In turn, General Electric has announced a net-connected refrigerator with bar-code based food tracking and reordering capability. As John Thackara ironically says: "Ubiquitous computing spreads intelligence and connectivity to more or less everything. [...] You name it, and someone, sooner or later, will put a chip in it."[80]

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[76] Interconnectivity comes from “interactivity” plus “connectivity”. By this word, I mean both the ability to interact with machines, humans, or other thanks to the mediation of networked computers, and the dimension of a continuum of connections and potential interactions.
[77] Agoston, Ueda and Nishimura, 2000, p. 1.
[78] Messerschmitt, 1999.
[79] Ibidem, p. 8.
[80] Thackara, 2000, p. 3.

But pervasive computing is not just about smart appliances and devices. One of the fastest growing industrial sectors in telecommunications is, for example, medical telematics. As John Thackara notes, "pervasive means everywhere, and that includes also our bodies"[81], so much that "the space where 'human' ends, and machine [or software] begins, is becoming blurred."[82]

According to market predictions, between 2005 and 2010 companies will be technically able to make amazing things. But the question is: how will our lives change?

The integration of physical and networked electronic spaces will generate hybrid realities, which will become our habitat. In view of recent developments in scientific and technological research, we may foresee that all areas of our lives will be networked and blurred by pervasive computing: the physical, the biological, the human and the artificial. Reality will be composed of multiple and connected space/time, materials and entities that will engender a more 'populated' social world, while the self and the consciousness will emerge from new and more complex relationships and negotiations.

According to the enactive approach of recent cognitive science[83], we produce our world and our consciousness through our experience, more precisely through our relational embodiment in the environment in which we live. Evan Thompson argues:

[T]he mind does not internally represent an independent external world, but rather it enacts a meaningful world through embodied action. To say that cognition is embodied means that it depends upon the perceptual and motor capacities of our bodies, and is intertwined with the environment.[84]

This means that individual human consciousness is "a relational mode of being of the whole person embedded in the natural environment and the human social world"[85].
If we scientifically state that cognition is an embodied action that has no ultimate foundation or ground beyond its physical, biological and cultural history of relational embodiment, and that consciousness is therefore inherently intersubjective, then we must recognize that pervasive computing is not merely a technological innovation. The impact of the changes produced in our lives by a widespread and finely grained interconnectivity must be responsibly taken into account.

Are the principles of human-computer interaction adopted by the designers and activity modellers of high-tech companies scientifically and historically appropriate to the new trends?

According to Andrew Feenberg, the way in which nowadays technology acquires meaning and significance is due to the interconnections between different technologies in a network that imposes a specific way of life. He calls the work of making these connections "system-congruent design":

The intricately interlocking network or system of technologies appears value-free but in fact inducts us into a normative framework as we adapt to it in our daily activities. The unending chains of dependencies arising out of everything we use, [...] our way of life, our very gestures are programmed by our artefacts with a rigidity that has no precedent. [86]

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[81] Thackara, 2000, pp. 4.
[82] Thackara, 2000, pp. 5.
[83] See Varela, Thompson, and Rosch, 1991 for the original presentation of the theory.
[84] Thompson, 1999, p. 2.
[85] Ibidem.
[86] Feenberg, 1995, p. 228.

It is expected that pervasive computing is going to reinforce and empower old and new interconnections within the network created by "system-congruent design"[87]. In turn, it is likely that "system-congruent design" peculiar to pervasive computing is to model our experience[88] with powerful tools. Looking to the future, reasonable questions arise: to what extent will we have control over the horizons of our daily life? Will we be able to play creatively with the alternative and unknown worlds and ways of being that technology seems to offer to us? If we will, what new ethics will belong with a creativity extended to such a degree?

There is no doubt that we are developing transformational technologies and that pervasive computing and networked-based applications will be a form of social engineering and cultural experimentation. Facing this scenario, the challenge is to define a way of life, not to obtain more goods as in the prevailing socio-economic model[89].

INTERCONNECTIVITY IN ART AND THE AESTHETICS OF USER EXPERIENCE

The aesthetics emerging within interactive arts interestingly outline a design of the 'user experience' that seems to answer some of the concerns expressed in the previous paragraph, particularly those connected to the issues of relational embodiment and intersubjectivity. By enabling new categories of human-computer interaction to be imagined and investigated, the aesthetics of user experience developed within interactive arts come up with fresh and creative new approaches to design, which diverge from the mainstream development of pervasive computing.

In his forthcoming book "The Language of New Media", Lev Manovich argues:

Many new media artworks have what can be called 'an informational dimension', the condition which they share with all new media objects. Their experience includes retrieving, looking at and thinking about quantified data. [...] At the same time, new media artworks have more traditional "experiential" or aesthetic dimensions, which justifies their status as art rather than as information design. These dimensions include a particular configuration of space, time, and surface articulated in the work; a particular sequence of user's activities over time to interact with the work; a particular formal, material and phenomenological user experience.[90]

The analysis of Manovich well examines the aesthetics of user experience elaborated by new media artworks in general. To consider the kind of experience that takes place in art within the dimension of interconnectivity allows me to make a step forward in my argumentation.

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[87] The tendency to cross-industry partnerships between appliance manufacturers and technology companies or the setting up of large groups of producers to develop and establish new standards are clear indications of this phenomenon.

[88] Coherently with the trends of technological development in networked computing, 'experience modelling' or 'experience design' seems to be a major preoccupation of the new economy. Within the field of e-commerce applications, experience design is conceived as the way business will create products and services, "paying careful attention to an individual's entire experience, not simply to his or her expressed needs" (Rick Robinson, Chief Experience Officer, Sapient).

[89] Andrew Feenberg (ibid.) points out the relevance of this goal within the context of a discussion about the definition of new politics of technology. But in the present paper I argue that we miss out a step, if first we do not re-examine the categories of human-computer interaction which current design methodologies are founded on.

[90] Manovich, forthcoming. Excerpt from a preview published on RHIZOME_RAW, 29th January 2000.

Moving from the assumption that every single interactive artwork can be led back to different types of interactivity[91] and different qualities of interaction[92], we may maintain that the 'conditions' designed for the interaction process are evidence of a creative strategy from which the artwork's aesthetics of user experience originates and develops and consequently experimental categories of human-computer interaction as well.

With respect to the dimension of interconnectivity and the types and qualities of interaction that can be adopted in an online interactive artwork, a first and elementary distinction can be made between an interactivity of selection and an interactivity of content.

When the outcome of the interaction of the user is a new web page, an image, a sound or any other class of retrieved information, he or she makes a selection and realizes something that is predetermined and therefore possible[93]. This condition is independent from the range of the selection allowed to the user, that can be a site or in principle the whole Net. But if the user is in the condition to create content, his or her experience is not confined to the choice of an option; of a possible path. The outcome of his or her interaction is not simply the web pages or multimedia files selected and served through the client-server system. In the case of an interactivity of content the user experience, though still depending on the system and interface of the artwork, is undoubtedly much more creative and unpredictable than the experience generated through an interactivity of selection. It is an experience much more 'poietic'[94], rather than aesthetic. Moreover, the more 'subjects'[95] are involved and intertwined in the process of interaction and creation, the more complex the system becomes, and the interface acts and enacts meaningful worlds as agent of virtualization and actualisation, moving us into the heart of creation or into the indeterminate event of being as creation.

Within this strand of development in interactive arts some artists are developing strategies of user experience inspired by ideas of relational embodiment and intersubjectivity. The indeterminacy of the event of creation is moved into the exploration of 'inter-being'. Such 'inter-being' is experienced through networked processes that allow people to grasp the available intersubjectivity and the relations that come about within a place - at the same time physically distributed and interactively connected - where subject and object are relationally embodied into the system. The ways in which subject and object are relationally embodied into the system and put into the condition to interact are different. Creative processes can arise from interpersonal relationships, group relationships, collective mechanisms or any other pattern of relations[96]. Intersubjectivity can be extended to comprehend different realms and different levels of relation[97].

The principles developed by these artists let a relational paradigm in human-computer interaction emerge; one that seems to match the trends illustrated in the previous paragraph and welcome the epistemological shift in our approach to the world claimed by enactive cognitive science. This relational paradigm challenges not only aesthetics and epistemology, but it consequently challenges, pointing out some lines of direction, the

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[91] Cf. Vittadini, 1993. According to Vittadini, we can distinguish two basic types of interactivity: interactivity of selection and interactivity of content. These types of interactivity are explained and developed in the following lines.
[92] The quality of interaction is linked to the extent and the depth of the interaction process.
[93] In this paragraph I mean the difference between possible/real and virtual/actual according to the meaning gave by Gilles Deleuze in *Difference and Repetition* and by Pierre Lévy in *Becoming Virtual*.
[94] 'Poietic' derives from the ancient greek verb 'ποιεω', that means 'to create, to generate'.
[95] From human beings to non-human beings (animals and plants), artificial beings, machines and codes. Here 'subject' is not meant as a pre-established and fixed entity.
[96] For a detailed review of the relational strategies of some online artistic projects: cf. Giaccardi, 1999.
[97] Human-to-human, interspecies, human-to-artificial, artificial-to-artificial and so on.

foundations and the established categories of the discipline of human-computer interaction.

But how can we develop, in the field of human-computer interaction, the paradox of the non-substantial foundation that a relational paradigm seems to insinuate? How can we give this development the scope, depth and complexity suitable to a society that will become more and more pervaded by computing and network connections?

WORKING HYPOTHESIS FOR A NON-SUBSTANTIAL DEVELOPMENT OF HUMAN-COMPUTER INTERACTION AND DESIGN

The reason why I am interested in the philosophy of Nishida Kitarō[98] is the extent to which he thematized the issue of embodiment and the relation of intersubjectivity in the final years of his philosophical career.

Of course the philosophy of Nishida Kitarō is very complex, and I will address just some of his core logics. I apologize in advance if, in this paper, I will refer to these logics without going into the complexity and the historicity of the thought of Nishida Kitarō. Nevertheless, let me draw up a set of working hypotheses, in order to frame the development of pervasive computing and the reassessment of human-computer interaction in the light of the nishidian 'interconnectivity':

I hold that the self is consciously active when it is interactive [...] Self and other, subject and object, are constituted in the individual acts of existential consciousness. These acts are self-originating and yet co-originating, too, as forms of dynamic, reciprocal expression[99].

First working hypothesis: identity.
Nishida's logic of contradictory identity can support the development of a relational paradigm in human-computer interaction on a non-substantial foundation. According to Nishida, self and world are mutually revealed and ontologically constituted. The principle this embodiment - bodily and historical - is grounded on is contradictory as it discloses the codetermining identity of subject and object. The embodiment and the creative interaction from which subject and object originate constitute a system of experiential interrelations; a place of dynamic identities and entities where everything is active and interactive and is therefore non-substantial. Each action (or interaction) is poietic creation (or enaction[100]), and as it is a point of co-origination of subject and object it is also a point of co-origination of space and time.

It is a radically transformational and *event-centred approach* that can let the discipline of human-computer interaction switch off from the tendency to approach computer-mediated interpersonal and social interaction through fixed and reductive schemes. Within the framework that the study of human-computer interaction can gain from this approach, we can start thinking of users as more dynamic and transformative planes of interaction and stop thinking of space-time as a matrix of predefined synchronous or asynchronous spaces and times. Having said that, this is not the occasion to explore which new categories of human-computer interaction can be derived from this theoretical framework[101].

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[98] I want to thank Masaru Yoneyama and Matteo Cestari for having introduced me to Nishida's thought when I was graduate student and I was working to my graduation thesis on the creative interaction on the Web.
[99] Nishida, 1987 [1949], p. 49.
[100] To use the terminology of the cognitive science.
[101] See Giaccardi, forthcoming.

Second working hypothesis: place.
Nishida's logic of place is connected to the logic of contradictory identity. According to Nishida, the dynamically tensional structure of the place from which subject and object, self and other, originate is given at three different levels. Typically Nishida begins with the physical world, which is to him the more causal and therefore less dynamic matrix of interacting forces. He builds up from this level to the biological, and finally to the human (historical and existential) worlds. Each of these "worlds" presupposes and exhibits the contradictory identity of objectivity and subjectivity.

This structural matrix is particularly interesting when considered in the light of pervasive computing. Without comparing the characteristics of the nishidian places to the historical reality of high-tech society (is biological time still irreversible, as Nishida states, in high-tech society? Will it still be?), the multidimensional and transformational ontology elaborated by Nishida is extremely interesting. The adoption and development of the Nishida's structural matrix to think of the 'places' of interactivity mediated by pervasive networking can be, in my opinion, very fruitful.

Curiously, Edward Casey concludes his history of the notion of place from the pre-modernity to the contemporary age setting forth that:

[P]lace is not entitative - as a foundation has to be - but eventmental, something in process, something unconfinable to a thing. Or to a simple location. [...] The primacy of place is not that of the place, much less of this place or a place (not even a very special place) - all these locutions imply place-as-simple-presence - but that of being an event capable of implacing things in many complex manners and to many complex effects. [102]

Third working hypothesis: world-poesis.
Nishida's logic of world-poesis subtends the existential nexus between freedom and creativity. If the scheme subject-object is temporary, as Masaru Yoneyama assumes in his paper on Nishida Kitarō and the Western dualisms, all things are not separated, but become free variations[103]; creative moments of lived experience. According to Nishida, creativity is not unidirectionally oriented from the self to the world, but it is horizon of interaction[104].

The challenge for new approaches to computing and design and for new politics of technology, hopefully for new forms of "pervasive" ethics, is given on such a poietic and indeterminate horizon of interaction and creativity.

CONCLUSION

The elaboration of a non-substantial foundation in the field of human-computer interaction, of a design space based on relational and embodied categories of identity and activity, and on a structural matrix of 'places' of interactivity, can give to the design of interconnectivity the scope, depth and complexity demanded by a society that will become more and more pervaded and made composite by computing and network connections.

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TRADITION OFFERS ARTISTIC POSSIBILITIES FOR NEW MEDIA TECHNOLOGIES: AN ANIMATION SYSTEM FOR SHADOW THEATRE

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Abstract

We describe an animation system for *Karagöz*, which is a shadow theater. It is one of the most important traditional arts of Turkish culture. The animation system uses hierarchical modeling to animate two dimensional characters, like *Karagöz* and *Hacivat*. Hierarchical modelling animates the characters by using model parameters related to the different parts of the body and the joint parameters between these body parts. The system uses texture mapping to realistically render these characters since the body parts are modelled as two-dimensional polygon meshes. The animation system functions as an authoring tool creating keyframe animations, by editing the character parameters such as position and orientation for different keyframes. These animations can then be played back by reading the animation parameters from disk and interpolating between the keyframes.

Keywords: computer animation, keyframing, hierarchical modelling, texture mapping.

1. Introduction

The first performances of *Karagöz* (Karagheus), the traditional Turkish Shadow Theatre, date back to the 16th century. It was one of the most popular forms of entertainment right up until the cinema replaced it in the late 1950s. The opening of each play references a Sufi leader, Mehemmed Küşteri, as the patron saint of *Karagöz*. Legend has it that *Karagöz* and *Hacivat* were two masons working on the construction of a mosque in Bursa, then the capital of the Ottoman State. They were an odd couple, whose unending conversations were so entertaining that the other workers often stopped work to listen to them. When the Sultan learned why the mosque could not be completed in due time, he ordered that they be hanged, an order which he later regretted deeply. Seeing the Sultan in distresss, one of his advisors, Küşteri, designed an apparatus which he thought might console him. He stretched a translucent screen (*perde*) across two poles and then placed a light source behind it. He cut out two figures which resembled *Karagöz* and *Hacivat* and manipulated them behind the screen. We do not know if this really worked for the Sultan, but the story reveals another example of how art functions as a substitute for loss, an experience that is fundamental to the human psyche.

In fact, there is hardly any historical evidence of such an event. It is generally accepted that the Shadow Theatre was introduced into Turkey by the Egyptians who had adapted it from the Javanese shadow play. The masters of Karagöz, however, created their own indigenous types, stories and music. The figures, *Karagöz* (which means, perhaps referring to his Gipsy origins, Dark Eye) and *Hacivat* (albeit pretentious, a man of manners) being the most prominent of them, reflect the cosmopolitan nature of Ottoman society. *Karagöz*, like other Turkish theatrical forms such as *Meddah* and *Ortaoyunu*, plays largely on mimicry or imitation of the various ethnic, religious and regional personages inhabiting Turkey (or the then Ottoman Empire). Some examples of these are *Adjem* (a Persian), *Arnaut* (an Albanian), *Turk* (a peasant or cook), *Laz* (a person from

Black Sea Region), *Ermani* (an Armenian), *Arab*, *Yahudi* (a Jew), *Kaisarli* (a person from Kaisariye), *Kurd* (a person from South East), *Zaibek* (a peasant) and *Frenk* (a European). These were all popular figures that represented the pluralism of the Ottoman Empire. One of the sources of pleasure offered by comedy lies in language running against signification: accents and dialects, absurd rhyming, puns, and even stuttering come into play in order to invert possibilities of meaning. This may go to the limits of absurdity, which may perhaps offer further possibilities to experimental, pure and absurd theatre.

The Karagöz screen used to have a size of 2.0 x 2.5 meters, but was later reduced to 1.0 x 0.60 meters. The aspect ratio of the screen is very similar to those of cinema and television. It is a well-known fact that, in the early years of cinema, many theatre owners in Istanbul projected films on screens formerly built for Karagöz. The apparatus, however, bears more resemblance to television rather than cinema: the images are not projected on the screen, on the contrary the light source comes from behind it. When the light produced by olive oil lamps hit cut-out figures (*tasvir*) with tiny holes on the edges, the result is a flickering image, an aesthetic value which disappeared when the Karagöz operators began to use electric bulbs. The figures are made of animal skin (especially camel skin), which is smoothed out and dried under the sun and treated until it gets almost transparent. *Hayali*, the master performer of Karagöz (which means a person who is involved with the imaginary), attaches the figures to rods and skilfully manipulates them in all the possible ways. He performs all the dialogues as well as songs with some help from a *yardak* (apprentice), who plays some musical instruments to accompany him.

The mode of representation in Karagöz, which can also be observed in other traditional performance arts of the East, is in contrast with traditional narrative forms of the West. The western narrative produces a sort of classical realist text that presents itself as real, and in order to achieve this impression of reality it effaces the traces of its production. In addition, it relies heavily on character identification and exploitation of codes of reality. Karagöz, however, is non-illusory and self-reflexive in the sense that it quite often makes references to its fictitious nature, reminding the audience of the fact that what they are viewing is not real but *hayal* (imaginary). This attitude originates from the Sufi doctrine which repeatedly returns to the theme of the world as something unreal; a textual production which must be decoded in order to catch a glimpse of Truth. In addition to the opening songs and dialogues, the visual style is devoid of any impression of reality; just like the representational arts of the East, visual composition in Karagöz is innocent of perspective. It purposefully constructs a two-dimensional world that lacks depth of field, hence a total negligence of figure-background. The audience of Karagöz can side with the figures, especially with Karagöz himself, but identification is almost impossible; the visual style allows no point of view due to the positionings and movements of the figures. Finally, the play suggests its logic of representation and transgresses the diegetic boundaries: when Karagöz needs a telescope, he takes his leg off and uses it to see what is going on in the distance. This not only produces a comic effect, it also indicates that a leg can also be a telescope because it is actually not a leg but a representation of it, and any representational element can be used to represent anything.

The long-neglected tradition of Karagöz is being taken up again. Its artistic features and means of expression as described above are not yet exhausted but are open to further explorations. There is nothing nostalgic about seeking new potentialities of traditional arts. We should be prepared to witness media technologies turning to old forms in their search for new possibilities in art production. Karagöz as an apparatus may not be able to compete with the latest technologies exploited in film production and exhibition: digital dolby surround sound systems, special effects and large-screen formats seem to have formed a specific audience that would possibly be interested in specific sorts of narration only. Karagöz, however, does not require extravagant camera movements, fast editing, a full range of shot types or sound effects. As a matter of fact, its strength lies in the

economy of its stylistic devices and conventions. It should stay within the confines of a fixed frame that contains two-dimensional images devoid of perspective, and it should have a limited number of characters and settings. This does not mean that it is closed to adaptations, appropriations or diverse applications.

This article introduces a new computer software designed to accomplish the tasks described above in order to model and animate Turkish shadow play characters. It is exemplary not only in the sense that it shows how traditional forms can be adapted to new media, particularly computer and television, but also in the way that Karagöz can perhaps force the new media to develop new capabilities of artistic expression. We do not believe that one can or should restrict what awaits the multimedia artist in his/her path. Instead, the animation system offers the artist an altogether new set of possibilities that would also enable him to challenge the dominant modes of representation and forms of narration in the popular media.

The computer animation system described here uses hierarchical modelling to construct and animate two-dimensional articulated characters containing body parts and joints between these body parts. Different characters have different body parts and joints, and therefore have different hierarchical structures. Texture mapping is the technique used for rendering the characters since different body parts are modeled as simple two-dimensional polygon meshes and have a predefined texture that can be mapped to these polygons as the model animates. To animate the models, the system uses keyframing based on the model parameters of the characters. These model parameters include the positions of body parts and the angles of the joints between different body parts.

The animation system functions as an authoring tool creating keyframe animations involving the characters, by editing the character parameters such as position and orientation for different keyframes. These animations can then be played back by reading the animation parameters from disk for each keyframe and interpolating between the keyframes. The interpolated frames are rendered by using texture mapping on the characters appearing on the frame.

The rest of the paper is organized as follows: In Section 2, we describe the two main techniques that are used to produce animation, namely hierarchical modeling and texture mapping. The main data structures that are used to model and animate the characters are described in Section 3. In Section 4, we explain how the animations are produced using the animation editor. An illustration of the user interface of the system and still frames from the animations are also given in this section. Section 5 gives conclusions and describes possible future extensions to this work. Some of the characters for the shadow play can be found in the Appendix.

2. Background Work In this section, we describe the two basic techniques employed by our animation system: hierarchical modelling to model and animate articulated characters and texture mapping to realistically render them. (It should be noted that by “realistically” we refer not to the realism of the visual composition and to the narrative plot, but to the “authenticity” of Karagöz. In other words, we did not intend to reproduce reality but the reality of Karagöz.)

2.1. HIERARCHICAL MODELLING

Hierarchical modelling is a technique to model and animate articulated structures consisting of links connected by joints. Hierarchical modelling accomplishes this as follows: once simple parts of a hierarchy are defined as primitives, we combine these simple parts into more complex hierarchical (articulated) objects. The main theme of hierarchical modelling is that a group of parts (aggregate objects) can be treated just like a

primitive object. Any operation that can be performed on a primitive object can be applied to aggregate objects too [3].

To implement hierarchical modelling, the model hierarchies for different characters are defined in our system. The model hierarchies for the two main characters are given in Figure 1. To display and animate a hierarchical model, we have to apply transformations to different parts of it. These transformations, such as translation and rotation, are generally represented using constant matrices. To apply transformations to hierarchical models, we used OpenGL's matrix stack data structure [7], which has operations defined for manipulating the matrix stack storing the transformations. Moreover, it is very fast since it is implemented in hardware on Silicon Graphics workstations (Silicon Graphics is a registered trademark of Silicon Graphics, Inc.). While drawing the characters, we apply the required transformations using the model parameters, such as joint parameters. For example, when a transformation is applied to the hip, the two legs connected to it are also affected, and these may have other transformations applied to them as well.

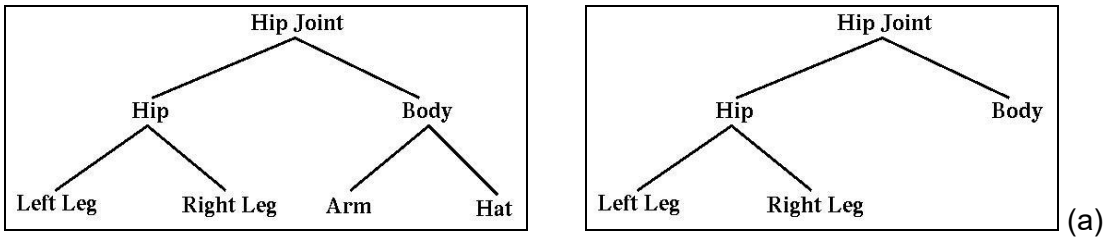


Figure 1: (a) Karagöz hierarchy and (b) Hacivat hierarchy.

2.2. TEXTURE MAPPING

Texture mapping is one of the most popular techniques to increase realism of rendered objects. It allows one to glue an image to a two or three-dimensional object, usually represented as a polygon mesh. Detailed explanation of texture mapping can be found in [5].

3. Data Structures

The data structures are defined to be used effectively for hierarchical modelling and texture mapping. The parts of the characters are modelled as two-dimensional polygons. Textures of the parts of the characters remain the same although the position and orientation of the characters change. The data structures are described below. They are given in the C programming language [6] format with some details omitted for simplicity and clarity.

The point data structure keeps the x and y coordinates of a point. A z-coordinate is stored for the global positions of the characters in the structures for keeping the character parameters.

```
typedef struct {
   float x, y;   // x and y coordinates of the point
} point, *Point;
```

The vertex data structure contains the information needed for a vertex of a polygon. The parts of the characters are subdivided into triangular polygons. We also keep the texture coordinates of the vertex in this data structure, for use in the texture mapping process.

```
typedef struct {
```

```
    point xy;     // (x,y) coordinate of the polygon vertex
    point tex;    // corresponding texture coordinate for the vertex
} vertex, *Vertex;
```

Our models use triangular polygons, which are defined using the polygon data structure containing pointers to vertices.

```
typedef struct {
    vertex vert[3]; // vertex coordinates of the triangles
} polygon, *Polygon;
```

The characters consist of movable parts, which are modelled as polygons. So, we keep a polygon for each body part and do the required initializations and settings to display the characters with their texture. Since each character has different body parts, we define a different data structure for each character. To define the models of the different characters of the shadow play, we divide the characters into body parts, then generate the polygon meshes and the texture maps for these body parts. The data structures for Karagöz and Hacivat are shown below. (In these structures, texName is the texture binding for the characters and texpic is the texture data for the character parts.)

```
typedef struct {
    GLuint texName;
    Pic *texpic;
    Polygon hat;
    Polygon body;
    Polygon hip;
    Polygon rightLeg;
    Polygon leftLeg;
    Polygon arm;
} *Karagoztype;
```

```
typedef struct {
    GLuint texName;
    Pic *texpic;
    Polygon body;
    Polygon hip;
    Polygon rightLeg;
    Polygon leftLeg;
} *Hacivattype;
```

The following data structures for the model parameters of Karagöz and Hacivat are used for producing the animations. Other characters have similar model parameter data structures.

```
typedef struct {
    float x, y, z;
    float rotx, roty, rotz;
    float bodyangle;
    float hipangle;
    float hatangle;
    float leftlegangle;
    float rightlegangle;
    float armangle;
} *KaragozParameters;
```

```
typedef struct {
    float x, y, z;
    float rotx, roty, rotz;
    float bodyangle;
    float hipangle;
    float leftlegangle;
    float rightlegangle;
} *HacivatParameters;
```

The aniparameters data structure stores information for a keyframe of an animation. If a character does not appear on this keyframe then its pointer is null.

```
typedef struct {
    int FrameNo;
    KaragozParameters karagoz;
    HacivatParameters hacivat;
    ZenneParameters zenne;
    IhtiyarParameters ihtiyar;
    GostermelikParameters gost1;
```

```
} aniparameters, *AniParameters;
```

The animation data structure stores information for an animation as a list of parameter values of different characters for the keyframes.

```
typedef struct {
   int nframes;       // number of frames in the animation
   AniParameters par;  // array of character parameters for keyframes
} animation, *Animation;
```

4. The Animation Editor

The animation system works as an authoring tool creating keyframe animations involving these characters, by editing the character parameters such as position and orientation for different keyframes. These animations can then be played back by reading the animation parameters from disk for each keyframe and interpolating between the keyframes. The interpolated frames are rendered by using texture mapping on the characters appearing on the frame.

A screen snapshot of the animation system is given in Figure 2. The user interface is divided into two main parts: the display window to display the animations and the animation editor to edit the character parameters. The animation editor has buttons to select the character whose parameters will be changed. The parameters are adjusted by moving the sliders in the animation editor and the effect of modifying the parameters on the character is displayed in the display window. The user interface also has elements to write model parameter values for a keyframe to a file, and save/load an animation file in the form of parameter values for the keyframes. A sample animation file is given in Figure 3. Each line in a keyframe definition contains the position, orientation and the model parameters, like hip angle, body angle, arm angle, etc. Figure 4 gives still frames from two different shadow plays. (Sample animations can be found in http://www.cs.bilkent.edu.tr/~gudukbay/hacivat_karagoz.html.)

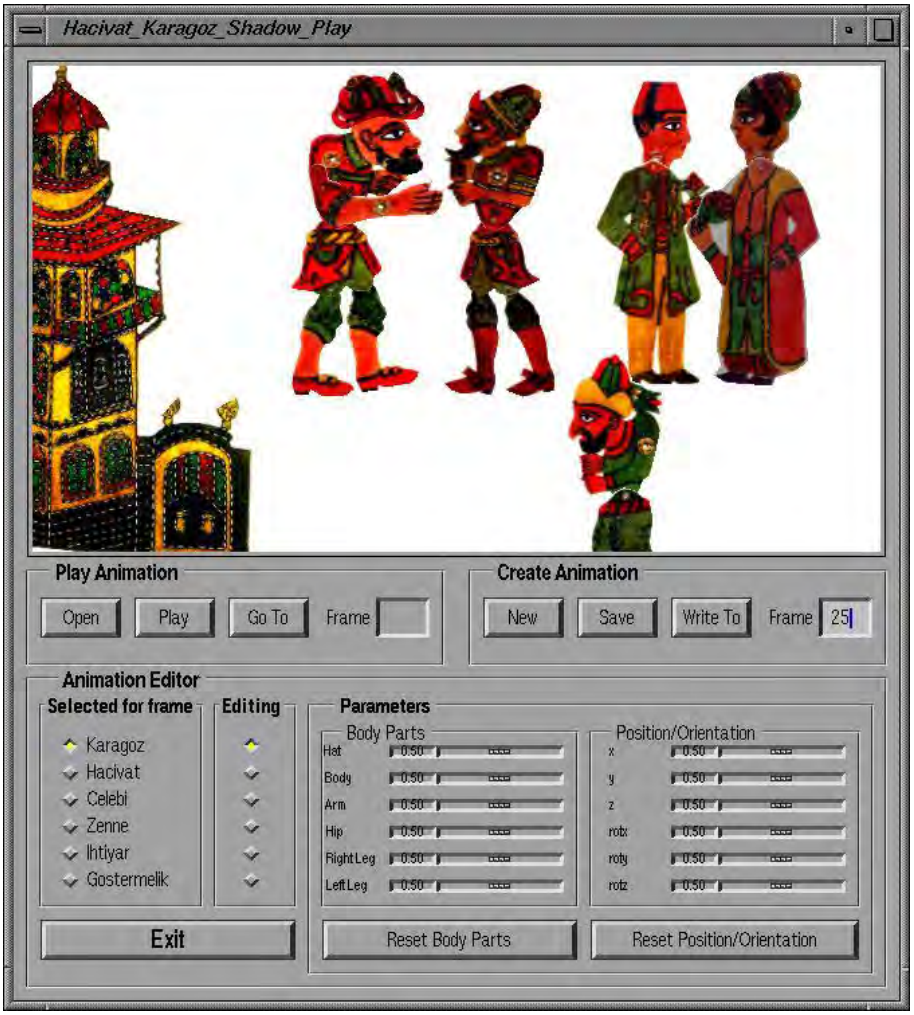
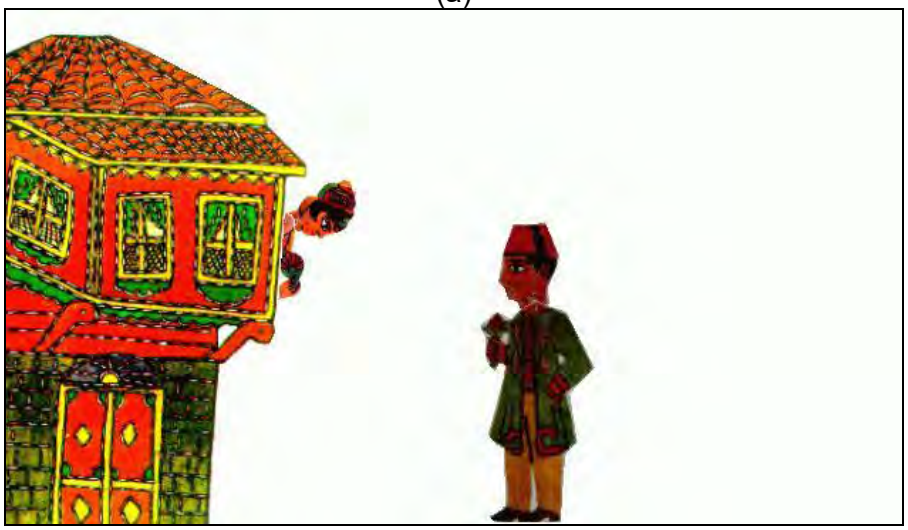


Figure 2: *The animation system user interface. The user interface has two parts: the display window and the animation editor. The display window is used to display the animations. The animation editor has user interface elements, such as buttons and sliders, that are used to produce, save and play keyframe animations.*

```
50          // number of frames in the animation
1 :         // keyframe definition for frame #1
karagoz     0 0 0 0 0 0 40 20 20 40 40 40
hacivat     0 0 0 0 0 0 0 0 0 0
celebi      0 0 0 0 0 0 0 0
gostermelik 0 0 0 0 0 0 0
;
20 :        // keyframe definition for frame #20
karagoz     0 0 0 0 0 0 60 0 0 0 0  4
hacivat     0 0 0 0 0 0 0 0 30 0
celebi      0 0 0 0 0 0 30 0
gostermelik 0 0 0 0 0 0 0
;
50 :        // keyframe definition for frame #50
karagoz     0 0 0 0 0 0 0 0 0 0 0 10
hacivat     0 0 0 0 0 0 0 0 0 60
gostermelik 0 0 0 0 0 50 0
;
```

Figure 3: A sample animation file. The animation file contains the posture definitions and locations of the characters appearing on each keyframe.

(a)



(b)

Figure 4: Still frames from two different shadow plays. (a) One of the unending conversations Karagöz and Hacivat. (b) *Çelebi* is wooing a *Zenne*.

5. Conclusions and Future Work

This paper introduces an animation system for modeling and animating Karagöz, the Turkish shadow theatre. The system uses hierarchical modeling to construct and animate two-dimensional articulated characters containing body parts and joints between these body parts. Texture mapping is used for rendering the characters.

To animate the models, we use keyframing based on the model parameters of the characters. These model parameters include the positions of some body parts and the joint angles between different body parts. After the user defines the keyframes, the system interpolates these keyframes and displays the characters by rendering them using texture mapping to produce animation.

The animation system works as an authoring tool to create keyframe animations involving these characters by editing the character parameters for different keyframes. The animations can be played back by reading the animation parameters for each keyframe from disk and then interpolating between the keyframes. The interpolated frames are rendered using texture mapping.

There are possible future extensions to this work.

1. The real shadow theater is performed by using sticks attached to different parts of the characters and these sticks are used to move the parts of the models. These sticks could be simulated by binding them to different keyboard/mouse buttons to interactively animate the models as in the real shadow theater. This may enable an operator/artist to give live performances.

2. The number of animated characters could be increased. The Appendix provides an almost complete set of characters for the shadow play. We are also implementing a hierarchy editor to add any user-defined character to the system.

3. Sound-track: Dialogue, sound effects and music are components that are crucial to Karagöz. Currently, the software does not include these features, so a sound-track must be added in the post-production stage, using a standard sound editor. A music composer, effects library and dialogue program could be integrated into the software.

Acknowledgement

The characters used in the animations are scanned from Hayali Küçükali Shadow Play Collection of the Turkish National Library and from the book *Dünkü Karagöz*, by Uğur Göktaş, Akademi Kitabevi, 1992. Special thanks to Bülent Özgüç and Varol Akman for valuable discussions. David Davenport and Peter Chen kindly read the manuscript. This project is partially supported by an equipment grant from Turkish Scientific and Technical Research Council (TÜBİTAK) with grant no. 198E018.

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Appendix: Characters of the Shadow Play

Some of the most frequently used characters are given in Figure 5 ([1, 2, 4]). The characters are grouped according to the type of movable parts as follows.

- Characters having a movable hat jointed with head: *Karagöz*.
- Characters having a movable joint in the neck: *Çelebi*, *İmam*, *Acem*, and *Zenne*.
- Characters having a movable joint in the arm: *Karagöz*, Karagöz's son, *Tahmisçi*, *Hançerli Tahir*, *Çengi*, and *Köçek*.
- Characters having a movable joint in the waist: *Karagöz*, *Hacivat*, *Tuzsuz Deli Bekir*, *Yahudi*, *Kayserili*, *Frenk*, and *Laz*.
- Characters whose legs can move: *Karagöz*, *Hacivat*, *Tuzsuz Deli Bekir*, *Cambaz*, and *Beberuhi*.
- Stationary characters: *Cazu* and *Cihazcı*.

The personality of the characters are described below [1, 2, 4].

- *Karagöz:* Karagöz and his partner, Hacivat, are the most important and active characters. Karagöz represents the public. He is known as a brave person but is uneducated. The movable joints of Karagöz are his waist, his legs, one of his arms and his hat. Karagöz's hat, called *Işkırlak*, moves back when he hits Hacivat with his head, although it remains connected to the rear of Karagöz's head. For this reason, his hat is modeled in such a way that it can move around the joint at the back of his head. There is another joint at his shoulder that connects his arm to the body. Karagöz is sometimes seen in different forms like Lady-Karagöz, Pride-Karagöz, Donkey-Karagöz, Naked-Karagöz, and Guard-Karagöz, etc.

- *Hacivat:* Hacivat is the other important character in the play. Hacivat is a person who knows about everything. He represents the intellectual part of the society. The movable joints of Hacivat are his waist and his legs.

- *Tuzsuz Deli Bekir* (Drunkard and Braggart): He is known as a man who solves the complex problems. He is also known as the murderer of many people and represents the rude segment of the society. He usually carries a sword in his hand. He has a joint in his waist.

- *Zenne* (Lady): All women are called *Zenne* in the *Karagöz* and *Hacivat* plays. They usually have bad ethics as they live with many men. Most of them have joints in their heads. The most important ladies are the wife of *Karagöz*, *Kaynana* (Mother of *Tuzsuz Deli Bekir*), and *Kanlı Nigar*.

- *Çelebi* (Gentleman, Native of Istanbul): Always speaking clearly and politely and with an Istanbul accent, this character represents the rich, womanizer part of the society. There are two types of *Çelebi* according to their hierarchical structure: some have joints in their heads and others have joints in their waists. The ones with joints in their waists usually have umbrellas in their hands. The ones with joints in their heads usually have walking stick or flower in their hands.

- *Tiryaki* (Opium Addict): He is one of the oldest people in the play. He represents people who prefer the amusing environments in the society. There are two types of Tiryaki according to their hierarchical structure: some have joints in their waists and others have joints in their arms. The ones that have joints in their arms usually have opium stick in their hands.

- *Bebe Ruhi* (Dwarf): He is a dwarf who speaks with an Istanbul accent. He holds a big hat and represents insolent people. The character usually has joints in its legs.

- *Laz* (Man from the Black Sea Coast): This character represents the people of the Black Sea region. He is either a boatman, a wool-beater, or a tinsmith. He is impatient and talks too much. He has a joint in his waist.

- *Kayserili* (Man from Kayseri): Representing the foxy people of Kayseri region, he has a single joint in his waist.

- *Kastamonulu Baba Himmet* (Baba Himmet from Kastamonu): He represents the tall, impolite people of the Kastamonu region. He is a wood cutter and carries a large axe on his shoulder. He has a joint in his arm.

- *Muhacir* (Immigrant from the Balkans): He is either a wrestler or a carter.

- *Acem* (Persian): Representing the exaggerative Persian people, Acems are sometimes shown as riding a horse. They have a joint in their heads.

- Other Characters: Historic characters that are rarely used include the play are *Külhanbeyi*, *Zeybek*, *İzmir Efesi*, *Kambur Mehmet Efe*, *Çengi*, *Köçek*, *Cazu*, *Aşık Hasan*, *Çingene* (Gipsy), *Ferhat*, *Cihazcılar*, *Arap* (Negro), *Arnavut* (Albanian), etc. There are also some other characters who represent Istanbul minorities, such as *Yahudi* (Jew), *Ermeni* (Armenian), *Rum* (Greek), *Frenk* (European), *Çerkes* (Circassian), and *Haham*.

- *Göstermelik:* Background pictures used in the play. The examples are house, sandal etc.

Figure 5: *Some of the main characters in the shadow play. First Row: Karagöz, Hacivat, Zenne-1, Zenne-2, Tiryaki; Second Row: Çelebi-1, Çelebi-2, Beberuhi-1, Beberuhi-2, Beberuhi-3; Third Row: Tuzsuz Deli Bekir, Kastamonulu, Bolulu, Kayserili, Laz; Fourth Row: Arap Köle, Çerkes, Muhacir, Yahudi-1, Yahudi-2.*

AUDIENCE PARTICIPATION AND RESPONSE IN MOVEMENT-SENSING INSTALLATIONS

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Abstract

Audio and video installations requiring audience movement and participation pose a unique set of problems. These works are realized through physical action within a responsive environment. Participants may become part of the work itself, as others outside of the sensing area view the spectacle of their interaction while seeing the results. Those inside the sensing area (if more than one person is allowed) share in a collaborative "performance," their social interactions contributing significantly to their experience of the work.

What is the psychology of this participation? How can installation artists engage, prompt, and empower amateur "performers" who have no prior knowledge or particular expertise? How does the computer program and content facilitate action and encourage response?

This paper examines factors contributing to the audience experience, with special attention to non-digital concerns. Strategies to engage audience participation will be shown in several of the author's interactive audio and video installations.

1. INTRODUCTION

Movement-sensing installations offer audience members an opportunity to become actively involved in the creative process by influencing image and sound output from a computer. These works typically use various types of sensors to analyze human activity, location, and gesture, so that natural movement can be used as primary input to a responsive computer system. Interactive installations are often presented as environments open for exploration, with each "realization" determined by individual action, curiosity, and play. What separates interactive installations from other types of art installations or interactive performances is that the work is only realized through a participant's actions, interpreted through computer software or electronics, and those actions do not require special training or talent to perform.

All of this suggests a new social and artistic dynamic that is unique to interactive installations, requiring the audience to physically participate in creating their own artistic experience. Rather than create finished works, interactive artists create the potential for many works to be realized through anonymous collaboration. With the audience's acceptance of this new responsibility may come a greater acceptance and ownership of the results: participants seem to enjoy, accept and pay great attention to the results of their own responsive actions.

The term "audience" may ambiguously refer to anyone viewing or participating in an installation. To clarify those roles, person(s) activating an installation will be referred to here as the "player(s)," as in a musician playing music or someone playing a game. Audience members simply viewing the players will be called "spectators," implying a group's role in a live event.

2. FACTORS IN THE AUDIENCE EXPERIENCE

Artists investigating computer installations often focus on theoretical concepts, digital content, and technical issues. However, many aspects of the work are only realized after the installation is taken out of the "laboratory" and set up where the public can try it out. Revelations pour in after observing that the non-digital aspects of an installation are not trivial, but have a large impact on the audience's perception of a work.

Four interconnected factors may be examined to gain a better understanding of the complex relationships at force in movement-sensing installations. These broad categories could be further subdivided, but are presented here as a way to analyze the non-digital aspects of a work. They are listed, in order, by the amount of direct influence an artist has over aspects of a work. Although indeterminancy and surprise may be built into software as features, they are given when dealing with players.

The Digital Factor refers to anything residing on the computer: digitized video, sound and other stored material, generative algorithms, real-time processing, and software for interpreting and mapping movement data.

The Physical Factor involves the installation space and set, including items used to create the space and interface with the computer, such as sensors, props, video screens, constructions, printed images, and furniture. How people move around the space and the activity required to interact with digital material should be considered here. One could view this active area as an expanded computer interface. The feeling of the venue and location also contribute to the audience's reaction to a work.

The Social Factor examines the relationships between people before, during, and after the installation experience. Artists may consider designing situations where social interactions are likely to occur based on decisions regarding the number of players allowed to participate and the role and location of spectators. A work may accommodate a single player or multiple players, it may include spectators or take place in isolation away from the crowd. Several studies of audience reactions to museum installations suggest that works encouraging social interactions among multiple players are often viewed as the most popular and engaging (Graham, 1997; Mitchell and Bicknell, 1994). Ironically, the presence of many players triggering the same system makes it more difficult for individuals to follow the results of their actions in the digital domain. Their engagement with the computer may decrease as their social interactions increase.

Humans are social animals, and part of the reason they go to an exhibition is to spend time with companions, watch other people, and feel the excitement of the social scene. A big factor in an audience's potential understanding and enjoyment of a work is the ability to have companions watch them play (in single player works), or play together (in multi-player works). A few artists have gone so far as to devise installations requiring cooperation amongst players to realize their work (Ritter, 1997). However, the potential for a work to foster social interaction is an essential artistic decision that will not be appropriate for particular works, or may be limited by a given space, or the capabilities of software and sensors.

The Personal Factor is the area most difficult for artists to predict and influence, although the three previous factors all contribute to create the individual experience. Beyond the control of the installation artist are issues such as a person's mood, musical taste, interest in technology, or whether they have the knowledge and skills required to participate and understand the installation. Some people may be easily intimidated and unwilling to

participate, or they just don't have the time. However, by knowing the audience, some potential problems may be solved in the design and layout of the installation.

3. CHALLENGES TO PLAYER PARTICIPATION

One big challenge to the installation artist is to know the full range of audience members, and provide a multi-layered work that will be engaging on many cognitive, physical, and emotional levels. Ideally, all of these factors add up to more than the sum of their parts, reinforcing the artist's intentions, and leaving the participants with transforming ideas or emotions.

Potential problems can be identified in each stage of participation: waiting/watching, decision to play, playing, staying, and leaving. Although a crowd of spectators watching an installation reduces the chance of anyone playing, people will flock to a group out of the assumption that the installation must be good if so many other people are watching or waiting. Allowing spectators to view an installation engages both non-players and potential players, who carefully watch the performance to learn how it works, how long it will take to play, and how "safe" it is to enter. Many players enjoy the attention of the audience, and the rapport that comes from the collective experience. Other people might be intimidated by spectators, afraid of looking foolish because of a perceived lack of knowledge, or body conscious and uncomfortable being watched.

On the other hand, installations that only allow one or more players inside a closed space can evoke a more intimate, reflective, and "whole" world, without the distractions of everyday life. Sound and light can be more carefully controlled within a closed space, as can the number of people entering and exiting the installation.

The role in which players are cast by the artist will ultimately shape their experience and willingness to participate. Will they be separated from family and friends to be isolated in a dark room for an exciting and dangerous experience? Will they be asked to playfully cooperate with others in a well-lit open space? How are they invited in? Are people forced to wait on line or read confusing instructions? What about the digital material? Is it insultingly simplistic, pleasantly aggressive, or impenetrable in its complexity?

Once inside, players will need to know how to run the installation and the rules of engagement. One challenge is to make instructions and prompting part of the work, so that players are educated and guided in a non-obtrusive manner. "Natural" interfaces requiring everyday movement or the manipulation of familiar objects may be so obvious as to not require further explanation. Players also learn how to operate the installation simply by watching others.

What are the minimum and maximum times needed to get a good understanding of the work? The scope of the installation may determine the necessary range of time needed for a full experience. Factors that influence the duration of use include: attraction to the material, intellectual and emotional interest, ability to understand and enjoy the content, the feeling of engagement with the computer, and social interactions (Graham, 1997). The pacing will also contribute to the perception of expected time as will physical objects in the room, such as couches or comfortable chairs (both spectators and players will stay longer if they have a chance to be seated).

Most people avoid doing things in public that will draw the attention of strangers. Usually, people do not feel free to dance in front of an audience, and they know not to touch artwork in a museum. Artists need to give permission to players to do the activities required of the installation, even if it goes against the normal expected behavior in a museum or other

public space. The permission may be liberating or intimidating, depending on social and personal factors, and the intention of the artist.

4. DESCRIPTION AND ANALYSIS OF TWO INSTALLATIONS

The author's *Light Around the Edges* (1997) is a sound/video installation that uses a video camera to detect location and movement of people in a large public space. The sensing camera is placed high above the audience, pointed downward at an angle. Movement on the ground is transmitted as numbers into the Max programming environment via David Rokeby's Very Nervous System (Rokeby, 1995). There, software interprets data representing players' speed and location to create original music or to triggers individual sound samples. While participants hear the results of their actions, they simultaneously see themselves in the form of a processed and abstracted video projection.

The players are not only the musicians playing the music, they are the dancers in their own dance. In other words, the players are the content of the work. For example, in one instance, two young women were in the middle of the floor, holding hands and swinging around in circles, the speed of their movement altering the density and speed of computer-generated music. The installation sets the stage for this event to occur, but this particular realization only exists because of this particular performance. The installation, therefore, is not an interface designed to "get to" content in the way a mouse is used to retrieve data from a computer, but a more complex system that requires a tight feedback loop of action/results/modified action/modified results, where each component is interdependent, brought into existence only with the help of the other.

Except for four speakers, the installation is invisible. Any number of people may walk through the sensing area, often just passing by. Any number of spectators can watch players dance or move around the space. As the number of participants grows, the ability of an individual to perceive direct impact on the system is reduced. To meet the challenge of accommodating an unknown quantity of players, the installation operates in three different modes, based on how many people are playing. Each mode defines a sonic environment and a lever of interaction appropriate for the number of players. For one to four players, the software is highly interactive, with speed and location perceived as having an immediate and obvious impact on the sound, generating music, processing sound, and controlling panning. With five to ten players, the perception of immediate interaction is lessened, and the space transforms into a soundtrack of a train station, with players' locations triggering conversations in many languages, train doors opening, announcements, and the sounds of trains coming and going. Thus, the space becomes an invisible set, defined architecturally in sound, with fixed locations on the floor representing specific sounds and functions (although not entirely predetermined). Finally, with too many players to identify any individual's input, the third mode turns the space into a big party, with movement triggering canned laughter, sounds of people eating, conversations, glasses clinking, and other crowd sounds. The effect is a fortified social space, where the audience's movements alter their own social interactions in real time.

All three modes are playful environments that encourage conversation, eye contact, and movement between players and spectators, companions and strangers. The participants are the subject of this work, their actions, responses, facial expressions, bodies, and social interactions are much more significant than the actual visual and sonic material they generate.

The author's video installation, *Maybe...1910* (1999), suggests a very different sense of time and interaction. The work explores concepts of memory. Here, the content is more significant, based on video-taped interviews conducted with elderly residents from Providence, Rhode Island, discussing experiences from childhood and major life events.

The pacing is slow and introspective, less energetic and immediate than *Light Around the Edges*, but with compelling material structured by simple human activities within the installation space.

Players enter an intimate set resembling a bedroom from the earlier part of the 20th century, where they are free to explore the room and examine its contents. Their location and activity is tracked by fourteen sensors imbedded into a bed, a chair, a rug, and the drawers of a vanity and a dresser. Each sensor triggers corresponding digitized video based on a theme, such as earliest memories, family, money, or dating. The project also incorporates views of seniors regarding the fast pace of modern life, and their memories of technical innovations (electricity in the home, automobiles, television). Video and audio files are processed to simulate the quality of memory which may be lucid, blurry, fragmented, or incomplete.

All sensors, wires, and speakers are hidden. Three video sources play back in the room disguised as an old television set, a two-way vanity mirror, and as scenes rear-projected onto a curtained window. Using the Icube System (Mulder, 1995) controlling Director software, each sensor rotates through its own collection of six video clips. The entire collection of video totals forty minutes, with the expectation that players will spend four to thirty minutes inside the space for a “full” experience, with little or no repetition.

Each trigger shows a person telling his or her story on one video screen, accompanied on the other screens by flashback or memory scenes using archival footage and processed images. The story is further illustrated by players examining antique objects assembled within the installation space, such as old photographs, personal letters, a dried rose, or articles of vintage clothing. These physical objects, as well as the period furniture, prove to be powerful multi-sensual links to the past, engaging players through sight, smell and touch.

The audience encounters the set as a small bedroom built inside a much larger room, with boundaries indicated by a carpet, furniture placement and ropes. Spectators gather around the bedroom on three sides, and peer through the “invisible walls” to watch players and view the computer playback. Only 2-3 players are allowed inside together; any more would add confusion about who triggered which clip, and encourages interruptions. Social interactions between companions is very high inside the room, while much lower between strangers sharing the experience. People are respectful of the interviewees, quietly listening to their stories, but are eager to speak to one another about the stories during the silence between segments. The project encourages people to reflect on their own lives, with elderly participants often recalling stories of “the old days.”

Eight-hundred people saw the installation over a three-day period at the Rhode Island School of Design as part of a millennium celebration. On the final day, chairs were provided for the spectators, and this seemed to greatly increase the average viewing time and enjoyment. Although there were simple written instructions as to how the installation worked, most people didn’t read them. An assistant is was needed at all times handle the crowd. Perhaps in a less crowded and more secure museum environment, the installation could be run on its own; the most difficult aspect would be how to limit players and playing time. One solution would be to use software to track the number of players and automate new video messages encouraging them to stay or leave.

5. CONCLUSION

Non-digital aspects of digital installations have a significant impact on audience perception. Participants are asked to become artistic collaborators, performers and, finally, content in a digitally mediated work. As sensing technology matures, artists will be

compelled to conceive of work where physical interaction, computer interaction, and social interaction are vital to creating new forms of expression and experience.

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LA QUESTION DE LA MULTISENSORIALITE DANS LES ARTS NUMERIQUES INTERACTIFS
Présentation d'une expérimentation : Le Funambule Virtuel

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RESUME :

Contrairement à l'idée reçue que les arts numériques seraient dématérialisés et décorporalisés, nous constatons que l'interactivité a introduit une certaine forme de sensorialité dans ces arts. D'une part, alors que l'interactivité a fait appel dans un premier temps à des modèles mécanistes, elle s'oriente actuellement vers des modèles connexionnistes et évolutionnistes ainsi que vers des modèles de la vie artificielle. D'autre part, dans une première phase, la multisensorialité était surtout pensée du côté du spectateur, aujourd'hui elle se pose également du côté de l'œuvre elle-même.

La question de la sensorialité dans les arts numériques

Ce travail s'inscrit dans des recherches qui tentent de dépasser les reproches faits aux arts numériques et en particulier à l'image de synthèse: la froideur, la précision excessive, l'hyperréalisme sec, mais surtout l'absence de la participation du corps à son élaboration. Son incapacité à intégrer le geste et sa puissance expressive en ferait une technique incapable *a priori* de servir une intention esthétique.

Mais le calcul automatique de l'image par des ordinateurs de plus en plus rapides et puissants a modifié, en effet, très profondément la relation de l'homme à la machine depuis quelques années, non seulement dans le domaine des sciences, de l'industrie, de la communication, des jeux ou des sports, mais également dans le domaine de l'art, domaine où le *geste* créateur, dans toute sa subjectivité et sa singularité corporelle, semble ne tolérer aucune compromission avec le machinique.

Les possibilités de l'image de synthèse attirent depuis plus de vingt ans des artistes tentés par de nouvelles expériences. Ils se sont affrontés à la question cruciale de savoir comment passer de l'intelligible (les langages de la programmation et leurs modèles — informatique, mathématique, physique, etc.) au sensible — ce qui est finalement perçu par le spectateur.

Une des réponses réside dans l'interactivité. En effet, l'interactivité — qui est l'une des spécificités des images numériques — conditionne fortement le dialogue homme/machine. Avec la diversification des dispositifs d'entrée-sortie (souris, crayons, joysticks, space ball, data glove, data suite, capteurs de toutes sortes), la qualité des données prises en compte par l'ordinateur s'est considérablement enrichie : Aux informations purement symboliques transitant par le clavier (chiffres et lettres) se sont ajoutées des données d'une autre nature qui sont des émanations directes, concrètes, du monde réel (mouvements, forces, pression, etc.).

L'interactivité comme transformateur de réalités

Si on pose l'existence de plusieurs " couches " de réalités susceptibles de s'interpénétrer : la réalité naturelle (la nature, les êtres), la réalité artificielle (les artefacts) et la réalité virtuelle de la simulation (les univers simulés par les ordinateurs), on considérera que l'interaction est la relation de l'homme aux réalités naturelles et artificielles, et que

l'interactivité est la relation de l'homme aux réalités virtuelles, c'est-à-dire la *simulation de l'interaction.*

L'interactivité fonctionne, par conséquent, comme une sorte de *transformateur* entre les réalités, permettant de passer d'une réalité naturelle ou artificielle à une réalité virtuelle. En effet, tout dispositif interactif d'image de synthèse se présente comme un agencement homme/machine composé d'une multiplicité d'éléments hétérogènes reliés entre eux. Pour comprendre comment la relation d'interactivité permet un *cofonctionnement* véritablement partagé par l'homme et la machine, il importe de mettre en évidence la manière dont ces éléments s'articulent entre eux.

Le philosophe Georges Simondon, dans *Du mode d'existence des objets techniques* [105], nous apporte des éléments de compréhension sur ce cofonctionnement et sur cette fonction de transformation.

Il refuse les oppositions classiques entre l'homme et la machine, la culture et la technique, et il met en évidence les deux attitudes contradictoires qui consistent à regarder les objets techniques, soit comme des assemblages de matière dépourvus de vraies significations, soit comme des objets animés d'intentions hostiles envers l'homme. En s'appuyant sur l'analyse des objets techniques, il montre concrètement que ce qui réside dans les machines n'est rien d'autre que de la réalité humaine.

Ainsi, il fait ressortir les concepts de " couplage " et de " synergie " pour décrire la relation entre l'homme et la machine : " Il y a couplage, dit-il, lorsqu'une fonction unique et complète est remplie par les deux êtres[106] " Les deux êtres sont indispensables pour l'effectuation de cette fonction unique. Les machines permettent ainsi de décupler certaines de nos fonctions, de nos perceptions et de modifier de la sorte notre être par ce couplage.

" Le couplage de l'homme à la machine commence à exister, précise Simondon, à partir du moment où un codage commun aux mémoires peut être découvert, afin que l'on puisse réaliser une convertibilité partielle de l'une dans l'autre pour qu'une synergie soit possible[107]. " L'interactivité, en tant que transformateur, participe à ce codage commun, à cette convertibilité qui permet la synergie, c'est-à-dire l'action coordonnée de plusieurs organes, ici l'homme et l'ordinateur.

Dans le cas de la création d'une réalité virtuelle simulant par exemple, sous une forme imagée, l'espace naturel, ses objets et leurs actions, plusieurs modèles sont nécessaires : des modèles de perspectives, des modèles d'éclairement, de couleur, de rendu, des modèles de lois de mouvement cinématique ou dynamique, de comportements etc. L'interactivité est ce qui permet à un acteur externe (artiste ou spectateur) de dialoguer avec ces modèles.

La multisensorialité dans les installations artistiques

Dans le domaine artistique, de plus en plus de créateurs, recherchant l'intervention du spectateur, proposent maintenant des dispositifs numériques variés qui sollicitent directement son concours non seulement au moyen de la vue, comme les arts plastiques nous y ont habitués, mais aussi au moyen de la parole, du son, du toucher, du mouvement : Faire de la musique en touchant de la main simplement des images d'instruments (*Mandala* du groupe Vivid Effects), caresser une " image-corps " et lui donner ainsi la

105. Georges Simondon, *Du mode d'existence des objets techniques,* Aubier, Ed. Montaigne, 1969, p. 124.
106. *Ibid,* p.124.
107. *Ibid,* p. 124.

vie (*The Sensuality and Anarchy of Touch*, T. Schiphorst), faire surgir des ombres improbables en touchant du doigt des petits cônes colorés (*Kage,* M. Chikamori), tourner les pages d'un livre virtuel et provoquer divers événements poétiques comme par exemple la fuite d'un caillou (*Beyond Pages*, M. Fujihata).

On peut constater que ces expérimentations remettent en cause la place prépondérante qu'il était habituellement faite à la vue et font intervenir simultanément d'autres sens et tout particulièrement le mouvement. Si la peinture tendait à privilégier à travers le regard une mono-sensorialité de la vue (qui n'était, toutefois, pas sans effet sur les autres sens), le cinéma, la télévision nous ont habitué depuis longtemps à une certaine forme de multisensorialité, celle de la vue et de l'ouïe, alors que l'interactivité tend à susciter le plus souvent la multisensorialité du mouvement.

Cette intégration de l'action et du mouvement du spectateur au coeur même de l'expérience esthétique est un des aspects essentiels de ces créations. En effet comme le montre Alain Berthoz, dans le livre intitulé *le sens du mouvement*[108], se mouvoir met en jeu la coopération de messages sensoriels multiples : système vestibulaire de l'oreille interne, capteurs musculaires et articulaires, récepteurs visuels et cutanés. Ainsi ces artistes qui intègrent dans leurs installations le mouvement, provoquent une sollicitation multisensorielle du spectateur.

Ils associent la contemplation à l'action, au mouvement, au geste. Par exemple, dans l'installation *La tentation de voir* de Marlène Puccini, la multisensorialité est convoquée grâce au mouvement du cube dans lequel est placé le spectateur. Ce mouvement provoque, pendant qu'il regarde une séquence d'images presque blanches sans repère, un léger vertige favorisant une étrangeté de la perception. Quand le spectateur marche sur l'image des corps endormis de l'installation *Coro* du Studio Azzuro, et que ceux-ci réagissent en remuant doucement à son passage, il a littéralement l'impression de voir du bout de ses pieds (peut-être une métaphore de la " rétine des pieds " ?).

Ainsi contrairement à l'idée reçue que les arts numériques seraient dématérialisés et décorporalisés, nous constatons que l'interactivité a introduit une certaine forme de multisensorialité dans ces arts, en faisant appel dans un premier temps à des modèles mécanistes, et en s'orientant actuellement vers des modèles connexionnistes et évolutionnistes ainsi que vers des modèles de la vie artificielle qui se nourrissent des neurosciences et de la biologie.

Si dans une première phase, la multisensorialité était surtout pensée du côté du spectateur, aujourd'hui elle se pose également du côté de l'œuvre elle-même, car celle-ci se trouve dotée maintenant de ses propres perceptions. Ainsi serait posée l'une des questions les plus actuelles dans les arts numériques : celle des relations entre les " perceptions-mouvements-actions " naturels et artificiels.

Le funambule virtuel

Cette installation réalisée avec Michel Bret, propose au spectateur de devenir, pour quelques instants, un funambule. Avec le balancier qu'il tient entre les mains, il interagit avec un autre funambule, virtuel celui-ci, dont l'image est projetée sur un écran de deux mètres de haut. Le face à face entre les deux "acteurs" s'élabore autour d'un jeu d'équilibre-déséquilibre.

Un capteur de mouvements, fixé au balancier, transmet à l'ordinateur des informations de position et d'orientation interprétées en temps réel comme des forces agissant sur l'acteur

[108] Alain Berthoz, *Le sens du mouvement,* Editions Odile Jacob Sciences, 1997.

dynamique de synthèse contrôlé par des réseaux neuronaux. Ainsi celui-ci développe des stratégies gestuelles autonomes acquises lors d'apprentissages.

Notre objectif est de mettre en scène un funambule virtuel doté de perceptions artificielles lui permettant de réagir de façon autonome (perceptions, mouvements et actions) aux sollicitations d'un spectateur. Grâce à une interactivité multisensorielle, le spectateur dialogue avec cet acteur virtuel quasi vivant, doté d'organes sensoriels artificiels et de capacité cognitives lui conférant des comportements émergents, autonomes et adaptatifs (mouvements et actions). Ainsi nous introduisons une certaine forme de sensorialité du côté du spectateur mais également du côté du funambule virtuel, en faisant appel à la fois à des modèles cinématiques et dynamiques, mais aussi à des modèles connexionnistes.

Les modèles cinématiques et dynamiques, qui sont le plus souvent employés dans les installations interactives, permettent une relation d'immédiateté entre le spectateur et l'être virtuel, soit sur le modèle du miroir (ex: je fais tel mouvement, l'être virtuel exécute en même temps le même mouvement), soit de type réactif à la manière " d'un ressort " (ex: j'applique une force sur l'être virtuel et celui-ci réagit dynamiquement en contre-réaction).

Ces types de relations ont l'avantage d'être évidents pour le spectateur qui se trouve soit dans la situation simple de prise directe avec son " ombre virtuelle ", soit en une situation réactive du type " tenir au bout de sa ligne l'être virtuel " qui réagit à son action. De nombreuses installations sont basées sur ces deux catégories d'interactivités soit de type " miroir " soit de type " réflexe ". L'interactivité " miroir " permet de projeter dans le monde virtuel son propre double qu'on pilote afin qu'il agisse. L'interactivité de type " réflexe " lui permet d'interagir avec les êtres et les choses qui peuplent ce monde.

Par ces procédés s'opère une fusion ambiguë entre le monde réel et le monde virtuel, fusion sur laquelle s'installe la possibilité d'un imaginaire, d'une poésie, d'une rêverie. En effet de façon simultanée à la relation interactive que le spectateur entretient avec le monde virtuel, où l'être virtuel qui lui est proposé (relation faite de perceptions et d'actions: il voit, il entend, il se déplace, il agit) il développe une relation imaginaire avec cet autre ou cet ailleurs.

On est ici au cœur de la question de l'esthétique de l'interactivité qui ne saurait se résoudre à un simple problème technique, tout en lui étant intimement liée. L'artiste crée les conditions techniques et esthétiques sur lesquelles pourront se développer l'imaginaire du spectateur dans sa relation au virtuel.

Toutefois quand la relation devient trop simple, trop évidente, la magie disparaît et " la présence " avec laquelle on entretient un dialogue devient trop triviale. Face à cette situation le créateur d'installation interactive a plusieurs stratégies. Une méthode consiste à complexifier la relation par différents procédés : par exemple, en faisant intervenir par tirage au sort des réactions imprévisibles, ou en créant des embranchements de réactions à choix multiples offrant ainsi un éventail de possibilités plus large. Une autre solution consiste à rompre de temps en temps la relation d'interactivité et ainsi donner une certaine indépendance à l'être virtuel qui, pendant quelques instants, se déconnecte du monde extérieur afin de vivre en autarcie sa propre vie.

Mais ces différentes solutions, tout en permettant un enrichissement (nous les avons utilisées dans d'autres installations) représentent une première phase d'expérimentation. Ainsi pour ne pas s'en tenir à la seule boucle rétroactive, l'approche connexionniste nous apparaît comme une voie nouvelle de recherche artistique. En effet si l'autonomie du personnage virtuel se traduit par la production de comportements volontaires, non prévus, face à ceux du spectateur, les réseaux neuronaux donnent la capacité de faire émerger de tels comportements.

Dans une première phase, nous apprenons au funambule différentes manières de retrouver son équilibre à partir de situations de déséquilibre. Dans une deuxième phase, il entre en interaction avec un spectateur et, grâce à l'apprentissage acquis précédemment, il " improvise " une réaction.

Il improvise, car il ne répète pas les différents mouvements qu'on lui a appris pour retrouver son équilibre, mais il utilise son réseau de neurones comme une mémoire afin de trouver, face à une situation nouvelle, la meilleure solution de rééquilibrage. Pour cela il utilise sa matrice de poids acquise lors d'un apprentissage préalable pour déterminer un comportement en fonction des entrées de son réseau, c'est-à-dire des ses capteurs (capteur externe: le capteur de mouvements déplacé par le spectateur et capteurs internes donnant la position de son corps dans l'espace).

Quand nous voyons ce funambule virtuel " inventer " ses propres solutions, ses propres mouvements de rétablissement, que nous ne lui avions pas encore vus effectuer précédemment, nous avons l'impression d'interagir avec un être vivant.
Cependant tout n'est pas si simple, alors qu'il est assez facile de mettre au point une interactivité de type réflexe, des difficultés surgissent dès lors que l'acteur virtuel devient autonome et manifeste des réactions imprévues, mais n'est ce pas justement l'intérêt de telles expérimentations ?

L'IMAGE DE SYNTHESE ET LA SEXUALITE
ou comment l'image de synthèse pense la sexualité

PAR ANNE-SARAH LE MEUR

La sexualité est une fonction vitale chez les êtres vivants. Elle leur permet de se reproduire, induit ainsi la survie de l'espèce. Elle correspond à un besoin physiologique (source ?) chez les animaux, et à une source de plaisir intense pour les êtres humains. Pour ces derniers, cette fonction biologique est devenue un comportement privé et relève de l'intimité. Elle se réalise la plupart du temps hors de vue.

Les arts en ont toujours montré des représentations : les sculptures préhistoriques de vénus *(Vénus de Willendorf* par exemple*)*, les fresques érotiques de Pompéi et des coupes grecques… Par la suite, la culture judéo-chrétienne en a quelque peu atténué les manifestations (Lucie-Smith), mais Courbet, puis Picasso en ont réalisé d'étonnantes peintures. Ces oeuvres peuvent nous révéler les comportements secrets des couples, mais surtout comment était perçue et interprétée la sexualité, tant par le peintre que par la société.

Ce texte cherche à montrer si les représentations sexuelles varient avec la création en image de synthèse. Si oui, comment et pourquoi.

Le mode de création avec l'ordinateur diffère de celui en peinture, en photographie ou en vidéo. Dans ces dernières, la réalité — la présence du modèle, ou la matière déposée sur la toile — agit sur les sensations et sentiments de l'artiste, et peut entretenir certains états de sensibilité propices à l'acte de création. Le travail par ordinateur, — et celui qui nous intéresse ici, en trois dimensions —, est radicalement différent : sans modèle réel ou autre stimulus sous les yeux, sans matière organique à transformer, l'artiste n'a que les " pures " mathématiques (géométrie, logique…) pour atteindre son but. L'artiste écrit des formules, des valeurs numériques, et les formes, les couleurs… apparaissent.

Une méthode aussi radicalement abstraite entraîne des changements notables. Les divers éléments formels semblent devoir être conscients et consciemment, précisément, décrits à l'ordinateur pour apparaître dans l'image. La spontanéité est réduite, la sensibilité, les impulsions peuvent s'émousser à force de géométrie et de quantifications obligatoires. Qu'en est-il des représentations sexuelles en image de synthèse ? Si la sensibilité et le désir/plaisir doivent passer par le filtre des mathématiques, existent-ils encore ? Sous quelles formes ? Que peut-on en déduire quant à la capacité d'évoquer le réel pour cette nouvelle méthode de création ?

A travers ce thème un peu racoleur, nous reprenons une question qui nous motive depuis longtemps : quelle corporéité, ou conscience du corps propre, ou façon d'être dans/avec son corps, possède l'artiste lorsqu'il crée à partir du langage et des nombres ? Nous la concentrons ici dans le champ/le lit du sexuel.

Ce que nous entendons par sexualité doit être tout d'abord précisé — ce qui déterminera notre plan. La sexualité peut apparaître de diverses façons, la plus évidente n'étant pas forcément la plus intéressante. Elle renvoie initialement à la représentation des organes génitaux, des caractères sexuels secondaires masculins ou féminins (les seins), ainsi qu'à celle de l'accouplement. Mais la sexualité peut apparaître aussi de façon symbolique : œil, conduit, etc., certaines formes participent d'une expression sexuelle, moins consciente ou moins explicite que les formes littérales, mais réelle, — la psychanalyse nous l'a montré. Enfin, et c'est ce qui nous intéresse le plus, la sexualité peut se loger dans la manière-même de présenter les formes, indépendamment de toute figuration. La sexualité devient ainsi globale, dispersée dans toute l'image. Elle

correspond à l'expression d'un désir, du désir, du plaisir, du sentiment sensuel, corporel. Elle manifeste son auteur, qu'il le veuille ou non.

Nous n'aborderons pas la question des relations de force dans le couple, vues par l'artiste, telle que l'exposition *Posséder et détruire* du Louvre (avril-juillet 2000) l'a traitée : d'une part, parce que la durée de chaque film est très brève (quelques minutes), limitant de fait le développement d'une telle présentation, d'autre part, parce que nous avons jugé le nombre d'oeuvres insuffisant pour que l'analyse soit intéressante.

Précisons encore que notre recherche se limite aux oeuvres créées en 3D, sans capture de volume ou de mouvement réels, dans la mesure où nous avons pu le détecter, et où cela est significatif dans l'œuvre. Nous ne parlerons pas des expériences de cybersexe ou de la consultation des sites " adultes ". Notre point de vue concerne la création de formes et d'images par langage interposé.

Remarquons que les femmes créatrices sont minoritaires, comme généralement dans les milieux scientifiques et technologiques — mais même dans le milieu de l'art officiel. Certaines (les plus connues sont Amkraut, Ikam, Sommerer) sont accompagnées par un homme — pour des besoins techniques ou de crédibilité ? Il n'apparaît pas clairement que ces Dames, dont je fais partie, réalisent des oeuvres différentes de celles de ces Messieurs.

La représentation d'organes sexuels humains est rare dans les films synthésiques.
Le remplacement généralisé des personnages humains par des objets industriels (jouet, gadgets, robots) ou par des squelettes (voir article Anomalie), pour éviter les " défaux " de réalisme, justifie en partie cette absence : peut-on imaginer des organes génitaux à un vélo, à une lampe ou à un robot ? Quoique cela pourrait être amusant… La sexualité est ainsi a priori écartée d'une grande partie des réalisations. Dans *Tall Story* (1996), Snow présente pourtant un robot constitué de parallélépipèdes filaires, l'un d'eux est un pénis. A l'image de certaines oeuvres dadaïstes, et sans posséder forcément d'organe sexuels, une machine pourrait être sexualisée[109].

Certains auteurs répugnent à montrer les parties génitales de leurs personnages lorsque ceux-ci sont nus : l'entrejambe reste cachée. Une couche dissimule l'identité génitale du bébé dans *Tin Toy* (1988), de John Lasseter. Dans *Migrations* (1997), de Chamski, après observation attentive, on devine que l'homme ailé a une culotte, fondue dans la matière uniforme du corps. Le film *Dobermann* (Imagina 1998), Jan Mounen, présente bien un loup habillé et debout, qui en vient à pisser, mais le cadrage ne le montre alors qu'au dessus de la ceinture.

Lorsqu'il y a des nus intégraux, très très très rares, les détails sexuels de leur corps restent discrets, voire invisibles. Le nu ne possède pas d'irrégularités à l'entrejambe. Les femmes de Michel Bret par exemple (voir plus loin), si elles sont entièrement nues, aux seins soigneusement aréolés et pointus, n'ont ni pubis ni sexe. Les personnages danseurs, de matière transparente, de *Luxor Excerpts*, de Kleiser et Walczak, ne présentent pas non plus de différence sensible en bas du ventre, comme s'ils portaient des costumes moulants, effaçant certains détails " inutiles ". D'autres corps sont tout simplement discontinus. Les danseurs masqués d'*Eurythmy* (1989), d'Amkraut et Girard, n'ont pas d'articulation : le bas du torse est ainsi constitué d'une sorte de triangle, sans fesses ni sexe, alors que les pectoraux sont dessinés dans le souci du détail plastique. Si

[109] *Voila la femme*, 1915, Picabia ou *Woman*, 1920, Man Ray, *La mariée mise à nu par ses célibataires même*, 1915-23, Duchamp. *Féminimasculin, Le sexe de l'art*, Centre Georges Pompidou, 1996, p. 190-195.

cela peut être justifié par des contraintes de réalisme des articulations et des mouvement, cela semble avoir été une solution d'évacuation de la sexualité.

Certaines exceptions existent : *Les Wrong Brothers* (1995), de Weston, une fois passés anges, et blancs, à force d'envols infructueux, laissent voir leurs jolies fesses rondes ainsi que leur zigounette. *Les Xons* de Babiole, que nous réservons pour plus tard. Et puis *Joram* (1994), de Rosen et Broersma présente un superbe personnage, un sexe masculin séparé de son corps et personnifié, debout, marchant, et faisant danser sa " capuche ", dans une forêt de mains ouvertes. De ce film se dégage la joie d'évoluer en pleine insouciance et liberté.

Si les organes génitaux proprement dit sont très rares, ou oubliés, il n'en est pas de même pour la représentation des seins. Que les femmes soient habillées ou nues, leur poitrine est toujours autant présente, visible et surtout valorisée. Minces de corps, souvent généreuses de poitrines, et d'une fermeté à toute épreuve. Les exemples " regorgent " : Lara Croft de *Tomb Raider* (1997) de Eidos, la voisine dans *Cloison* (1997) de Bériou, *Xanadu City* (1992), d'Estienne et Duval, *Eccentric Dance* (1992), de Takaoki, Jap, la chanteuse de *Don't touch me* (1989) de Kleiser et Walczak, USA, la barbie dans *KnickKnack* (1989), de Lasseter, sans oublier la *Sexy Robot* (1984) d'Abel.

Exception notable, *La grosse Lulu retourne à Venise* (1991) de Buendida, où la femme est plutôt forte et semble sensiblement moins jeune. Elle en possède d'autant plus de présence.

La situation de ces femmes est particulière. En premier lieu, elles sont très souvent seules. Certes, le peu de personnages à calculer réduit le temps de calcul. Mais cette solitude ne répond-elle pas à un désir des créateurs ? L'une d'elle prévient même : " Don't Touch me ". La femme de synthèse est-elle encore la représentation idéalisée de la femme, la beauté intangible, inaccessible ? Son corps dirait " touch me ", tandis que ses paroles et sa position dans l'espace l'interdiraient ? En second lieu, et cela revient au même, elles sont souvent actives voire super-actives, sportives et volontaires. Elles n'adoptent pas la position de séductrice jouant de son regard (à la différence de certains films de Dwoskin), ou de la femme séduite, offerte, ouverte aux regards. Elles n'en ont pas le temps — elles sont très contemporaines. C'est vraisemblablement parce qu'elles sont seules qu'elles sont actives, ou réciproquement.

La femme est donc objet de regard, objet de désir, mais ni sujet de désir — elle n'a pas conscience de sa sexualité —, ni partenaire dans un désir commun. Si la sexualité de la femme n'est pas complètement niée, elle est représentée chastement, par le buste, sans sexe. Elle n'est donc pas thématisée. *Diable est-il courbe ?* (1995) de Benayoun en est-il une tentative ?

Toutes ces oeuvres évitent de représenter un sexe, ou une quelconque fente ou zone plus sombre. Nous sommes très loin de *L'Origine du monde* de Courbet (1866) ou de la série *2000 photographies du sexe d'une femme de* Maccheroni (1969-72), où le sexe, ses lèvres et sa pilosité priment. Le poil est d'ailleurs le très grand absent de l'image de synthèse (cf. *Wrong Brothers* et *Joram*).

Comme les représentations de sexes, celles de l'acte sexuel sont rares, elles cachent alors souvent les organes correspondants.

Un des épisodes de la série des *Quarks* (1991) de Benayoun, Schuiten, et Peeters, montre l'accouplement d'êtres mâle et femelle en un emboîtement pudique et statique. *Lawnmawer man* propose une union-fusion entre l'homme et la femme, dans une liquéfaction en spirale, quasi monstrueuse. *The End.* (1995), de Landreth, choisit aussi l'union dans une spirale énergique, où d'épaisses gouttes opaques et roses finissent —

pudiquement ? — par encombrer l'écran et masquer la scène. La spirale et la liquidité auraient-elles remplacé le rythme en " va et vient " du cinéma ? Du comportement mécanique, serait-on passé à l'expression de l'intériorité ?

Dirty Power (1989) de Lurye, est un exemple curieux. Deux fils électriques sont branchés l'un sous l'autre, visiblement dans le mur d'un chambre, étant donnée le type de tapisserie. Bruit de radio. Lumière tamisée. Intimité. Ils se débranchent bientôt de leur attache, restent suspendus dans l'espace, se regardent, deviennent comme des serpents qui se reniflent, et ensuite se rebranchent alternativement à leur prise respective, la lumière et le son les suivant au même rythme.

Que veut dire le titre : *Dirty Power* ? Sale pouvoir ? Pouvoir électrique, pouvoir sexuel ? Dirty power ou dirty duty ? Faut-il y lire une note d'humour ? renvoie aux électriciens, cf. web ?

La série des *Xons* (1991-1992), de Cécile Babiole, semble être la seule réalisation sans fausse pudeur : elle montre et les organes et le rythme de copulation, et en joue avec humour. Sur une planète éloignée, des squelettes jaunes bien vivants vaquent à leurs occupations. Leur morphologie présente quelques libertés : outres leurs côtes " suspendues ", les hommes possèdent un pénis (présent également dans *Baston*), les femmes présentent un anneau relativement grand, vertical, au bas du ventre. Dans le numéro *Crac Crac*, un couple fait l'amour, debout et en société : le pénis en érection pénètre le vagin de la femme, ce dernier s'agrandit par a-coup après fécondation, puis disparaît dans le cosmos, identique en forme à la planète portant les personnages (film). Dans ses autres films, Babiole n'a pas donné d'organe sexuel à ses créatures. Mais sa tonicité perdure, à l'encontre des clichés sur les femmes.

L'absence de représentation d'organes sexuels est donc très généralisée, à la différence des autres arts (les nombreuses oeuvres de Picasso), ou de la télévision. Il est peu facile d'en trouver la raison. Il se peut que certains films ne nous soient pas connus, et que de nombreux étudiants ou artistes modélisent secrètement des sexes — féminins et masculins —.

Cette absence est-elle liée à une difficile modélisation ? Si un simple tube, éventuellement doté de petites boules, peut devenir un sexe masculin, une fente plus sombre ou un simple triangle peut convenir à la discrétion du sexe féminin. L'un ou l'autre peuvent être plutôt que montrés, signalés dans leur existence par une feuille de vigne, comme à la Renaissance. La difficulté n'est pas une excuse valable.

La nature du travail et la fatigue intellectuelle amènent-elles les créateurs à ne plus vouloir jouer et se faire plaisir ? Les auteurs ont-ils peur de choquer, ou d'être mal interprétés ? N'osent-ils plus aller à l'encontre des idées convenues ? Comment oublier que les personnages nus, pour être humains, doivent être sexués ? Les créateurs ont-ils refoulé leur propre sexualité, leur propre corps ? Eux qui poussent le réalisme physiologique à modéliser squelette et muscles sous-jacents avant d'aborder la peau et le mouvement, ils ne respectent pas le minimum vital biologique pour leur marionnette ! Sont-ils plus fascinés par le mécanisme du squelette de synthèse en marche que par le réalisme biologique ? Mais même les danses se sont édulcorées pour ne plus être érotiques. Ailleurs (Linz), la reproduction devient affaire de clonage, se passant ainsi de sexualité. Sans elle, quelle image du monde sommes-nous en train de produire ?

Notons également que les situations sont rares à valoriser la nature organique des corps : combien montrent des personnages âgés ou malades ? Et combien d'animations sur le thème de l'alimentation ? Le plaisir de bouche rejoint pourtant celui de corps. En

évacuant la sexualité, c'est la matière corporelle et putrescible que les créateurs tentent d'évincer.

Nous espérons que cette absence ne relève que d'une période initiale dans l'histoire de l'image de synthèse, et que lorsque certains auteurs auront réalisé plusieurs films, et notamment des films personnels, ils en viendront à représenter l'ensemble de leur réalité, et notamment leurs émotions liées à la sexualité. Ce texte vise aussi à les y encourager.

Si l'on recherche dans l'image réaliste plutôt que des formes directes, des symboles, la sexualité semble alors plus répandue.

L'œil est ainsi une forme fréquente. Il représente certes l'exacerbation du désir de voir, mais vaut également pour tout désir (psychanalyse). Sur les visages, il est souvent hypertrophié. Certains films le présentent isolé du corps, se déplaçant de façon autonome : logo du salon *Imagina* pendant de nombreuses années, de l'*Oeil du cyclone*, *Automappe* (1988), de Michel Bret, ou *Limbes* (1995), de Bériou. Dans de nombreuses oeuvres tant littéraires que picturales, l'oeil est souvent associé au sexe, féminin ou masculin[110] : *Tableau d'amour* (1993), Bériou le manifeste également. Précisons que cet artiste mêle vidéo et synthèse, ce qui facilite la représentation.

Le " tuyau " — forme oblige — est également de la partie. Les couloirs infinis dans lesquels la caméra vole à toute bringue, appelés *rides* ou *fly through*, fleurissent dans les parcs de jeux et les salles de cinéma dynamique. Or, ces espaces tubulaires, souvent sombres, sont une métaphore du vagin. *Limbes* nous le montre sans détour, lorsqu'à la fin, l'œil — ou sa transformation ? — arrive dans les bras d'un accoucheur. Ces tuyaux représentent alors le désir de revenir dans le ventre de la mère, en lévitation, sans lourdeur matérielle (Marc Dery[111]).

Mais les déplacements dans ces couloirs sont rapides, ils apparaissent pressés, comme pressés d'en finir. Et pourtant ils n'en finissent pas. Drôle de désir que ce désir qui ne s'avoue pas et qui ne semble pas être agréable lorsqu'il est réalisé.

A travers ces manifestations symboliques, l'œil ou le tuyau, nous voyons que, si les créateurs en image de synthèse ne représentent pas littéralement de sexe, ce dernier est donc pourtant très présent de façon détournée, presqu'angoissée.

Ironiquement, on pourrait également évoquer les éclatements, les fusées et autres navettes volantes qui expriment une énergie peut-être davantage masculine…?

J'aimerais maintenant insister sur la quantité de formes molles, plus ou moins flasques ou énergiques, dans les animations synthésiques. Elles sont définitivement souples ou elles le deviennent : *Limbes*, mais également *In search of muscular axis* (1990), de Kawahara Toshifumi, *Organ House* (1992), de Masa Yoshi Obata, *The page master* (Imagina 1995), de Hunt et Stoen, *Le ressac* (1992), de Le Peillet et de Kermel, *Lux* (1992), de Guilminot, *Displaced Dice* (Imagina 1995), de Zancker, *Betezeparticules* (1994), de Bret, et tous les films de Kawaguchi, etc.

Si ces formes molles manifestent la capacité de transformation des images numériques, elles relèvent ce faisant d'un jeu avec la " matière ", de l'effet d'une force sur la forme redevenue matière, voire de l'action que leur fait subir leur créateur mentalement

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[110] Georges Bataille, *Histoire de l'œil*, Bellmer, *Unica, L'œil sexe*, 1961, Brauner, *Le monde paisible*, 1927, et Louise Bourgeois, *Le regard*, Annette Messager, *Chimère*, 1982, etc. *Féminimasculin*, *op. cit.*, p. 167-169.

[111] M. DERY, *Vitesse virtuelle. La cyberculture aujourd'hui*, Abbeville, Paris, 1997, p. 168.

: “ dans le pétrissage, plus de géométrie, plus d’arêtes, plus de coupures[112]. ” Avec ces courbes et ces mouvements, c’est également son désir de contact, de liaison, d’adhésion que le créateur exprime[113].

Saluons à cet égard la sensualité globale qui se dégage de *Indo Dondaine* (1993), réalisé par Huitric, Nahas, Tramus, et Saintourens : les couleurs, les formes et les mouvements communiquent dans l’ensemble de l’image.

L’image de synthèse amène ainsi une expression inattendue. Son immatérialité tant décriée se voit démentie : le contact entre le créateur et la matière de l’oeuvre se fait symboliquement, de façon imaginaire et profonde, car inconsciente. Il ne faut donc pas tant s’attarder aux formes visibles qu’à la manière dont celles-ci apparaissent.

Si certains créateurs d’image de synthèse parlent de sexualité ou manifestent un désir de contact, littéralement ou inconsciemment, ils restent trop souvent en surface, sans en traiter la face cachée. Ils ne se questionnent pas sur l’intériorité du personnage, de la leur, ni de celle du spectateur. Les réalisations par ordinateur peuvent-elles manifester la complexité, le mystère de la sexualité ?

Certains rétorqueront que tant que cette image de synthèse restera trop propre, trop lisse, trop ordonnée et trop léchée, elle ne pourra pas apparaître un tant soit peu sexuelle ou sensuelle. Sans imperfection, sans saleté, sans accident, car sans matière organique, ni à la source, grâce à un modèle, ni dans son support, comme médium de représentation, quel désir ou quel plaisir peuvent y être inscrits ?

Pour finir, je souhaiterais montrer deux travaux, l’un et l’autre travaillent avec l’obscurité, la fugacité, la matière indéterminée. L’un et l’autre condensent une présence à l’oeuvre, et un travail du regard sur l’image totale, dans une exigence plastique — des éléments difficilement quantifiables.

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[112] G. Bachelard, *L’eau et les rêves, Essai sur l’imagination de la matière,* José Corti, Paris, 1942, p. 146.
[113] G. Durand, *Les structures anthropologiques de l’imaginaire*, Dunod, Paris, 1992, p. 308-312.

CORPS DISSIDENTS DANS L'ERE NUMERIQUE

PAR MARIA KLONARIS ET KATERINA THOMADAKI

Le titre de cette intervention est *Corps dissidents dans l'ère numérique*. Un corps dissident implique un sujet dissident. Les corps et donc les sujets dissidents sont rebels par rapport à une norme. Une norme implique une idéologie socio-culturelle fondée sur l'exclusion. Des corps et des sujets hors norme, extra-ordinaires sont souvent au centre de notre univers.

L'une de nos spécificités c'est que nous travaillons sur des corps différents mais qui sont bien réels. Il ne s'agit pas de fictions numériques autour du corps. En ce sens notre travail s'oppose à cette tendance qui se généralise pendant les dernières années, cette tendance de fictions numériques sensationnelles autour du corps humain. Chez-nous il s'agit de corps bien réels, déjà extraordinaires, par nature, si l'on peut dire. Des corps contre-naturels, au sens où ils défient l'idée que nous nous faisons de la nature du corps. Les outils numériques interviennent dans notre création pour nous permettre de reformuler l'image de ces corps, et de la projeter dans un univers poétique. Nous utilisons le potentiel transformateur des technologies imagistes non pas pour détruire, pour désagréger ces corps dissidents, mais au contraire pour en augmenter l'impact mental, autrement dit leur puissance.

Une autre spécificité de notre travail, c'est que les corps/sujets différents sur lesquels nous travaillons impliquent toujours une rencontre. Ce sont des personnes que nous rencontrons à travers des documents d' archives médicales, photographies ou cires anatomiques, des personnes qui s'imposent à notre regard et à notre création par la force de leur présence, ou de leur souffrance. Ces personnes gardent un statut de sujet dans notre création. Notre œuvre fleuve *Le Cycle de l'Ange* (1985-2000) a comme point de départ une photographie médicale d'intersexuel/le que Maria a trouvé dans les archives de son père gynécologue chirurgien. Pendant 15 ans, nous retravaillons cette photographie par divers médias et nous la mettons en scène dans des environnements spécialement conçus. Vous pouvez visiter *Le Cycle de l'Ange* sur notre site Internet.

Aujourd'hui nous vous présenterons le nouveau cycle d'œuvres que nous avons inauguré à la Galerie Donguy en mars 2000, et qui s'appelle *Désastres sublimes*, *les Jumeaux*. Empruntée à nouveau à l'imagerie médicale, ici l'image de départ est une cire de jumeaux "siamois" de la collection anatomique du Musée Spitzner. Nous associons cette image d'un corps "monstrueux" avec des organismes marins, des photographies de coquillages, ainsi que des planches extraites de l'ouvrage *Formes artistiques de la nature* (1899) du biologiste allemand Ernst Haeckel. Nous intégrons ainsi des champs d'exploration scientifique (biologie, génétique) dans notre recherche plastique.

Dans la première partie de cette intervention nous vous parlerons des protagonistes de notre série de photographies numériques *Désastres Sublimes* et de la réflexion qui sous-tend cette œuvre.

Dans la deuxième partie, nous vous présenterons un document vidéo que nous avons réalisé sur notre exposition à la galerie Donguy.

Tout d'abord les protagonistes de *Désastres sublimes* : d'une part les enfants dont nous reprenons l'image et d'autre part Ernst Haeckel.

Ces enfants sont catalogués “monstres”. Monstres biologiques. Monstres humains. Il s'agit de Giacomo et Giovanni Tocci nés en 1877 en Sardaigne et classés à leur naissance dans la catégorie des xiphodymes par les professeurs Fabini et Moss de l'Académie Royale de Médecine à Turin. Selon la nomenclature instituée par Isidore

Geoffroy Saint-Hilaire en 1832, ils seraient des dérodymes de la famille des sysoliens de la catégorie des monstres doubles autosites de la classe des monstres composés. C'est l'époque où triomphent la classification et la typologie. La science se construit alors sur l'idée d'une homogénéité naturelle, mais aussi d'une supériorité naturelle du type idéal. Elle invente ses règles à partir de phénomènes statistiquement majoritaires dans une périphérie géographique limitée - le monde occidental - et repousse dans les marges les phénomènes rares, exceptionnels, ainsi que toute forme d'étrangéité. Elle balise ainsi les limites inviolables de la normalité et assimile la différence à la déviance. Depuis, la génétique nous a appris que, comme dit Albert Jacquard, "les individus, tous différents, ne peuvent être classés, évalués, ordonnés (...) le processus naturel n'aboutit nullement à rassembler les individus autour d'un type idéal. Il semble avoir une tout autre stratégie : préserver la diversité".

"De tout temps, le corps étrangement formé représente l'absolue Altérité" remarque Leslie Fiedler, auteur de *Freaks : Myths and Images of the Secret Self* . Il est *l'étranger archétypique*, l'étranger le plus extrême. Figure de la complexité et de l'insaisissable, le monstre est aussi un agent perturbateur radical, qui ébranle toute notion d'ordre. Michel Foucault insiste sur la dimension "juridique" du monstre : "juridique, bien sûr, au sens large du terme, puisque ce qui définit le monstre est le fait qu'il est, dans son existence même et dans sa forme, non seulement violation des lois de la société, mais violation des lois de la nature. (...) Il est l'infraction et l'infraction portée à son point maximum. (...) Le monstre est une infraction qui se met automatiquement hors la loi".

Ces corps hors la loi deviennent emblématiques dans la deuxième moitié du XIXe siècle. Leur fragilité, couplée avec la force de l'inimaginable, exerce un magnétisme particulier. Le corps monstrueux acquiert une visibilité maximale au sein de ces musées primitifs que furent les *freak shows*. Il donne lieu à une forme spéciale de voyeurisme, celle que Robert Bogdan appelle *the pornography of disability* (6). Pourtant, même examinés par des spécialistes, les "monstres" n'étaient pas alors des patients. Ceux parmi eux qui arrivaient à maîtriser leur condition, devenaient des professionnels, gagnaient leur vie et attiraient le respect de la communauté. Les autres, beaucoup plus nombreux, restaient des objets d'appropriation, corps exploités par les gestionnaires du spectacle, victimes d'un esclavage contemporain de la nouvelle forme de démocratie façonnée par la révolution industrielle.

Depuis leur plus tendre enfance, Giacomo et Giovanni Tocci étaient exhibés par leur père en tant que "phénomènes". Après avoir parcouru les villages de leur Sardaigne natale, dans leur adolescence ils deviennent des professionnels se produisant dans de grands établissements comme le Panopticum de Berlin. Ils parlaient couramment l'italien, le français et l'allemand. Partis aux Etats-Unis en 1892, ils sont reconnus par l'American Scientific Academy comme "les plus remarquables monstres doubles qui aient jamais approché la maturité". Cela leur vaut une carrière de stars dans les *freak shows* américains. Ils font fortune. Avant la fin du siècle, en 1897, à l'âge de 20 ans, ils décident de quitter les Etats-Unis et le monde du spectacle. Ils retournent en Italie et font construire une villa entourée de hauts murs aux environs de Venise. Ils épousent deux sœurs. C'est en leur compagnie qu'ils vivront désormais séquestrés dans leur villa, sans plus jamais se montrer en public. Ils meurent en 1940 à l'âge de 63 ans. Leur vie dément le mythe de la survie impossible des monstres. Mais aussi, elle semble symptomatique du retournement historique du statut du monstre. Du XIXe au XXe siècle, ils passent de la visibilité à l'invisibilité, de la spectacularisation à l'(auto)séquestration.

Les fameux frères ont été modelés dans l'éphémère matière de la cire. De sculpteur inconnu, leur portrait de cire a fait partie des collections du Musée Spitzner.

Ainsi leur exhibition fut dédoublée. Les foires ont accueilli leur(s) corps vivant(s) et leur simulacre en cire. Les cabinets de curiosités, précurseurs des musées modernes, ont été l'autre versant des *freak shows*. Ils ont mis en place un autre type de spectacularisation de l'anomalie et de la pathologie humaines. Les corps disséqués y voisinaient avec les corps atteints de maladies mortelles et avec les corps monstrueux. L'apprentissage du corps devait passer par la terreur des corps interdits.

En 1881 les frères Tocci sont présentés à la Société Anthropologique de Berlin. Rudolf Wirchow parle des "Italiens xiphodymiques" dans son rapport de fin d'année des activités de la Société. C'est l'époque où les monstres exhibés au Panopticum de Berlin sont systématiquement "expertisés" par les scientifiques allemands. Les curiosités humaines recrutées par les impresarii alimentent la recherche scientifique. La théorie darwinienne a déjà acquis une grande popularité en Allemagne, largement grâce au biologiste Ernst Haeckel. Dans le prolongement de la pensée darwinienne, Haeckel formule sa théorie de la récapitulation, notamment sa "loi bioénergétique" (1866) qui postule que l'ontogenèse est une récapitulation de la phylogenèse.

Nous ignorons si Ernst Haeckel avait pris connaissance du cas Tocci, mais leurs trajectoires semblent se croiser en cette Allemagne fin de siècle. En 1899 Haeckel publie la première partie de sa recherche à la fois scientifique et plastique sur les *Formes artistiques de la nature* . Il dessine des micro-organismes marins découverts au cours de ses voyages dans diverses mers - la Méditerranée, la mer Rouge, l'océan Pacifique - et observés au microscope. Des études comparatives récentes de ces dessins et de photographies actuellement obtenues par microscope, montrent que les dessins sont incomparablement plus précis et complets. Haeckel y investit à la fois sa vocation de peintre et ses dons d'observation scientifique.

L'intérêt de Haeckel pour les protozoaires marins, dont il a découvert près de quatre mille nouvelles espèces, est lié à sa théorie du jaillissement spontané de la vie par les océans. Les méduses, les radiolaires, les siphonophores, les éponges calcaires et les amonites, leur parenté formelle intrinsèque, les variantes de leurs géométries, démontrent la continuité entre l'organique et l'inorganique défendue par Haeckel. Dans l'espace de ses planches, les micro-organismes acquièrent une dimension cosmologique. On dirait des organes de l'univers, des astres sous-marins, qui partagent avec les astres célestes la symétrie rayonnée. Haeckel nous livre un firmament océanique. Et ce miroir qu'il avait imaginé entre ontogenèse et phylogenèse ressurgit entre microcosme et macrocosme, entre révélations microscopiques et téléscopiques. Les dessins détiennent la densité philosophique d'un théorème sur l'origine du monde.

Les œuvres

Des assemblages de photographies et d'objets ont été la première étape de notre travail sur les jumeaux conjoints (*Les Jumeaux célestes*, 1995 - œuvre inédite). Dans un deuxième temps nous avons retravaillé la photographie initiale sur copieur numérique en surimpression avec des photographies de coquillages. Les tirages grand format de l'exposition *Dés*astres *sublimes* font partie de cette étape. Dans un troisième temps nous avons intégré l'image des enfants dans certaines planches extraites des *Formes artistiques de la nature*. Les imbrications et les transformations ont été obtenues par des traitements numériques. Pour cette même exposition nous avons retenu 33 variations présentées sous forme de tirages numériques de format 33 X 48 cm réalisés par nous-mêmes sur imprimante à jet d'encre. Par la prise en mains de ces techniques successives, nous avons retrouvé, avec les outils numériques, copieur ou ordinateur, le rapport direct entre *la main* et *la vue*, cette synergie si présente dans nos films. Mais la différence ici, c' est qu'il n'y a pas de regard à travers l'objectif. Nous n'avons procédé à aucune capture d'image par une caméra. Comme pour *L'Ange. Corps des étoiles* ou

Angélophanies, toutes les images sont trouvées et proviennent de sources scientifiques (médecine/astronomie pour *L'Ange,* médecine/ biologie pour *Les Jumeaux*).

Ces enfants jumeaux, on dirait des clones naturels. Dans *Dés*astres *sublimes,* le processus de clonage se démultiplie - de la réalité catoptrique du corps à une chaîne de simulacres : cire, photographie, palimpsestes numériques. L'affrontement entre le corps et le regard est médiatisé à répétition. Les doublures qui s'emboîtent sont autant de dialogues avec la terreur et la splendeur. Puis une image apparaît, qui cristallise le transfert sous-jacent : nous, enfants, empruntant le corps des jumeaux. Double enfant, enfants du double, mise en abyme de l'expérience intérieure du double auteur. Saut dans le miroir.

Le corps extraordinaire des jumeaux soulève une question devenue aujourd'hui incontournable, celle de la nécessité de redéfinir la nature. Le monstre, disait Foucault, est "la forme naturelle de la contre-nature". "Un être cosmologique ou anti-cosmologique". Du côté de la biologie et de la génétique, cette anatomie monstrueuse et rêvée transgresse une limite réputée inviolable. Elle impose, par sa réalité, un élargissement de la notion de nature et du coup une révision de la notion de normalité ancrée dans un ordre "naturel" qui reflèterait l'ordre divin. Ce corps cosmologique nous oblige à tout repenser : la "nature", le langage, le regard, le monde. Ce monstre humain rejoint, tout en s'y opposant, les interrogations bouleversantes générées actuellement par les hybridations entre corps et technologie.

Les dessins de Haeckel, on pourrait dire ses cristallographies marines, posent aussi la question de la nature, mais d'un autre bord. Inventeur, entre autres, du terme "écologie", Haeckel s'est penché sur les rapports des organismes avec leur environnement. Sa vision de la nature abandonne la limite entre l'organique et l'inorganique, l'inerte et le vivant. Une position confirmée aujourd'hui par les recherches sur les propriétés auto-organisatrices de la matière, mais aussi, à tort ou à raison, par les néo-ontologies cybernétiques.

Tant le corps des jumeaux que les planches de Haeckel soulèvent enfin la question de la symétrie, de l'ordre et du désordre, du chaos. Si les planches de Haeckel rangent, les jumeaux dé-rangent. Leur corporéité apporte le désordre et le chaos. Et pourtant ils dégagent une hallucinante perfection.

Dans *Désastres sublimes* sont réunis des corps qui appartiennent à d'autres dimensions du réel, à d'autres niveaux du visible. De l'échelle humaine à l'échelle microscopique, des liens se tissent, des miroirs surgissent. Car l'ensemble de notre œuvre est traversé par l'idée que la réalité ne peut pas se restreindre à la convention qui l'identifie au monde extérieur. Elle la déborde à la fois en termes de dimension - humaine, microscopique, subatomique, macrocosmique... - et en termes de visibilité - perceptions du monde extérieur, rêves, visions, hallucinations... C'est sur ce réel-là, sur ce réel multidimensionnel que nous travaillons. D'où notre attirance pour les projections, les doubles et les nouvelles dimensions ouvertes par les technologies imagistes. D'où notre passion pour les corps visionnaires.

Dans l'espace de l'exposition de *Désastres sublimes* nous avons utilisé des miroirs. Les miroirs ont été intégrés dans les diptyques ou les triptyques composés de tirages photographiques grand format, de sorte à inclure le spectateur dans un espace défini par le corps des jumeaux conjoints. Le spectateur se trouvait ainsi confronté à sa propre image qui prenait une autre dimension à travers cette confrontation. D'autre part les miroirs ouvraient un espace virtuel à l'intérieur même des œuvres exposées. Dans le document vidéo que vous verrez maintenant nous n'avons pas voulu enregistrer uniquement l'espace ou les œuvres exposées, mais les trajets du regard dans l'espace et

sur les œuvres. Et ceci à travers cette connivence entre le regard et le geste de la main qui filme, qui marque notre pratique filmique. La vidéo est silencieuse, elle dure 14 minutes.

MULTIMEDIA: FROM WAGNER TO VIRTUAL REALITY

BY RANDALL PACKER

(Includes excerpts from the forthcoming book “Multimedia: From Wagner to Virtual Reality”[xiii])

Overture

The attempt to apply a definition to multimedia has been a difficult proposition. To begin with, multimedia as a description of artistic activity has changed dramatically since the 1960s when it referred to experimental forms of performance art, happenings, mixed media, and other forms of interdisciplinary art. In the 1980s, multimedia was applied to the plethora of emerging forms of entertainment and educational media from CD-ROMs to interactive games to virtual reality. Since the mid-1990s, multimedia has taken on new definition and significance with the emergence of widespread networked technologies, most notably the World Wide Web. It is no wonder the term has become problematic: vague, over-hyped and referencing a seemingly endless array of new media forms, genres, and commercial application.

It was in response to this dilemma, particularly the medium’s lack of historical context, that I began my research in the late 1980s. It became clear to me at the time that an idealized model for contemporary forms of multimedia could be found in Richard Wagner’s Gesamtkunstwerk (Total Artwork), as well as the work of later composers whose artistic pursuits led them to the notion of composing with media. Throughout the 20th Century, artists and composers alike have explored the interdisciplinary realm of music theater, performance art, and interactive electronic media. Of prime importance in this analysis was linking experimental forms that blurred the boundaries of music and the arts to parallel movement in the cybernetic and information sciences – the work of engineers who also embraced interdisciplinary ideals and the quest for new avenues of subjective experience through integrated and non-linear forms.

From this investigation, I began to explore a set of key paradigms that provided a conceptual framework for bridging these two seemingly disparate worlds of creative activity in the arts and sciences. This framework was distilled to five essential concepts that have come to form a meta-description for discussing multimedia: integration, interactivity, hypermedia, immersion, and the emerging narrative forms that have resulted from these evolving paradigms.

Integration

In 1849, Wagner introduced the concept of the Gesamtkunstwerk, or Total Artwork, in an essay called "The Artwork of the Future."[xiv] It would be difficult to overstate the power of this idea, or its influence. Wagner’s description of the Gesamtkunstwerk is one of the first attempts in modern art to establish a practical, theoretical system for the comprehensive integration of the arts. Wagner sought the idealized union of *all* the arts through the "totalizing," or synthesizing, effect of music drama – the unification of music, song, dance, poetry, visual arts, and stagecraft. His drive to embrace the full range of human experience, and to reflect it in his operas, led him to give equal attention to every aspect of the final production. He was convinced that only through this integration could he attain the expressive powers he desired to transform music drama into a vehicle capable of affecting German culture.

Twentieth century artists have continued the effort to heighten the viewer's experience of art by integrating traditionally separate disciplines into single works. Modern experience,

many of these artists believed, could only be evoked through an art that contained within itself the complete range of perception. "Old-fashioned" forms limited to words on a page, paint on canvas, or music from an instrument, were considered inadequate for capturing the speed, energy and contradictions of contemporary life.

In their 1916 manifesto "The Futurist Cinema,"[xv] F.T. Marinetti and his revolutionary cohorts declared film to be the supreme art because it embraced all other art forms through the use of (then) new media technology. Only cinema, they claimed, had a "totalizing" effect on human consciousness. Less than a decade later, in his 1924 essay describing the theater of the Bauhaus, "Theater, Circus, Variety,"[xvi] László Moholy-Nagy called for a theater of abstraction that shifted the emphasis away from the actor and the written text, and brought to the fore every other aspect of the theatrical experience. Moholy-Nagy declared that only the synthesis of the theater's essential formal components – space, composition, motion, sound, movement, and light – into an organic whole could give expression to the full range of human experience.

The performance work of John Cage was a significant catalyst in the continuing breakdown of traditional boundaries between artistic disciplines after World War II. In the late 1940s, during a residency at Black Mountain College in North Carolina, Cage organized a series of events that combined his interest in collaborative performance with his use of indeterminacy and chance operations in musical composition. Together with choreographer Merce Cunningham and artists Robert Rauschenberg and Jasper Johns, Cage devised theatrical experiments that furthered the dissolution of borders between the arts. He was particularly attracted to aesthetic methods that opened the door to greater participation of the audience, especially if these methods encouraged a heightened awareness of subjective experience. Cage's use of indeterminacy and chance-related technique shifted responsibility for the outcome of the work away from the artist, and weakened yet another traditional boundary, the divide between artwork and audience.

Cage's work proved to be extremely influential on the generation of artists that came of age in the late 1950s. Allan Kaprow, Dick Higgins and Nam June Paik were among the most prominent of the artists who, inspired by Cage, developed non-traditional performance techniques that challenged accepted notions of form, categorization, and composition, leading to the emergence of genres such as the Happenings, electronic theater, performance art, and interactive installations.

In this climate, artists became increasingly interested in integrating technology into their work. While technology clearly played a significant role in 20th century arts (such as photography, film, and video, as well as various fine arts genres), it was not until Bell Labs scientist Billy Klüver placed the potential of advanced engineering into the hands of artists in New York that integrated works of art and technology began to flourish. Klüver conceived the notion of *equal* collaboration between artist and engineer. He pioneered forms of art and technology that would have been unimaginable to the artist without the engineer's cooperation and creative involvement. With Robert Rauschenberg, Klüver created several of the earliest artworks to integrate electronic media and to encourage a participatory role for the audience, including Oracle (1963-65) and Soundings (1968).

In 1966 Klüver co-founded E.A.T. (Experiments in Art and Technology) to bring artists and engineers together to create new works. E.A.T.'s most ambitious production was the Pepsi-Pavilion, designed for the Osaka Expo '70 in Japan – a tremendously ambitious collaborative, multimedia project that involved over 75 artists and engineers. As Klüver explained, audience participation was at the heart of their interests: "The initial concern of the artists who designed the Pavilion was that the quality of the experience of the visitor should involve choice, responsibility, freedom, and participation. The Pavilion would not tell a story or guide the visitor through a didactic, authoritarian experience. The visitor

would be encouraged as an individual to explore the environment and compose his own experience."[xvii]

Interactivity

In the years immediately after World War II, under the shadow of the atomic bomb, the scientific establishment made a concerted effort to apply recent advancements in technology to humanitarian purposes. In this climate, Norbert Wiener completed his groundbreaking theory on cybernetics. While Wiener did not live to see the birth of the personal computer, his book, *The Human Use of Human Beings*,[xviii] has become *de rigeur* for anyone investigating the psychological and socio-cultural implications of human-machine interaction. Wiener understood that the quality of our communication with machines effects the quality of our inner lives. His approach provided the conceptual basis for human-computer interactivity and for our study of the social impact of electronic media.

Bush and Wiener established a foundation on which a number of computer scientists associated with the Advanced Research Projects Agency (ARPA) – a U.S. government funded program to support defense-related research in the1960s – began to build. Leading ARPA's effort to promote the use of computers in defense was the MIT psychologist and computer scientist J.C.R. Licklider, author of the influential article "Man-Computer Symbiosis."[xix] Defying the conventional wisdom that computers would eventually rival human intelligence, rather than enhancing it, Licklider proposed that the computer be developed as a creative collaborator, a tool that could extend human intellectual capability and improve a person's ability to work efficiently.

While at ARPA, Licklider put significant resources towards the pursuit of his vision. Among the scientists he supported was Douglas Engelbart, who since the mid-1950s had been seeking support for the development of a digital information retrieval system inspired by Vannevar Bush's Memex. APRA funding enabled Engelbart to assemble a team of computer scientists and psychologists at the Stanford Research Institute to create a "tool kit" that would, as he phrased it, "augment human intellect."[xx] Dubbed the oNLine System (NLS), its public debut in 1968 at the Fall Joint Computer Conference in San Francisco was a landmark event in the history of computing. Engelbart unveiled the NLS before a room of 3,000 computer scientists, who sat in rapt attention for nearly two hours while he demonstrated some of his major innovations, including the mouse, windows for text editing, and electronic mail. Engelbart was making it possible, for the first time, to reach virtually through a computer’s interface to manipulate information. Each of his innovations was a key step towards an interface that allowed for intuitive interactivity by a non-specialist.

Engelbart's NLS pioneered some of the essential components necessary for the personal computer, but it would be up to a new generation of engineers to advance computing so it could embrace multimedia. As a graduate student in the late 1960s, Alan Kay wrote a highly influential Ph.D. thesis proposing a personal information management device that, in many ways, prefigured the laptop. In 1970, as research in information science was shifting from East Coast universities and military institutions to private digital companies in Silicon Valley, Kay was invited to join the new Xerox PARC in Palo Alto. PARC's mandate was no less than to create "the architecture of information for the future."

At PARC, Alan Kay conceived the idea of the Dynabook – a notebook sized computer that enabled hyperlinking, was fully interactive, and integrated all media. With the Dynabook, digital multimedia came into being. Echoing Licklider, Engelbart and colleagues at PARC, Kay declared the personal computer a medium in its own right, It was a "meta-medium," as he described it in his 1977 essay "Personal Dynamic Media,"[xxi] capable of being "all other

media." While the Dynabook remained a prototype that was never built, the work that came from its development, including the invention of the Graphical User Interface (GUI) and subsequent breakthroughs in dynamic computing, was incorporated into the first true multimedia computer, the Xerox Alto.

Hypermedia

It was Vannevar Bush who, in 1945, determined the chief narrative characteristic of multimedia by proposing a mechanical device that operated literally "as we may think."[xxii] The challenge, as he saw it, was to create a machine that supported the mind's process of free association. Bush noted how ideas tend to evolve in a non-linear, idiosyncratic fashion. His Memex would be a tool that could supplement this aspect of human creativity by organizing its media elements to reflect the dynamics of the mind at play.

Douglas Engelbart expanded on Bush's premise. His quest to "augment human intelligence," as he aptly phrased it, was based on the insight that the open flow of ideas and information between collaborators was as important to creativity as private free association. The personal computer, as he envisioned it, would not only allow for the arrangement of data in idiosyncratic, non-linear formats. By connecting workstations to a data-sharing network and turning them into communications devices, Engelbart's oNLine System allowed for a qualitative leap in the collaboration between individuals – almost as if colleagues could peer into one another's minds as part of the creative process. In the early 1960s, experiments with networked personal computing promised the non-linear organization of information on a grand scale.

While few recognized this possibility at the time, it inspired a series of influential theoretical writings by the rogue philosopher Ted Nelson. Working outside of the academic and commercial establishments, following his own strongly held convictions, Nelson devised an elaborate system for the sharing of information across computer networks. Called Xanadu, this system would maximize a computer's creative potential. Central to Nelson's approach was the "hyperlink," a term he coined in 1963, inspired by Bush's notion of the Memex's associative trails. Hyperlinks, he proposed, could connect discrete texts in non-linear sequences. Using hyperlinks, Nelson realized, writers could create "hypertexts," which he described as "non-sequential writing" that let the reader make decisions about how the text could be read in other than linear fashion. As he observed in his landmark book from 1974, Computer Lib/Dream Machines,[xxiii] "*the structures of ideas* are not sequential." With hypertext, and its multimedia counterpart, "hypermedia," writers and artists could create works that encouraged the user to leap from one idea to the next in a series of provocative juxtapositions that presented alternatives to conventional hierarchies.

In 1989 Tim Berners-Lee, a young British engineer working at CERN, the particle physics laboratory in Geneva, Switzerland, circulated a proposal for an in-house on-line document sharing system which he described modestly as "a 'web' of notes with links."[xxiv] After getting a grudging go-ahead from his superiors, Berners-Lee dubbed this system the World Wide Web. The Web, as he designed it, combined the communications language of the Internet with Nelson’s hypertext and hypermedia, enabling links between files to extend across a global network. It became possible to link every document, sound file or graphic on the Web in an infinite variety of non-linear paths through the network. And instead of being created by a single author, links could be written by anyone participating in the system. Not only did the open nature of the Web lend itself to a wide array of interactive, multimedia experiences, but by hewing to a non-hierarchical structure and open protocols, Berners-Lee's invention became enormously popular, and led to an explosion in the creation of multimedia. By 1993 the Web had truly become an international phenomenon.

The success of the Web seemed to confirm the intuition of artists engaging in digital media that in the future, a global media database would inspire new forms of expression. Roy Ascott, for example, had already been exploring the creative possibilities of networking since the 1980s. He was interested in the notion of "dataspace," a territory of information in which all data exists in a continual present outside the traditional definitions of time and space available for use in endless juxtapositions. Ascott considers dataspace a new type of Gesamtkunstwerk, or a Gesamtdatenwerk as he calls it, in which networked information is integrated into the artwork. In such an environment, Ascott wrote, “meaning is not something created by the artist, distributed through the network, and *received* by the observer. Meaning is the product of interaction between the observer and the system, the content of which is in a state of flux, of endless change and transformation.”[xxv]

Immersion

There are many examples of immersion in the history of art. The Dyonisian rituals of Greek Theater, and the construction of the great cathedrals of Europe, are two obvious examples. Richard Wagner's Gesamtkunstwerk was driven by a vision of theater in which the audience loses itself in the veracity of the drama, creating an immersive experience. As he wrote in "The Artwork of the Future,"[xxvi] "the spectator transplants himself upon the stage, by means of all his visual and aural faculties." To facilitate his vision, Wagner reinvented the conventions of the opera house, and in 1876 opened the Festpielhaus Theater in Bayreuth, Germany, with the first complete production of *The Ring* cycle. The Festpielhaus, with its employment of Greek amphitheatrical seating, surround-sound acoustics, the darkening of the house, and the placement of musicians in an orchestra pit, focused the audience's undivided attention on the dramatic action. His intent was to maximize the suspension of disbelief, to draw the viewer into an illusionary world staged within the proscenium arch.

In the 1950s, a similar vision inspired the American cinematographer Morton Heilig to propose a "cinema of the future" that would surround the audience with facsimiles of life so convincing they would believe themselves to be transported to another domain. Such a cinema, he wrote, "would faithfully reproduce man's outer world as perceived in his consciousness, it will eventually learn to create totally new sense materials for each of the senses… [that] they have never known before, and to arrange them into forms of consciousness never before experienced by man in his contact with the outer world."[xxvii]

While Heilig devised a theoretical framework that applied the technologies of his day toward the achievement of virtual experience, it was only as a consequence of advances in computer science that the immersion his work suggested became possible.

By 1965, Ivan Sutherland had already achieved legendary status among computer scientists as the inventor of Sketchpad, the first interactive graphics software. In a short paper published that year, Sutherland mused over the options available to the engineer to display computer data, to create a "a looking glass" into what he described as a "mathematical wonderland." It seemed reasonable for him to suggest that "The Ultimate Display"[xxviii] (as the paper was titled) would represent this data in 3-dimensional form, allowing the construction of entirely believable 3-dimensional, computer controlled virtual worlds. However, like Heilig before him, Sutherland took this suggestion one step further. "The ultimate display," he wrote, "would … be a room within which the computer can control the existence of matter." He suggested that such a display could present realities heretofore only imagined, as if seen through Alice's looking glass. Sutherland's proposal was startling, but it launched an entire field of scientific inquiry.

It also fueled the imagination of a generation of artists. One of the first to consider the possibilities of digitally-constructed virtual experiences was Myron Krueger. In the early 1970s, Krueger created the pioneering works Metaplay and Videoplace to explore the potential of computer-mediated interactivity. These works were interactive artistic environments, influenced by Happenings, designed to give participants freedom of choice and opportunities for personal expression. Videoplace also connected participants in different locations through networked technologies, creating the illusion of shared space. As Krueger later wrote about the piece, "our teleconference created a place that consisted of the information we both shared… a world in which full physical participation would be possible. This world is an 'artificial reality.'"[xxix]

During the 1970s and 1980s, several engineering projects pursued virtual environment display systems that could represent such an "artificial reality. Perhaps the most significant of these in the mid-1980s was led by Scott Fisher at the NASA-Ames Research Center. Fisher's intent was to engage the entire nervous system in a multi-sensory presentation of virtual space – extending multimedia beyond the screen. The Ames VIEW system (an acronym for Virtual Interface Environmental Workstation) included a headset with two small liquid crystal display screens, a microphone for speech recognition, earphones for surround-sound effects, a head-tracking device, and dataglove to recognize the user's gestures and place them within the virtual environment. The direction this work pointed in was clear. As Fisher wrote in his 1989 article "Virtual Interface Environments,"[xxx] "with full body tracking capability, it would also be possible for users to be represented in this [virtual] space by life-size virtual representations of themselves in whatever form they choose." Immersive environments, Fisher observed, could give birth to a new form of participatory, interactive electronic theater.

The possibility of such a theater had already taken hold of the public's imagination. In Neuromancer,[xxxi] his widely read novel from 1984, William Gibson described in palpable detail a future in which virtual reality was a fact of life. Echoing Myron Krueger's notion that teleconferencing created a "place" that consisted of shared information, Gibson's characters inhabited a virtual environment made possible by the networking of computers, which he named "cyberspace." Gibson's cyberspace provided the first literary definition for the computers, hubs, servers, and databases that make up the matrices of the network. His discussion of cyberspace was so tangible – and seductive, with its suggestion that any computer hacker could "jack-in to the matrix" with an encounter with a sexy avatar – it became a touchstone for every engineer, artist and theorist working in the field.

Narrativity

As we have already seen, experimental performances inspired by John Cage – including Happenings, interactive installations, immersive environments and performance art -- also gave rise to a variety of non-linear narrative strategies. But perhaps the most prescient explorer of this terrain was the novelist William S. Burroughs.

Like Ted Nelson, Burroughs was deeply suspicious of established hierarchies. He was especially interested in writing techniques that suggest the spontaneous, moment-by-moment movement of the mind, and how non-linear writing might expand the reader's perception of reality. Through his use of the cut-up and fold-in techniques, which he described in his 1964 essay, "The Future of the Novel,"[xxxii] Burroughs treated the reading experience as one of entering into a multi-directional web of different voices, ideas, perceptions, and periods of time. He saw the cut-up as a tool that let the writer discover previously undetected connections between things, with potentially enlightening and subversive results. With the cut-up, Burroughs prefigured the essential narrative strategy of hypertext and its ability to allow readers to leap across boundaries in time and space.

Allan Kaprow, who coined the term "Happening," was particularly interested in blurring the distinction between artwork and audience. The ultimate integrated art, he reasoned, would be without an audience, because every participant would be an integral part of the work. As he wrote in his 1966 primer, "Untitled Guidelines for Happenings,"[xxxiii] "The line between art and life should be kept as fluid, and perhaps indistinct, as possible." This approach led to a performance style that pioneered deliberate, aesthetically conceived group interactivity in a composed environment. Happenings artists devised formal elements that allowed participants the freedom to make personal choices and collective decisions that would affect the performance.

By the 1980s, Media artists whose roots lay in performance and video also began investigating hypermedia as a means of exploring new forms for telling stories. Artists such as Lynn Hershman and Bill Viola were drawn to the computer's ability to break down linear narrative structures. Viola approached the medium as a repository for evocative images that could be projected on screens in installations, "with the viewer wandering through some three-dimensional, possibly life-sized field of prerecorded or simulated scenes evolving in time,"[xxxiv] as he described it. Hershman was among the first to create digital artworks using interactive media, in such pieces as Deep Contact, from 1989. She introduced interactivity into her work to combat the loss of intimacy and control brought about by the dominance of media such as radio and television. Her use of hypermedia allowed the viewer to choose directions inside the artwork's complex branching structure, and shape a personal experience of it.

This notion of the artwork as a territory for interaction, as a locus of communications for a community, echoes the Happenings of a previous generation. On-line role-playing games have become laboratories for exploring this form of interactivity. As the social theorist Sherry Turkle has pointed out, on-line communities, such as Multi-User Dungeons (MUD), "are a new genre of collaborative writing, with things in common with performance art, street theater, improvisation theater, Commedia dell'Arte, and script writing."[xxxv] Pavel Curtis created one of the earliest MUDs, LambdaMOO, in 1990 at Xerox PARC. Though it consisted only of text, its interactive quality, made possible through intricate storytelling devices via the Internet, gave participants the illusion of immersion in a virtual environment. Interaction in the on-line environment, Curtis claimed, creates a kind of social behavior which "in some ways it is a direct mirror of behavior in real life."

Marcus Novak took William Gibson's description of virtual environments as the starting point for his own theoretical and artistic explorations. In his essay from 1991, "Liquid Architecture in Cyberspace,"[xxxvi] he follows the pioneering work of Sutherland, Fisher, and Gibson, et al, to its logical conclusion, and notes its profound implications for architecture, our notions of space, and our attitudes towards the organization of information. He notes that in cyberspace, since all structure is programmable, all environments can be fluid. The artist who designs these immersive digital habitats will be able to transcend the laws of the physical world. As a consequence, architectural forms built in cyberspace can respond to the viewer, encouraging provocative and illuminating interactions. In cyberspace, architecture becomes a form of poetry.

The Future is Under Construction

The breadth and potential of multimedia has lent itself to utopian proposals. The French media theorist Pierre Lévy describes multimedia as belonging to a trajectory of planetary evolution that runs from DNA to cyberspace -- an arc that follows pure information as it

reaches towards its most evolved form of expression. He proposes that today's global networks will usher in an era of "collective intelligence," [xxxvii] and suggests that "cyberspace constitutes a vast, unlimited field… designed to interconnect and provide interface for the various methods of creation, recording, communication and simulation." His enthusiastic perspective evokes a world of intriguing possibilities.

At the same time, we are all aware of the dystopian qualities of the 24/7 infotainment juggernaut that is being delivered across the globe through an ever more sophisticated telecommunications network. We read daily about the new media's encroachment on privacy, its opportunity for abuse, and the specter of centralized control that it might make possible. These dangers are real. There is a tension between opposing factions at the heart of the Internet -- between those who prize its potential for an open, freewheeling exchange of art and ideas, and those who see its pervasiveness as an opportunity to expand upon the marketing-driven broadcast model of 20th century media -- and it is not at all clear whether utopian or dystopian visions will ultimately prevail.

To a remarkable degree, the scientists, artists, and theorists who have pioneered the medium of multimedia share a commitment to forms of media and communications that are non-hierarchical, open, collaborative, and reflective of the free movement of the mind at play. It is, in sum, an extraordinary vision. But whether we will achieve it is an unresolved question.

MUSIC VIA MOTION: INTERACTIONS BETWEEN CHOREOGRAPHY AND MUSIC

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Introduction

In this paper, we present an ongoing research project, focusing on creating an augmented, interactive audio-visual environment, for stage performance, installation arts and other related applications. We describe a motion and colour sensitive system called MvM (Music via Motion), and report an interdisciplinary collaborative project to integrate dance, music, and costume design, using the system, called CoIN (Coat of Invisible Notes). The paper reviews public performances of CoIN, and discusses the interactions between choreography and music. The further enhancement of the MvM framework using sensors, and the future direction of the project, are also discussed.

MvM

The MvM system uses input from a video camera to process video frames acquired in real-time, detects and tracks visual changes of the scene under inspection, and make use of the recognised movements to generate interesting and 'relevant' musical events, using an extensible set of mapping functions (Ng 2000).

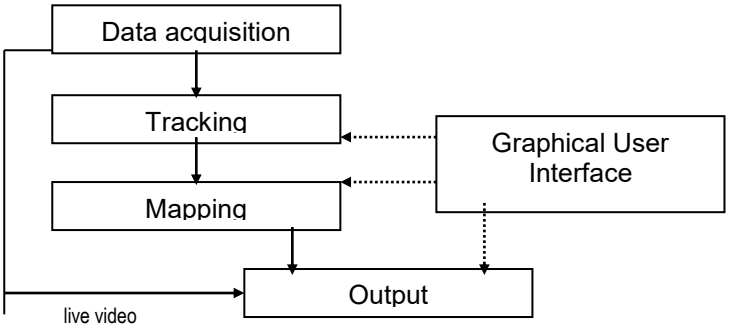

Figure 1: MvM framework

Figure 1 illustrates an overall framework of MvM. The data acquisition module is responsible for communication with the imaging hardware. The tracking module currently includes a motion-tracker and a colour detector. The mapping module consists of an extensible set of sub-modules, which *translate* detected visual changes into musical events, and the output module is responsible for the audio and graphical output. The graphical user interface module enables online configuration and control of the musical mapping sub-modules and provides overall control of the scale type (tonality), note filters, pitch and volume ranges, and other options. It also includes a simple colour calibration interface for the colour detector.

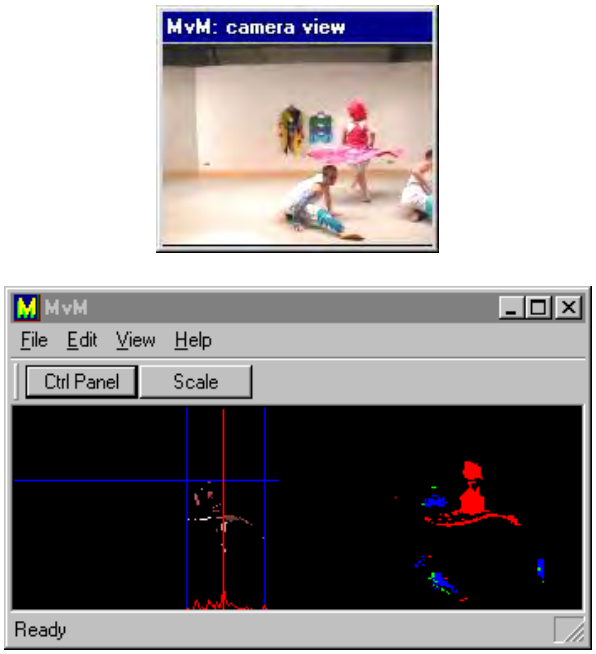

Figure 2: A screen snapshot of MvM in action

Figure 2 presents a snapshot of the system with a live video window, displaying the camera view and a frame differing tracker window, highlighting the areas with detected visual changes (left), and a colour detection window (right) showing the detected colours.

The MvM prototype detects visual activities using video data with no physical sensors or markers. This enables freedom of movement for the users, which is particularly important in a dance performance context. With MvM, dance activities are digitised, tracked and mapped to generate direct musical correlates within the domain of sound. Hence, there is a coherent integration of motion and sound within the performance, as the same body instigates both.

The Coat of Invisible Notes (CoIN)

The CoIN project brings together multiple creative domains to build specially designed costumes, music and dance within an interactive audio-visual augmented environment simulated by the MvM system.

The costumes in this project are not merely visual decoration but an integral part of the project. The designs apply large vibrant areas of colour, combining luscious fabrics such as satin, chiffon and crushed velvets in rich vibrant shades, featuring blocks of colour and texture both inside and out (see Figures 3 and 4). A particular feature of the costumes is that they are reversible and can be split apart into sections allowing the users to re-assemble and re-configure them to achieve different visual effects. These various changes in turn are detected by MvM and can be used to alter the character of the musical responses.

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Figure 3: Snapshots from recent rehearsals

In tune with the costume design, which makes use of everyday objects (e.g. headdresses are made from cut up plastic milk and soft drinks bottles, bubble plastic and loofahs), the

music features sound derived from similar sources. The intention of the music is to bring familiar sounds into the performance to encourage the audience to perceive them differently in this artistic context. A background layer of music was specially composed for the performances, with synthesised and sampled sounds, and effects triggered by MvM, to produce a musical and coherent performance.

For CoIN performances, MvM is configured to track the colour where visual changes were detected. Detected colours are used to control the choice of musical sound and effects. This feature is fully explored and is particularly apparent in a section of the choreography where the dancers are divided into two groups, wearing costumes in different colours. The contrasting movements and interactions between the two groups create interesting musical dialogues with two different musical sounds.

Dance with MvM

MvM and other similar systems alter the traditional relationships between choreography and music. Where the choreographer works with pre-composed sound, whether it be chosen from available material or created specifically for the performance, the dance has traditionally followed the music in direct relationships of tempo and rhythm. Increasingly through the twentieth century, choreographers have worked with more a flexible relationship between dance and music, where the dance exists independently of the music, with the two elements being linked by their style and rhythm. In the latter case, the dance and music coexist, complementing one another within the performance, but not restricting each other. However, in allowing the dancer freedom to perform, the potential for choreographed relationships between sound and movement is sacrificed.

MvM alters these traditional relationships between dance and music. The motion of the dancer *creates* the music, so that the dancer may perform with complete concentration upon the physicality of the movement, knowing that the music will be synchronised to it. While this may or may not be apparent to the audience, the effect upon the dancer is considerable, allowing a freedom to develop the movement to its full potential without restriction, but with direct connections between sound and gesture. Indeed, where technology and choreography complement each other fully, the technology will be transparent to both dancer and audience, so that it acts as a framework for the dance and the music without distracting from either.

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Figure 4: Snapshots from a public performance

MvM and Choreography

Blom and Chaplin (1989) note that ‘The relationship of dance to music is an intimate one ... The ideal relationship is when dance and music appear as one, mutually supportive, enhancing one another.’ Thus, a synthesis of the two elements in the final performance is the ideal. Yet traditionally, where music is used to accompany dance, the music provides the form and structure, and will largely influence, if not dictate, the mood, style and length of the dance (Foster 1986; Smith-Autard 2000). If the music is not to dictate so many elements then the dance should have some control of the music. Theoretically, using MvM, the choreographer and the composer can work so closely, that the dancer may perform the movement without being reliant upon the music. Thus the dancer might seem to perform with an authenticity born of the sense of the movement, rather than being coerced by the effort to stay ‘in time’.

Siegel (1999) refers to 'interactive dance', but it seems more appropriate to call this type of approach 'interactive performance', since all the elements are equal. The visual component of the performance becomes less 'dance' than 'movement', because not all of the usual practices of choreography necessarily apply. Many do remain, but some of those concerned with form and spatial orientation are replaced by conventions governing the use of the technology and the composer's requirements. Siegel also notes that 'simple mappings tend to be immediately understood by the observer but [were regarded as being] trivial, whereas the apparent relationship between movement and sound is lost when complex mappings are used' (Siegel 1999, p.56; Siegel and Jacobsen 1998). Similar features have been experienced with MvM. With simple motion (e.g. where only one or two dancers are moving at a time, or a group is moving in unison), it is apparent how the musical output from the system relates to the dance. However, when more than two dancers are moving independently, the relationship is less clear, and the resultant musical events may seem less correlated to the motion. As a result, there was substantially more unison movement in the MvM/CoIN performance than might normally be used by the choreographer.

Direct mapping of movement can also be tiresome and uninspiring. Hence, MvM has been equipped with modules which aim to introduce basic expressive features. Among these are an *accent detector* module that keeps a history of the size of the region of the visual changes, the directions and velocities of the motion, and their averages. Sudden changes in these parameters can be mapped to control the volume of the sound, in order to produce more *expressive* performances. This is particularly effective when percussive instruments with limited pitch range are used.

Further work in this area includes the sensing of gesture, shape and velocity, tracking only certain specific changes in the direction or momentum of the movement. In this way, the sound may be able to complement the form of the dance to a greater extent. It is difficult for the dancer to recreate the identical spatial localisation and orientation on the stage, on each performance, hence complex music cannot be repeated accurately. However, gestures and shapes can be reproduced with much greater consistency, and thus using these aspects of the performance to trigger musical output is likely to produce a more consistent result.

Conclusions and Future Directions

With computer vision technology, MvM attempts to create a highly dynamic and versatile interactive performance space, to bring together multiple creative domains, for the collaboration of choreographer and musician, providing the users with real-time control of musical sound by their physical movement.

Beside multiple cameras and distributed architecture for future MvM enhancement, small, simple and non-intrusive sensors and switches could be installed onto the floor and other surfaces to provide further input to the MvM framework, and thus provide additional dimensions of interactivity. Figure 5 illustrates a development plan, with a two-cameras setup, an array of pressure sensors on the floor, and a touch sensors installation on the walls. Many simple and low cost switches and sensors (for example vibration and proximity switches) can be used in such installation.

XXXX

Figure 5: Distributed MvM and sensors

Other ongoing experiments for the extension of MvM include using the velocity of sound to localise footstep noise. With two (or more) contact microphones on a wooden platform, noise signals from footsteps (or step-dancing) is detected and the difference of the onset position of the signals is used to estimate the location of the signal source. The output can be mapped onto various interesting musical scenarios. For example, if the locations were mapped onto pitch, it could simulate walking on a giant musical keyboard.

Many other researches in visual tracking and sensing can be integrated in the MvM framework. Future plans include face tracking, behaviour modelling (Johnson *et al.* 1998), and other motion, gestural and expression trackers (Camurri *et al.* 2000). With the advancement in science and technology, it is hope that systems like the MvM will continue to explore the integration of art and science to offer artistic and creative sensory experience (Ng *et al.* 2000).

Acknowledgement

CoIN project was carried out with financial assistance from Yorkshire Arts. We would like to thank Christine Hughes (Costume Designer), Eddie Copp (Head of Dance at Airedale Community Campus) and Claire Nicholson (Freelance Dancer/Choreographer), and dancers from the Bretton Hall College for their collaboration and support. We are grateful to ICSRiM and Department of Music, University of Leeds, for equipment, and rehearsal and performance space.

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SPACE, SOUND AND MUSIC: USING EMBODIED EXPERIENCES OF SPACE TO PRODUCE MULTIPLE AND INTERCONNECTING EXPERIENCES OF SPACE IN ACOUSMATIC MUSIC

BY CATHY LANE

PAPER ABSTRACT:

Many different spaces coexist and interconnect for any listener to music played over speakers or other means where there is no visible source of the sound. These spaces could include the physical space of the concert hall, a representation of space conceived in the perceived knowledge of the social practice of people getting together to listen to music in groups; the social space of the listeners; the virtual space of the piece of acousmatic music; the representation of perceived, conceived or lived space in the piece; as well as the representational space of the sound work and the mental space the individual listener inhabits while listening, a space that is possibly unique to sonic experience.

In this paper I shall discuss how these spaces are produced and coexist; how our embodied experiences of space can be used to produce new means of representation and new forms of expression through the production of space in sound works; and investigate spatial mimesis as a new area of discourse in sonic art.

These developments will be discussed in the light of the specific history of the use of space in electronic and electroacoustic music composition.
221 words

Acousmatic listening has been described as
“a situation where one hears a sound without seeing its cause”
(Chion 1994: 32).

However acousmatic music is more than music which is played over loudspeakers with no other visible source of sound. Features of acousmatic music may include the use of recorded sounds derived from real life or sounds which do not exist in the acoustic world and it may include sounds that the listener recognises or thinks that they recognise as to their source or may fail to. Those sounds may be heard from a completely different sonic perspective from that normally encountered in the real world and these sounds may be combined with others that they could not possibly exist alongside in real life. The sounds may be organised according to many different schemes or purposes, for example musical, narrative, or documentary and acousmatic sound works may be played in a number of settings or stored in a number of recorded formats. Acousmatic music is played over loudspeakers and as such always involves a composed or musical production of space. Acousmatic sound or music work can combine the lyricism and abstraction of music with its direct emotional appeal with narrative, documentary or factual approaches. It has the power to refer to, remind of and suggest things outside itself. Acousmatic music does not present ‘fixed images’ but, at best, allows the imagination to build pictures, atmospheres and moods based on the representational and abstracted elements as outlined above.

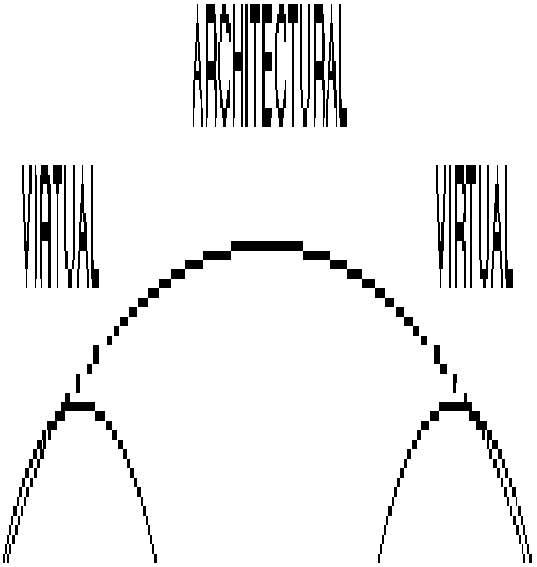
"Acousmatic art is the art of mental representation triggered by sound "
(Dhomont 'Is there a Quebec sound" Organised Sound. Vol 1 issue 1.)

My own interest in acousmatic sound composition is to make work that is expressive of aspects of my own experience particularly through the musical production of space and

my primary interest has been in the use of space and motion as forms of expression in acousmatic music.

The creation, performance and reception of an acousmatic work involves the production of a number of interlocking or related spaces including the composer or sound artist's representations of their experiences of space expressed in or though the sound work. These may be strictly realistic or may be partially or wholly abstracted from reality. When an acousmatic work is performed, particularly in a public listening space, it inhabits an architectural space upon which it imposes this representation of the composers experience of space. The concert hall is also a social and communal space where people gather together to listen. In the performance of the work each listener or member of the audience will inhabit their own space as they are experiencing the sound work. In many acousmatic works the space of the performance provides a link between the representations of the composers experiences and the mental representations of each listener which are informed by their own history and experiences.

This production of related spaces is possibly unique to the sonic experience and the ability to combine it with a very rich variety of sound material is unique to acousmatic music.



Although music has, throughout history, often incorporated space as an compositional element in addition to the usual parameters of melody, harmony, rhythm and texture, it is only with the onset of music mediated by loudspeakers that the movement and positioning of sound has become easier and more widespread. Some of these compositional uses of space could be said to be deliberately mimetic of experiences that we have of kinds of space outside music. I shall refer to this as spatial mimesis. Spatial mimesis in an acousmatic composition results in the positioning and movement of sound in the virtual space between the loudspeakers in a way that is based on, reminiscent of or represents different aspects of our perceived, conceived and lived experiences of space.

Stockhausen's *Gesang der Jünglinge is* a famously cited example of the compositional use of space. In playback it utilises five groups of loudspeakers surrounding the audience, of this, Stockhausen says

" The speed of the sound, by which one sound jumps from one speaker to another, now became as important as pitch once was. And I began to think in intervals of space, just as I think in intervals of pitches or durations."

(Cott, 1974: 87)

Stockhausen is drawing on experiences of mathematical space, of two or three dimensional geometric or mathematical models and patterns. In sound this might manifest itself as a spatial motif, in which spatial elements, phrases or patterns, are used to articulate sound objects in distinct positions in space or with a distinct motion path so that the *position* of each part of a musical phrase is as important as the rhythm, melody or any other aspects of it.

Other sound artists and composers are producing work which calls on experience of the space of enclosures or architectural space, built and natural, located and non located, public and private, urban and otherwise. These social spaces are often highly significant, on a personal level, to individuals, or on a social level, to a whole society, or sector of society. Much of our experience of architectural space is gathered though the aural space related to it. Sound recordings made in existing architectural spaces, by sound artists such as Jake Tilson have captured the aural features and thus some of the architectural and social aspects of those spaces. Other composers have made compositional use of the acoustic qualities of a physical or architectural space by allowing sound to behave in a particular way in that space. In *I am Sitting in a Room* by Alvin Lucier, the architecture of a room is used as a resonator for a piece of spoken text which is projected into the room and recorded, over and over again, with the additional room resonances building up every time the text is looped back into the room.

There is also a substantial body of sound work that concentrates on capturing and releasing recordings of specific or located natural places. In focusing the listening attention on the aural qualities of a place which is normally taken for granted then the other unique qualities of that place also become apparent. These recordings may be presented unmodified as recorded, or modified in some way, by means of studio processing or a textual commentary (for example *Kits Beach Soundwalk (1989)* by Hildegard Westerkamp). Another aesthetic motivation might be to provide a historical document of place in a time of fast changing natural environments for a multitude of reasons from the archival to the political. Examples of this can be found in the work done by sound artists working in the field of acoustic ecology who have made work particularly relating to Vancouver and its environs and other natural soundscapes. (*The Vancouver Soundscape 1973 and Soundscape Vancouver 1996).*

There are of course many other kinds of space that we experience outside of sound that can be represented in sound works. Antiphonal music is primarily compositionally based on social spatial mimesis particularly of conversation. Visual spatial mimesis might suggest the kind of points of perspective, or points of view, of an observer, that is usually associated with the visual experience of space, the watchful eye thus becomes the watchful ear. Our experiences of physical space as mediated by touch or haptic space gives us a connectedness to objects and textural detail. The language of touch or texture is similar to that which we apply to texture, density and mass in sound. Sound work mimetic of our aural experience of space can be found in the work of Cage and many others who work with whatever sounds can be heard or captured at any given moment without making ‘editorial’ choices. There are many other examples of kinds of mimesis.

My own concerns have been with using physical and mental embodied experiences of space to produce compositional space and motion in my work. I would like to illustrate this with reference to two works Nesting Stones and Invisible Crowds.

The sound world of Nesting Stones is largely derived from my daughter, just as she was learning to speak, and from myself. The sounds used are mainly non verbal; cries,

laughs, breaths and some words.

The use of space in the piece is informed by aspects of my experience of the child / parent relationship and include feelings of both claustrophobia and mutual dependence as well as observations of the child's growing sense of self, the ever widening boundaries of the child's perceived world and sense of inhabited space and of the perpetual movement, restlessness and curiosity of children and the changeability of their emotions. The physical and mental motion mimesis in Nesting Stones is based on both bodily experienced gesture and mental states and observed movement and emotion. These experiences and observations of space and motion are formed into spatial templates which are used as organising structures throughout the piece with the aim of adding to the already expressive nature of the sound material.

Some examples of these are given below and are a mixture of specific experiences and observations of space and motion, what they are expressive of and the spatial templates that are used in the piece.

Mental motion mimesis derived from lived emotional experiences:

- aloneness and isolation
- the drive to communicate
- perpetual motion
- the changing and revaluation of my personal liberty
- moving on
- enclosing
- soothing
- smothering
- massing
- closing in

Physical motion mimesis: observed motion

- running away
- restlessness
- exploring
- expanding her world
- moving on
- all over the place

Physical motion mimesis: experienced motion

- embracing and encircling
- pulling in opposite directions
- letting go
- perpetual motion
- moving together
- moving apart

The main *features* of motion mimesis in *Nesting Stones* are:

- dissonance and harmony
- reflection or call and response
- episodic
- cause and effect
- changes of speed and tempo
- energetic

Play extract
Talk specifically about extract.

In *Invisible Crowds* the experiences of space that I have drawn on are those of physical and mental aloneness, solitude and interruption and physical and mental overcrowding, all of which can be welcome or unwelcome. Compositionally, material is spatially organised according to templates derived from these experienced mental states with particular regard to texture and density.

Invisible Crowds opens with a kind of meditative state, metaphorically, a 'one track mind' cleared of all thoughts. Throughout the opening the smooth single pitched chime is joined by others, at times these patterns of thought are disturbed by more texturally spiky thoughts occurring and interrupting, some slowly dawning, some passing almost as soon as they occur. Eventually the smooth sounds are interrupted by waves of more jangling, less meditative, patterns until the speeding up bell sound starts to be an alarm which wakes the subject out of reverie. The 'warning bell sounding in my head' triggers another state of mind, more fractured with small varied fragments of thought appearing from all around and beginning to coalesce into a more cohesive whole. At times it sounds literally as if the "penny drops", at other times various external sources serve to interrupt and take over. The piece moves on to a more complex and less spatially specific section, but I would like to play the opening as described.

Play extract

In this paper I have described a compositional use of space that is mimetic of spatial experiences outside sound and have talked of my specific interest in expressing embodied physical and mental experiences of space. The compositional language that is developing is, of course, more complex than this and contains more variable elements but I hope that this short paper but goes some of the way towards explaining how using real world experiences of space to inform the production of space in an acousmatic work may interconnect with the experiences of space of the listener and establish spatial mimesis as a new area of discourse in sonic art.

PWSYNTH: A LISP-BASED BRIDGE BETWEEN COMPUTER ASSISTED COMPOSITION AND SOUND SYNTHESIS

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Abstract

This paper introduces a new Lisp based software synthesizer called PWSynth. In simple cases PWSynth can be used like other visual synthesis languages with the help graphical patches. The main aim with this project is, however, to integrate sound synthesis with a novel music notation package. This scheme allows to control sound synthesis interactively with a familiar representation of complex musical information. The system has also proven to be useful when designing different control strategies for physical models of acoustical instruments.

Introduction and Background

Computer music software has been divided in the past roughly in two main categories: computer assisted composition and sound synthesis. The former category (PatchWork, Laurson 1996; Open Music, Assayag et al. 1999) consists of systems that are typically built on top of a high level programming languages – for instance Lisp - and are meant to be used as non-real-time environments. The main emphasis has been in representing and generating musical material for instrumental music. The latter category consists of real-time sound synthesis environments (e.g. SuperCollider2, McCartney 1998) where performance is of primary importance. This has led to systems that do not include extensive tools for representing complex musical entities.

During recent years the distinction between these two approaches has become more obscure. On the one hand SuperCollider2 has built-in tools that allow the user to specify compositional structures. On the other hand PatchWork contains user-libraries – such as PWCollider (Laurson 1999c) - which are meant to serve as bridges between non-real-time compositional work and real-time environments. Although the latter approach has made it possible to work in both domains, the idea of interfacing two systems with different logic and syntax causes several problems.

PWSynth is a PatchWork user-library that aims at a better integration of computer assisted composition and sound synthesis. PWSynth is a part of a project which investigates different control strategies for physical models of acoustical instruments. PatchWork is used to generate control data from an extended score representation system called Expressive Notation Package or ENP (Laurson 1999b; Kuuskankare and Laurson 2000). The actual synthesis was meant to be realized with a synthesis environment outside PatchWork (either with MSP or SuperCollider2). This approach, however, turned out not to be fruitful. It became obvious that we need better integration of the high-level aspects and the DSP parts of the system.

The rest of this paper is divided in four main sections. First we discuss in general terms ENP and describe how it can be used for sound synthesis control. After this we go over to PWSynth starting with the basic structure of the system and extending it to cover more complex cases that are needed when designing model-based instruments. The next section gives some ideas how ENP and PWSynth are interfaced and how ENP is used to

control the synthesis engine. We end with a concluding section and give some ideas for future work.

Synthesis Control using Expressive Notation Package (ENP)

ENP is a PatchWork user-library written in Common Lisp and CLOS. It can be further extended and customized by the user. It has a graphical interface and musical objects and their properties are editable with the mouse or with specialized editors. The system provides full access to the musical structures behind the notation. Thus ENP can be controlled algorithmically. Furthermore, ENP provides both standard and user definable expressions. The user can create new expressions using inheritance. Note-heads, stem-lengths and slur-shapes can be set either locally or by using global preferences. Scores can be saved as MIDI-, ENIGMA- or ENP-files or they can be exported and printed as PostScript.

ENP has already been used to solve constraint-based problems and to produce control information for several model-based instruments (Laurson 1999a, Laurson et al. 1999b, Laurson 2000, and Välimäki et al. 2000). The main purpose of ENP is to provide in the same package both professional notation capabilities and powerful object structures for compositional use.

In synthesis control the user enters in ENP the musical piece or phrase in standard notation. The system requires no textual input and includes facilities for fine tuning of the timing information. The user can also add both standard and non-standard expressions that allow to specify instrument specific playing styles with great precision. Expressions can be applied to a single note (such as string number, pluck position, vibrato, or dynamics) or to a group of notes (left-hand slurs, finger-pedals). Groups can overlap and they may contain other objects, such as breakpoint functions. The latter case is called a group-BPF. Macro expressions generate additional note events (tremolo, trills, portamento). After the input is finished the score is translated into control information. During this process the expressions trigger instrument specific rules that generate appropriate control data. Figures 1 (from “Madroños” by Federico Moreno Torroba) and 2 (from “Lettera Amorosa” by Juan Antonio Muro) give two short musical excerpts containing both standard and non-standard expressions.

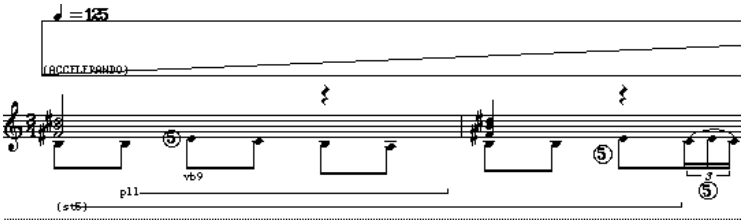

Figure 1. ***A musical excerpt from the standard classical guitar repertoire.***

Figure 2. ***A musical texture with some modern notational conventions.***

ENP contains an instrumental database consisting of instruments typically used in the modern western orchestra. The system can be easily extended to include also purely synthetic instruments. The root class is an abstract class - called ‘instrument’ - that has slots for general information such range, clef and transposition. The ‘instrument’ class has subclasses such as ‘strings’, ‘wind-instruments’, ‘percussion’, ‘keyboard-instruments’,

'human-voice' and 'synth-instrument'. The 'strings' class, in turn, has subclasses for 'bowed-strings' and 'plucked-strings', the 'plucked-strings' class has subclasses such as 'guitar', 'mandolin', and so on. This class hierarchy allows to add specialized methods that define how various instruments should react to note information and score expressions during synthesis.

ENP is described in more detail in Laurson et al. 1999b, Kuuskankare and Laurson 2000, and Laurson 2000.

PWSynth

The starting point in PWSynth is a patch consisting of boxes and connections. This patch is as any other PatchWork patch except that each PWSynth box contains a private C-structure. The C-structures are visible both to the Lisp environment and to a collection of C subroutines which are interfaced to the Lisp system. The Lisp environment is responsible for converting a PWSynth patch to a tree of C-structures. Also it fills and initializes all needed structure slots with appropriate data. Once the patch has been initialized PWSynth calls the main synthesis C routine which in turn starts to evaluate the C-structure tree. Real-time sliders, MIDI devices and mouse coordinates can be used to control the patch. These controllers can be scaled to the desired range either using linear or exponential scaling.

In simple cases PWSynth resembles many other visual synthesis languages where the user works with basic entities such as oscillators, noise generators, filters, delays, envelopes and other modules typically used in software synthesis. Figure 3 gives a simple PWSynth example containing a 'sinosc' module with two inputs: 'freq' and 'amp'. These inputs are connected to two slider modules that can be modified by the user in real-time. The output of the 'sinosc' module is connected to the first input of a 'synth' box that in turn is responsible in converting the synthesis patch to a C-structure tree. Thus every PWSynth patch must contain at least one 'synth' box. The second input gives the current synthesis mode. There are three modes. In our case the mode is 'RT' (or real-time) which means that the output is sent directly to the DACs. If the mode is 'File' then the system runs in a non-real-time mode and the output is written to an AIFF file. In the 'List' mode the 'synth' box returns the output as a list of floating-point numbers. The latter case is especially useful when the user wants to inspect the output either as numerical values or plot them in PatchWork in a special 'points' view box (see below Figure 4). Figure 3 shows also the 'Synth RT Status' window that is always shown when the system runs in real-time. It contains some general synthesis information such as the number of channels, the number of the C-structures used by the current patch, etc.

Figure 3: ***A simple PWSynth patch.***

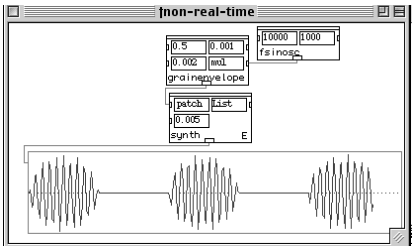

Figure 4: ***A 'List' mode patch with a 'points' view.***

A slightly more complex patch is given in the next example (Figure 5). It contains besides several 'sinosc', 'smooth', '+', and '*' modules also two real-time modules – 'mousex' and 'mousey' - that allow to control the synthesis according to the current mouse position within the main window.

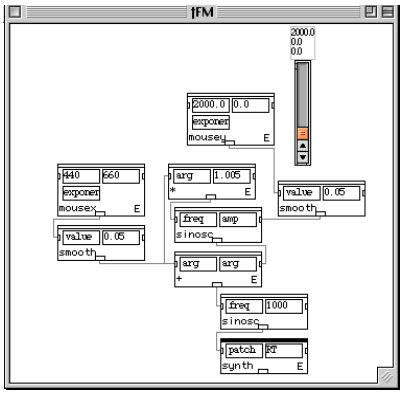

Figure 5: ***A PWSynth patch containing real-time mouse control.***

Figure 6, in turn, gives a fairly complex patch where there are two banks of resonators (band-pass filters). The interesting point here is to note that both banks - see the boxes with the name 'resonbank' – accept Lisp lists as the third input. In our case the list consists of three sublists – amplitudes, frequencies and bandwidths - that define the behaviour of the resonators. This scheme is very powerful as it allows the user to pass PatchWork data to the synthesizer in a flexible and dynamic way. Thus, for instance the number of filters can be modified simply by changing the size of the sublists of the main-list.

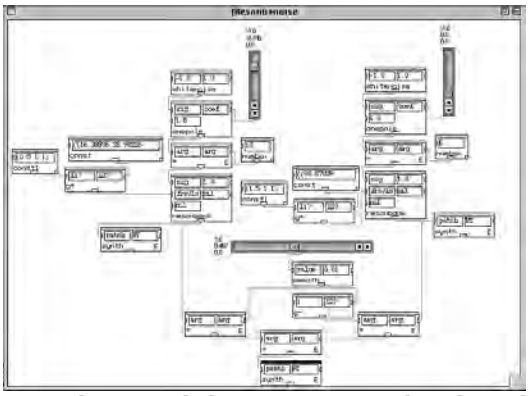

Figure 6: ***A PWSynth patch containing resonator banks with list inputs.***

PWSynth supports also imbedded definitions of C-structures (a C-structure can contain other C-structures to any depth). This feature is of primary importance when designing complex instrument models. For instance, a commuted waveguide guitar model (Smith 1993; Karjalainen et al. 1993) - consisting of a coupling matrix and six dual-polarization string models - contains a C-structure defining the complete instrument. This top-level C-structure contains seven sub-structures, one for the sympathetic couplings and six for

the strings. The most complex entity used in this example is the dual-polarization string model. It is a C-structure built out of nine sub-structures: two delay lines with 3rd order Lagrange interpolation, two loop-filters, three sample players, a delay and a timbre filter. The guitar model will be discussed also in the next section.

4. Interface between ENP and PWSynth

Figure 7 gives a typical example of how ENP is interfaced with the synthesis part of the system. On the left we have a window containing two patches: the first one, called '*SYNTH*', defines the synthesis part whereas the second one—'*ENP*'—is responsible for the calculation of the control data. The input ENP score is shown in the background behind the main window.

The synthesis part defines—using a box called 'guitar1'—a guitar synthesizer. The 'guitar1' box has three inputs. The first input defines the overall amplitude of the output. The second input is connected to a matrix-object, which contains a 6×6 matrix defining the sympathetic coupling of the strings. The third input is connected to a 6×18 parameter matrix where each row gives the parameters required for a single string. The contents of the parameter matrix is shown below in Figure 8. Thus our guitar synthesizer consists of a coupling matrix and 6 strings each having 18 parameters. The output of the 'guitar1' box is connected to a 'synth' box.

The control information is calculated with a box called 'enp→synth' having three inputs. The first one is an ENP input score. The second input is used for ENP performance rules (for more details see Laurson et al. 1999b). The third input defines the output mode for the calculated control information.

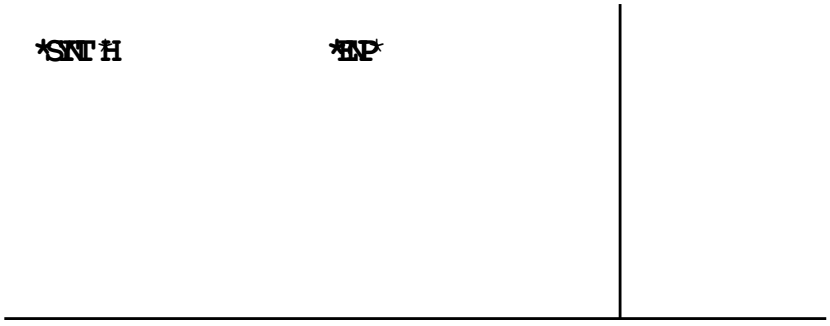

Figure 7: ***Overview of the synthesis and control part of the system.***

The interaction between ENP and PWSynth is realized in complex cases – such as the guitar model example given in Figure 7 - with the help of graphical matrixes (Figure 8). Each row and column are named. By taking the intersection of the row and column names a large symbolic parameter space is easily generated. Each resulting parameter name (pointing to an address in a C-structure) is a pathname similar to the ones found in other synthesis protocol schemes such as OSC (Wright and Freed 1997). Thus, if we assume that our current guitar synthesizer has the name 'guitar1', we can for instance refer to the loop filter coefficient ('lfcoef') of the second string ('2') of our guitar model with the pathname 'guitar1/2/lfcoef'. This naming scheme is powerful because it allows the simultaneous use of many instrument instances with separate parameter paths. For instance we can easily add new instrument boxes (such as 'guitar2', 'guitar3', etc.) each having a unique parameter name space.

Figure 8: ***Graphical parameter name matrix.***

5. Conclusions and Future Work

We have discussed a new visual software synthesizer called PWSynth. PWSynth has been implemented as a PatchWork user-library and thus allows to integrate computer assisted composition and sound synthesis in a novel and interesting way. Also it has been proven to be a useful research tool when designing control strategies for complex model-based instruments.

Future work will include the extension and refinement of the current model-based instrument library. Interesting modeling and control challenges can be found in the woodwind-instrument family, like flute and clarinet (both with fingerholes) and in the bowed-string instrument family such as cello and violin.

6. Acknowledgements

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LE FAUVISME OU L'EPREUVE DU FEU, ATELIER MULTIMEDIA AU MUSEE D'ART MODERNE DE LA VILLE DE PARIS

PAR FRANÇOIS GIRAUDON

"*Sans doute, il existe mille façons de travailler la couleur, mais quand on la compose, comme le musicien avec ses harmonies, il s'agit de faire valoir des différences.*" Matisse, Propos recueillis par Gaston Diehl, 1945.

I. Introduction

Parler de la couleur, en dehors d'un discours scientifique, oblige fréquemment à recourir à des métaphores, à des analogies qui se raccrochent à d'autres sens que le visuel. Passé au crible du langage, l'analyse d'un tableau utilise davantage de vocables destinés à solliciter notre oreille ou notre goût (couleurs criardes, froides, douces, acides…).
La composition de l'espace, l'expressivité et l'intensité de la couleur sont autant de points communs entre la composition musicale et la composition picturale. C'est par ces analogies, que nous nous sommes proposés de réaliser une lecture multimédia de la peinture Fauves, une peinture fondée sur une logique intuitive de la couleur. C'est à des fins explicatives, que cette approche sensible a été élaborée, l'ouie vient à la rencontre de la vision pour souligner, amplifier la perception de l'œuvre, en y révélant des dimensions cachées.

II. Présentation de l'atelier

Après la visite de l'exposition, privilégiant l'émergence des émotions et sensations esthétiques, l'atelier est conçu comme une succession de jeux créatifs et interactifs. À partir de trois tableaux sélectionnés de Matisse (La sieste ou Intérieur à Collioures – 1904), Vlaminck (Les berges de la seine à Chatou – 1905/1906), et Derain (Effets de soleil sur l'eau, Londres – 1906), trois jeux proposent une lecture des caractéristiques du mouvement fauviste par une approche visuelle et sonore, et aboutissent au quatrième jeu, où la créativité des participants est plus particulièrement sollicitée.
Cet atelier n'est pas seulement conçu comme un outil d'analyse des œuvres fauves, mais aussi comme une initiation à la pratique musicale, favorisant le travail de groupe par l'écoute et l'interprétation en temps réel en utilisant des capteurs gestuels.

II.1 Principe de fonctionnement de l'atelier

D'une certaine manière, l'atelier est une incitation à la créativité personnelle aussi bien sur le plan de la composition picturale, que sur le plan de la composition sonore et musicale. En offrant progressivement des champs d'exploration dans le domaine visuel et sonore, il invite les participants à s'investir plus personnellement, tout en restant dans le cadre et les contraintes que s'étaient fixés les peintres fauves.

II.1.a Matisse "La sieste ou Intérieur à Collioures"

Nous amenons, aux travers d'une analyse de la composition picturale, à établir une relation entre composition picturale et composition sonore.
Matisse utilise une palette de six couleurs (vert, jaune, rouge, bleu, rose, ocre). Ces six couleurs correspondent à l'essentiel de la palette utilisée par les peintres fauves. Chaque couleur est associée à un instrument de musique. Le choix de l'instrument par rapport à la couleur est arbitraire, mais motivé malgré tout par des critères que l'on peut donner comme objectifs. Comme par exemple :

- vert → forêt → arbre → *violoncelle*

- rouge → couleur chaude, éclatante → *trompette*

Plus considéré par nous comme une introduction à l'atelier qu'à proprement parler un jeu de création, il offre la possibilité de découvrir le tableau de manière interactive et d'écouter la composition musicale associée à chaque étape de l'analyse du tableau. La composition musicale est elle-même interactive. Elle est basée sur un thème écrit pour chacun des instruments et se décline en fonction de la configuration picturale et du temps que l'on prend pour la regarder.

II.1.b Vlaminck "Les berges de la seine à Chatou"

En reprenant la correspondance entre couleurs et instrumentation musicale, ce jeu est dédié à la relation entre geste pictural et geste musical. De la même façon que dans le Matisse on découvre une analyse picturale du tableau mais, contrairement au précédent jeu, la composition sonore n'est pas pré-éxistante, c'est le geste de l'utilisateur qui va définir le contour harmonique et rythmique de la composition sonore. Il y a ici deux types d'interactions, l'une correspondant à la position du point de vue dans le tableau, et l'autre, correspondant à la gestuelle qui est suggérée par le peintre, et que l'utilisateur peut suivre et écouter.

II.1.c Derain "Effets de soleil sur l'eau, Londres"

Ce jeu diffère sensiblement des deux autres, car il s'éloigne de la représentation classique de l'instrumentation et des modes de jeux classiques. Derain, dans cette œuvre, a travaillé de façon plus abstraite dans les rapports à l'espace et à la couleur, cela nous a permis d'aborder d'une manière intuitive, la synthèse et la spatialisation des sons, ainsi que l'interprétation musicale. Le tableau devient une partition sonore qu'il est possible d'entendre si ont y rajoute le geste musical. La couleur devient le timbre sonore, la position dans le tableau détermine la spatialisation du son et le geste musical est capté par l'intermédiaire de capteurs optiques qui réagissent à la position du corps dans l'espace.

II.1.d Atelier de création

Cette dernière proposition de l'atelier est conçue comme un jeu interactif pour la création sonore et picturale. Basé sur la palette fauve, ce jeu ouvre la possibilité d'enregistrer des gestes picturaux en corrélation avec des mouvements sonores.
Le temps est ici une dimension supplémentaire, car gestes sonores et picturaux se réalisent dans un contexte temporel. On peut enregistrer chaque mouvement de "couleur-son" et ensuite écouter et voir le résultat sonore et visuel se réaliser devant nous.

II.2 Modélisation informatique

L'ensemble des jeux a été réalisé dans l'environnement de programmation MAX/MSP de Cycling 74. Cet environnement est disponible sur la gamme Macintosh.
Cette option nous a permis de tirer au mieux partie de l'interaction entre son et image et du contrôle gestuel par l'adjonction d'interface utilisant le protocole MIDI. Cela nous a aussi permis de travailler sur la partie audio en utilisant des algorithmes de synthèse et de spatialisation sonore en temps réel.

L'interface gestuelle utilisée, a été conçue spécialement pour l'atelier, elle est construite autour de 16 capteurs optiques qui mesurent le taux de luminosité dans la gamme des

couleurs visibles. L'interface transforme ces données en code MIDI qui sont ensuite envoyés à l'ordinateur (voir Fig.1).

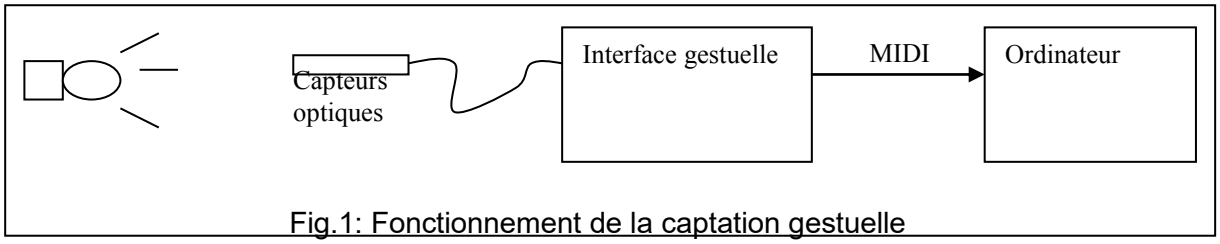

Fig.1: Fonctionnement de la captation gestuelle

La programmation des jeux est basée sur une gestion d'une fonction dépendant du temps qui interprète les commandes aussi bien graphiques que gestuelles et contrôle à la fois la partie audionumérique et la partie images et vidéos numérique. (voir Fig.2)

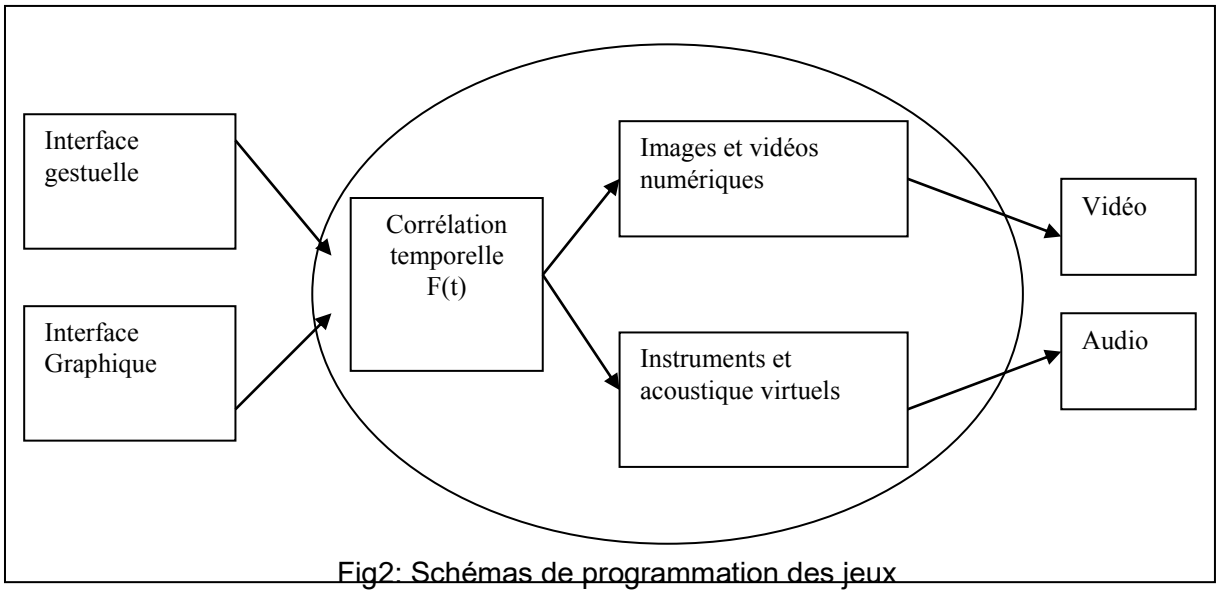

Fig2: Schémas de programmation des jeux

THE UNBEARABLE LIGHTNESS OF NEW MEDIA EDUCATION
NOTES ON TEACHING, TECHNOLOGY, AND ART

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My students and I are crammed in a small computer lab, waiting. We are always waiting: for computers to restart, for computers to recover, for projects to load, and in some cases, not load. I have learned that these interruptions are not wasteful, but precious; they are the only moments when I can devote myself entirely to teaching, instead of troubleshooting. If the time spent in front of a functioning computer counts as the waking time of a class, I imagine the time spent between the crashes and recoveries as the sleeping time, so the conversations and exchanges that occur, whether they are casual or curricular, can inform the class like a dream.

We are waiting to look at a final art project by a student we will call Postmodernity(1). She launches her project on the computer. A square of white light, centered and small, appears. I won't describe the whole project, but I will give you the highlights; a young couple walks on a deserted beach (the appearance of a beach signifies love); a camera spinning violently in circles in a busy city intersection (a favourite metaphor of hers that refers to the general confusion of contemporary life); a collection of flat shapes bouncing across the screen (telling me she has mastered the animation software we have in the computer lab); finally, large white type that reads, Postmodernity, copyright nineteen ninety seven.

Her piece looked technically impressive and very familiar. Postmodernity's pieces always do. The class creeps into a critique session. Before long, a student tells me the reason behind my lingering sense of familiarity with the piece: Postmodernity had made it last semester, in my Digital Video I class, only now it is a quarter of its original size. Incredulous (and slightly embarrassed that I didn't recognize it sooner), I ask her why she did not make something new. Postmodernity replied shyly and sincerely, Because everything is been done. There is nothing new anymore.

Of course I blamed myself. Time is precious in any classroom or studio. I failed to balance the allure of learning new technology with a curriculum reorganized and reconstituted their experience with the technology into something more meaningful. But I am not the only one at fault; I blame Avid for making propriety video software that is not compatible with other software; I blame Adobe, for making their applications increasingly less user-friendly; I blame Macromedia for upgrading their applications every six months; I blame that Cisco ethernet router for having network problems on days that I teach; I blame Microsoft, for being Microsoft; I blame Apple, for not evaluating third party software that run on their operating systems in order to minimize the amount of computer crashes. There's plenty of blame around.(2)

In the United States, colleges and universities are buckling under the weight of the new digital economy. (3) The need for skilled workers in all levels of the Internet and new media workforce, coupled with the demand of students to learn and keep pace with the rapidly changing technology, have driven institutions of higher learning into a desperate race for capital to finance hardware, software, facilities, and a labor pool of teachers and technicians to deal with this burgeoning academic enterprise.

In visual arts education, the need to stay relevant with the technological fields fueling this global shift in business, communication, and culture has been particularly taxing. On the

one hand, an arts education has never been more relevant: the Internet and emerging interactive tele-visual fields like broadband and mobile communication networks all demand a high level of aesthetic mediation in order to be effective. A visual arts education provides a language and a practice that can articulate the content of the technology into forms that can become useful, profitable, and sometimes even beautiful.

On the other hand, the continuing development of new technology that reshapes the different media into more and more complex modes of organization and distribution has made it increasingly difficult for teachers to keep up with and balance the teaching of the technology with an arts curriculum. I believe this is because a visual arts education, working within the milieu of these technological fields, or what I will now call new media arts education, is inextricably accountable to the rapidly changing technology that made the education relevant in the first place. So the aim of the education always betrays a particular bent toward these technological fields, which is essentially a set of techno-industries, rather than being more accountable toward, say, a history of production within the field, or the interpretation and reformulation of ideas and practices that result from the play between technological content and artistic form. In essence, the education's relevancy its weight doesn't come from itself, but from how that education accommodates and articulates the technology.

Can a balance be struck between the demands of technology and the aims of education? American philosopher and educator John Dewey believed it was possible. Dewey's Democracy and Education, written in 1916, outlined a pedagogy that rendered inseparable an education for citizenship and culture with an education for practical skills in the service of industrial needs.(4) His philosophy of progressive education, among other things, sought a convergence between the aims of a growing American industrial economy and the need for a new educational method to prepare people for the changing social and technological landscape. For Dewey, this is accomplished by identifying occupation as an educational method, and situating it between the narrowly practical confines of job training and the pursuit of purely contemplative knowledge generally associated with a liberal education. Dewey writes, an occupation is a continuous activity having a purpose. Education through occupations consequently combines within itself more of the factors conducive to habits into play; it is a foe to passive receptivity. It has an end in view; results are to be accomplished. Hence it appeals to thought; it demands that an idea of an end be steadily maintained, so that activity cannot be either routine or capricious. Since the movement of activity must be progressive, leading from one stage to another, observation and ingenuity are required at each stage to overcome obstacles and to discover and readapt means of execution.(5)

Dewey imagined a progressive education that worked through technology could benefit both the industry and the individual, since he believed the technology of his day took into account so many different sectors of knowledge that learning to use it amounted to a type of education that would perpetuate itself, like a liberal education, into self knowledge, and consequently, self-transformation. The same holds true now, albeit with computers, instead of factories. By using technology as a tool to shape industry, we in turn shape our society and ourselves.

The metaphor of technology as tool has resonated throughout the field of education for the past two decades like a sirenís call. Schools have diverted funding and raised capital for the purchase of computers and computer networks in hopes of using the technology to raise the standards of learning and transform the fundamentals of education into a field of knowledge that can cope with this new digital landscape.(6) Techno-industries, in turn, have courted schools by discounting and at times giving away hardware and software in hopes of solidifying the connection between industry and education. (7) For the arts, this has meant a retooling of virtually every media based curriculum, studio, and classroom to

accommodate the myriad possibilities of digital production. The toll of the retooling has yet to be adequately researched. But informal interviews conducted with media arts teachers in New York, Chicago, and Los Angeles suggests that even though the technology has opened the possibilities of art production, the quality of the class experience is unsatisfactory. Teachers complain about the computer problems distracting class time, a lack of proper technical support for labs and classrooms, and a general dissatisfaction with the low level of discourse.

Are the problems simply a matter of poor curricular planning or a lack of funding to properly fuel the technology? The problem, for me, lies deeper than both. It is the fundamental conception of technology as a tool that is at the root of the problem. Or rather, the view that technology is simply a tool, like a pencil or paintbrush, to be used as a part of the curricular discourse without taking into account the social connectedness that contextualizes and creates this tool. The industry producing the technologies that mediate our connections to each other through the new global networks is a multi-billion dollar business.(8) Applications like Adobe Photoshop and Macromedia Director, to name two, connect to each other in form, function, and production that reflect the connectedness of the industry that produced them. We must realize that as our digital content is launched, color-corrected, exported, rendered and saved, the contracts and transactions that take place between our content and the software we use commit our art practices to a flow of circuitry that can be characterized as the political economy of new media.(9) The aesthetic horizon of our new media art practices is shaped by this political economy, which is itself informed and shaped by a larger network of economies and technological infrastructures. The shifting of the horizon, in the development of new tele-interactivities, new software releases, and hardware and network upgrades has little to do with the need to expand that horizon. Rather, it is dictated by the need for profits and returns by the industries that are now inextricably connected to, and shaped by, each other.(10) Technology taught in classes without this understanding becomes unbearably light, because the weight of the technology, as a complex system of methodologies connected to drives outside of its own purview of utility, is freed from critique, responsibility, and ultimately, transformation. We are left, in the end, with only the utilitarian aspects of technology, which robs us the possibility of understanding technology not only as a tool for artmaking, but as a system of interconnected products selling us the image of a future shaped by the utility of its own presence.

Will a new media arts curriculum that takes this systems approach to technology produce better new media artists? It is unlikely. The lack of weight I see in technology articulated in new media education is shadowed by a similar lightness in its discourse on art. In Aesthetic Theory, Theodor Adorno warns: “The growing relevance of technology in artworks must not become a motive for subordinating them to that type of reason that produced technology and finds its continuation in it.” (11) For Adorno, the pursuit of science in the service of capital is what gives birth to modern technology, and art informed by technology has already compromised its potential force to make concrete “the unsolved antagonisms of reality” that is embodied through the artwork’s articulation of form.(12) The compromise is not complete. Art and technology can combine to create works of aesthetic value, Adorno suggests, but only at the cost of diminishing art’s utopian aspect as the embodiment of a space outside of this world, a space exempt from the mechanism of social process of production and reproduction that signifies the domination of technology in society.(13) For art to speak significantly art must be as abstract as social relations have in truth become, or art risks saying nothing at all.

It is no surprise that Adorno championed art that reflected his totalizing aesthetic: the music of Arnold Schoenberg and the work of Samuel Beckett to name two. And it is also no surprise that new media art, as it exists now in interactive installations, tele-visual sculptures, websites, and CD-ROMs nary even hint at the existence of such works, not to

speak of the modernist aesthetic that informed their sensibilities. The times and the technologies have changed. The aesthetic of new media art draws from a history that makes no distinction between high art and low, and finds its resources from a cultural space totally saturated with the image, whether it comes from advertising, communications media, or the new techno-global networks. New media art is now as interconnected and fragmentary as our cultural relations have in fact become.

Frederic Jameson characterizes postmodernity, among other things, as the leveling of social and cultural difference that blasts the aesthetic experience into the everyday, in an expansion of culture that not only made the idea of an individual work of art problematic, but has made hollow the notion of aesthetic autonomy, thereby rendering anything that aims to exist in a properly aesthetic sphere as thoroughly obsolete.(14)

For me, it is the notion of obsolescence, or rather, the need to escape the grip of obsolescence, that binds art and technology today as it is practiced in new media artmaking; the pursuit to render forms that rise above the base aesthetic aligns itself with the pursuit to generate profit through innovation. It is no coincidence that computer companies have begun sponsoring new media art exhibitions and the tha tele-communication industry have invested capital into museums and fine art institutions worldwide to build ìdigital museums.(15) Nor is it a coincidence that new media artworks exhibited and institutionalized function like beta-forms of technologies that act as down payments on products yet to be marketed.

If obsolescence is what binds art and technology, it is also perhaps the key to transforming their relations. For Walter Benjamin, every technological process is invested with a structure in which two opposing forms of equivalence converge: negative and positive, like an object and its shadow. Benjamin called this dialectical condition within the structure the ambivalence between its utopian and its cynical elements.(16) That the cynical element rises above the fray goes without saying. But Benjamin believed that at the birth of a given technological process the utopian element was present and that it is precisely at the point of its own obsolescence that the technology releases that element once again, like the last flash of a dying star. For obsolescence, the very law of commodity production, both frees the obsolete process from the bonds of utility and reveals the hollow promise of that law. (17)

It is through the perspective of obsolescence, then, that opens the possibility for redemption, in art as well as education. By teaching technology against the grain, the possibility of a pedagogical space immune to the anxiety of progress opens. This imaginary space gives student artists and artist teachers the room to re-imagine the place of technology in their practice, reformulate its tools to suit a critical aesthetic, and reshape the horizon of new media as they see fit.

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