notime: Identity and Collaboration

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Abstract

Although communication networks offer the possibility of a distributed community that can collaborate and exchange vital information, there is little time for these collaborations and exchanges to occur. Ironically, the same technology that makes distributed community a possibility and promises to save us time prevents us from actually having time to build community. Distributed presence inevitably moves us towards group consciousness, which shifts our perception of time and even productivity. This essay uses a large collaborative networked art piece, "notime," as an example of how the creative process shifts when working on the networks. The project attempts to rethink the idea of the avatar as a physical representation and compares it to that of energetic bodies carrying information and evolving with the time people devote to participating, onsite and online. "notime" is conceived to raise questions about our perception of time and identity as we extend our personal networks through technology.

Introduction

Against this dream or nightmare of the body as information, what alternatives exist? We can see beyond this dream, I have argued, by attending to the material interfaces and technologies that make disembodiment such a powerful illusion. By adopting a double vision that looks simultaneously at the power of simulation and the materialities that produce it, we can better understand the implications of articulating posthuman constructions together with embodied actualities.[1]

Three qualities are necessary for work on the networks: a need to connect, a willingness to collaborate, and the ability to embrace the fact that the work may change form and be re-appropriated in the process. In other words, this type of work requires letting go of the idea of "control" that we inherited from the cybernetic/industrial approach to computing. As we move into the age of bio-informatics, these systems are clearly not working for the advancement of social consciousness or collective intelligence. Social networking, online or offline, is directly connected to our relationship to time. "notime" is conceived to raise questions about our perception of time and identity as we extend our personal networks through technology. It is designed to address problems most specific to the Western human condition, which seems to be entering a crisis because of its particular stress on productivity and efficiency in structuring time.[2] The very technology that has promised to save us time has overextended us beyond what we are biologically equipped to handle, and there is less and less time to socialize, to think, to be in a space where there is no constructed time related to efficiency and productivity.

Much of time measurement, including the calculation of minutes and seconds, has moved into an abstract realm that is a figment of our collective imaginations. But it is the atomic clock that truly illustrates the height of the rationalistic subdivisions of time. It measures how long it takes an electron to pass from one energy state to another. Since no one is able to see individual atoms, they are measured collectively and statistically. Furthermore, energy levels, even electrons and atoms, are metaphors devised as a way of explaining microscopic behavior of nature. The atomic second became the official world time standard in 1967, dividing time into milli, micro, pico, and femto seconds. This concept of natural oscillation of microscopic matter as a time standard has entered the everyday public life in the form of digital watches and computing.

As we approached the year 2000, The End of the World as We Know It (teowawki) was pronounced on the net. But the millennium-bug paranoia was different from millennial movements in the past. It was a tangible problem hardwired into the very fabric of our society, directly connected to communication networks[3]. Yet in its fatalistic premise, it certainly overlapped with many religious movements, and, ironically, may be what raised our consciousness of connectivity and the complexity of global networks we are all part of. It was disappointing to find that most discussion on the subject largely revolved around bug fixes, remedies, and reports, rather than exploring the meaning of that collective fear. This moment that threatened to create havoc by disconnecting parts of the system made many acutely aware of our interdependency on computer networks. Financial systems and global corporate structures, arguably the most tangibly related to computing networks, were particularly worried because of their inherently shaky foundations. It is well known that most market oscillations are based on purely psychological aspects. There are many instances where the market is thrown off balance in one direction or other by rumors, not fact. Although the fatalistic visions of the millennial bug did not come true, it is quite possible that a collective realization and the resulting fear of being disconnected could have ever so slightly shifted our perception of time and networks. Perhaps because so many predictions now seem silly, the discussion around this phenomenon has been muted. It is, after all, embarrassing when one considers the stories, rumors, and large amount of resources allocated to "fix: this problem in the West. To me, it remained an inspiring moment, particularly when conceptualizing a piece that deals with social networks and time. In fact, the core of the "notime" project is rooted in that "Y2K moment." I wondered how to approach developing a work that prompts questions of our relation to time in connection to technology and points to how fragile our systems are? And the real challenge was to develop a way in which audiences become aware of the fact that one fearful thought, one rumor, one meme[2] can spark a ripple of change in our consciousness.

Physicists Per Bak and Kan Chen wrote a decade ago that systems as large and complicated as the earths crust, the stock market, and the ecosystem are not only impacted by the force of a mighty blow but also a drop of a pin[5]. Large interactive systems perpetually organize themselves to a critical state in which a minor event starts a chain reaction that can lead to a catastrophe.[6] Along with their colleague Chao Tang, they proposed a theory of self-organized criticality: many composite systems naturally evolve to a critical state in which a minor event starts a chain reaction that can affect a number of elements in the system. Chain reactions are an integral part of a dynamic system. Y2K, then, was a symptom of such a reaction, and it was directly related to computing and time. It was a meme. Memes, as coined by Dawkins, are ideas that are passed on from one human generation to another. They are the cultural equivalent of a gene, the basic element of biological inheritance. They are contagious ideas that replicate like a virus, passed on from mind to mind. Meme is the root word of "memetics," a field of study that postulates that the meme is the basic unit of cultural evolution. Memes function the same way genes and viruses do, propagating through communication networks and face-to-face contact between people. A meme is a cognitive or behavioral pattern that can be transmitted from one individual to another one. Since the individual who transmitted the meme will continue to carry it, the transmission can be interpreted as a replication: a copy of the meme is made in the memory of another individual, making him or her into a carrier of the meme. This process of self-reproduction, spreading over a growing group of individuals, defines the meme as a replicator, similar in that respect to the gene.

Biological Time

"Life," materialized as information and signified by the gene, displaces "Nature," pre-eminently embodied and signified by the old-fashioned organisms. From the point of view of the gene, a self-replicating auto-generator, "the whole is not the sum of its parts, [but] the parts summarise the whole"[7].

In 1944, Erwin Schrödinger (1887-1961), an Austrian physicist who developed wave mechanics[8] and received a Nobel prize as a result, wrote a short book entitled *What is Life?* In that book, Schrödinger advanced a hypothesis about the molecular structure of genes, stimulating biologists to think about genetics in novel ways and ultimately opening a new frontier of science known as molecular biology. This new field has played a key role in unravelling our genetic code, ushering us into an age where we began perceiving our own physical architecture as "information."
That same year, George R. Stibitz of Bell Telephone laboratories produced the very first general-purpose, relay-operated, digital computer[9]. We are now at the threshold of entering an age of biologically driven computers and can only anticipate that this will entail an enormous paradigm shift from industrial-based digital mechanics to ubiquitous computing that could become true extensions of our bodies. But we are also inheriting a technology that is dangerously repeating the Western notions of separation of mind and body, often privileging information over flesh.

Alan Turing's classic paper "Computer Machinery and Intelligence," in which he proposed the famous "imitation game," marked the beginning of many experiments that blur flesh and machine. Katherine Hayles called this an inaugural moment of the computer age when "the erasure of embodiment is performed so that intelligence becomes property of the formal manipulation of symbols rather than enaction of the human life world"[10]. That same year, Norbert Wiener envisioned a day when a human being could be telegraphically transported[11]. Forty years later, Hans Moravec proposed that machines become repositories for human consciousness. And Stelarc, a performance artist who had been exploring the boundaries of his body since the late 1960s, moved seamlessly into experimentation with the Internet. Stelarc's artistic strategy revolved around the idea of "enhancing the body" in both physical and technical ways. His work encompassed polar opposites: the "primal desire" to defeat the force of gravity using primitive rituals and hi-tech technologies like the third arm. Stelarc makes radical statements, such as "the body is obsolete."[12]

In a post-human paradigm, humans are perceived as information, as evidenced by both the Visible Human and Human Genome Projects, or as information-processing entities. In both cases, the "human" is abstracted. If we juxtapose these assumptions with late capitalism moving away from durable product to information, we can easily translate this to the art worlds dematerialization of object. This could be celebrated as a victory of conceptual movements or seen as a dangerous intersection where information about us is being collected, stored, and databased, without the opportunity for us to choose or to know or accept either its worth or its consequences.

The most human-related project dealing with the genome is intricately connected to power of computing. Watson and Crick explicitly described DNA in computer terms as the genetic "code," comparing the egg cell to a computer tape. This school of thought is perpetuated in even more extreme terms by proponents of artificial life such as Chris Langton, who speaks of separating the "informational content" of life from its "material substrate."[13] As Richard Coyne notes: "Information is thought to be the essence of life, as in the DNA code. To record and break the code is to have mastery over life."[14]

Haraway, on the other hand, identifies gene mapping as a particular kind of spatialization. She calls it "corporealization," which she defines as "the interactions of humans and non-humans in the distributed, heterogeneous work processes of technoscience… The work processes result in specific material-semiotic bodies – or natural-technical objects of knowledge and practice – such as cells, genes, organisms, viruses, and ecosystems."[15]. Information topographies are emerging in the biological sciences to map the human body or the genome, and the computer sciences are mapping the information activities on the networks. Turning to biological principles in relation to our social interactions may be the key to a more organic, human way to look at information. For instance, biologists such as Francesco Varela and Lynn Margulis are questioning what relationships our own bodily architecture and our societal organizations have to underlying biological principles. An entire field of consciousness studies is questioning what we know now about neurons in our brain and their relationship to consciousness. In January 1998, Donald E. Ingber[16] published an article in Scientific American in which he makes the extraordinary claim that he has recognized a universal set of building principles that guide the design of organic structures, from simple carbon compounds to complex cells and tissues. In his article, Ingber states: "identifying and describing the molecular puzzle pieces will do little if we do not understand the rules of their assembly"[17]. For two decades, he discovered and explored the fundamental aspects of self-assembly. For example, in the human body large molecules self-assemble into cellular components known as organelles, which self-assemble into cells, which self-assemble into tissues. Ingber discovered that an astoundingly wide variety of natural systems, including carbon atoms, water molecules, proteins, viruses, cells, tissues, humans, and other living creatures, are constructed by a common form of architecture known as tensegrity.

Tensegrity takes us back to Black Mountain College in 1948, where Buckminster Fuller taught. It was at this innovative college where Fuller met and worked with Kenneth Snelson, now an internationally renowned sculptor, then a young student who came under his spell along with John Cage and many others. Deeply inspired by Fuller, Snelson came up with a prototype employing discontinuous compression, which Fuller later coined tensegrity. Tensegrity (tensional integrity) was at the heart of Fuller's universe. After some time passed, Fuller ceased to credit Snelson for the prototype, causing a deep rift between the two for decades.

Donald Ingber writes: "...in the complex tensegrity structure inside every one of us, bones are the compression struts, and muscles, tendons, and ligaments are the tension-bearing members. At the other end of the scale, proteins and other key molecules in the body also stabilise themselves through the principles of tensegrity"[18]. Using a simple tensegrity model of a cell built with dowels and elastic cords, he shows how tensegrity structures mimic the known behavior of living cells. A tensegrity structure, like that of a living cell, flattens itself and its nucleus when it attaches itself to a rigid surface and retracts into a more spherical shape on a flexible substrate. Understanding the mechanics of cellular structures could lead to new approaches to cancer therapy and tissue repair, and perhaps even to creation of artificial tissue replacements[19].

Ingber talks about Fuller in his article and about the molecule that was named after him, the buckminsterfullerene or the buckyball, and has been well acquainted with the work of Snelson as well as Fuller. In 1983, he wrote a letter to Fuller in which he stated: "The beauty of life is once again that of geometry with spatial constraints as the only unifying principle. It is of interest to note that, as presented in the accompanying paper, cancer may be then viewed as the opposite of life resulting from a breakdown of this geometric hierarchy of synergetic arrangements"[20].

In 1962, when chemist Sir Aaron Klug observed geodesic structuring of viruses and wrote to Fuller telling him of his discovery, Fuller wrote back immediately with the formula for the number of nodes on a shell (10f + 2, varying according to frequency) as confirmation of Klug's hypothesis, and Klug answered that the values were consistent with the virus research[21]. It is important to note that geodesic domes were utilized worldwide 15 years before electron microscopy enabled detection of virus capsids. In 1982, Klug won a Nobel prize for his "structural elucidation of important nucleic acid-protein complexes," and he has been described as a "biological map maker," a Magellan "charting the infinitely complex structures of body's largest molecules"[22].

Whereas cells were regarded as the basic building blocks of living organisms during the 19th century, the attention shifted from cells to molecules toward the middle of the 20th century, when geneticists began to explore the molecular structure of the gene. Biologists were discovering that the characteristics of all living organisms, from bacteria to humans, were encoded in their chromosomes in the same chemical substance and using the same code. After two decades of research, biologists have unravelled the precise details of this code. But while they may know the precise structure of a few genes, they know very little of the ways these genes communicate and cooperate in the development of an organism. Similarly, computer scientists may be well versed in networked technologies but have no idea as to why the Internet exploded as it did: naturally, spontaneously. No one does.

The most common organizational pattern identified in all systems is networking. All living systems are arranged in a network fashion. Since the 1920s, when ecologists began studying food chains, recognition of networks has been essential to many scholars, in different forms. Cyberneticists, in particular, tried to understand the brain as a neural network and to analyze its patterns. The structure of the brain is enormously complex. It contains about 10 billion nerve cells (neurons), which are interlinked in a vast network through 1,000 billion junctions (synapses). The whole brain can be divided into sub-networks that communicate with each other in a network fashion. All this results in intricate patterns of intertwined webs, of networks nesting within larger networks[23].

In parallel to major advances in gene mapping, a growing number of researchers are working on visualizing the network geographies on the Internet, mapping various data use. As the networks continue to expand with unbelievable speed, systems administrators increasingly look more to visual representation of data to give them a quick overview of the local or global network status. Martin Dodge at the Centre for Advanced Spatial Analysis, University College, London, has put together an impressive array of various research efforts to visualise the net.[24]

Network topology maps typically show things such as traffic information flow. But more and more, scholars are recognizing the value of visualizing network topologies for analyzing social, demographic, and political information flow. This is the beginning of mapping our online societies and viewing ourselves as a particular organism, clearly a rich territory for artists working on the networks.

Molecular biology has moved us toward a perception of our physical selves as information, and the genetic decoding of our bodies has further emphasized this tendency. The question is how to humanize the information once again and avoid viewing the graphical representations as pure pattern. As Katherine Hayles argues, information was defined as pattern by Claude Shannon, founder of information theory, and resulted in abstracting information from a material base that meant it was unaffected by changes or context.[25] Just as graphical representations of ourselves in cyberspace (avatars) are merely masks for our databases, so too these topologies can become abstracted maps, suffering the same fate of geographical maps. The problem I faced echoed Varelas question of emergent selves: "The paradox between the solidity of what appears to show up and its groundlessness." I decided to attempt to make a move from the graphical representation of the physical body to the energetic body, using the principles of "energetic geometry," tensegrity.

Collaboration Time

> Whether communication is by telephone or by wireless radio, what you and I transmit is only weightless metaphysical information. Metaphysical, information appreciative, you and I are not the telephones nor the wire or wireless means of the metaphysical information transmitting.[26]

Just as relationships are shifting due to networks, so too is the creative process for those working on the net, and the meaning of collaboration changes drastically. The word collaboration assumes a very different meaning when there is lack of time for synchronous communication while we are bombarded with too much information. Collaboration happens in many ways, and unfortunately for those who would like a clearly organized world, there is no one straight formula. As creative projects using technology get more elaborate, the need to work with others is simply a necessity. Remote collaboration with people who have never met physically is already widely practiced by the open-source community in particular. Programmers can easily offer service without being onsite, and artists can consciously plan projects in which the audience becomes an integral part of the piece and even plays an important role in its development. This, together with the fact that new generations who grew up with games and interactivity are expecting a different type of interaction, has great implications in the art world and in the academic environment at large, which has traditionally nurtured the idea of an "individual."

"notime" is a collaborative piece at its core, and it would have not taken on the form it did if it wasn't for the Internet. My research into tensegrity structures led me to believe that if this principle works in physical architectures (as in Buckminster Fuller's domes and Kenneth Snelson's sculptures) and is the basis of cellular and molecular architectures, as Ingber discovered, the same principles should be applied to networked information spaces. I started imagining how these spaces could look and function, and was very inspired to start experimenting with visualization of social networks. However, I was having enormous difficulty finding someone who could both program and understand this type of system. This was not simply a matter of programming skills. It was a philosophical issue. I was looking for an information architect who understood conceptually what I was interested in. While researching on the Web, I discovered the work of Gerald de Jong, a programmer-artist working in Holland. De Jong had authored software called "struck," which later morphed into "fluidiom" (fluid idiom), and was actively engaged in programming dynamic tensegrity structures. In this system, synergetic geometry or "elastic interval geometries," as de Jong calls them, are used to model arbitrary database information for visualization and decision-making purposes, as well as for creation of effective and aesthetic presentation graphics and Web applications. The fluidiom projects inspiration was directly linked with Buckminster Fuller's comprehensive scientific philosophy, Synergestics'.[27]

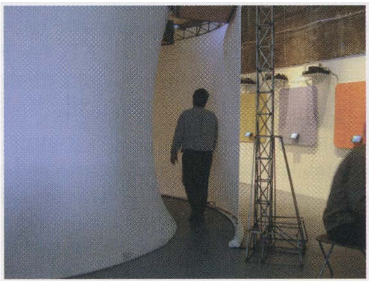
The fluidiom project was exactly what I was looking for, and in February 2000, I contacted de Jong via email, introducing my research and concept. Gerald was already thinking of creating networked human information architectures, using "energetic geometries." A month after our initial contact, he came to Los Angeles, and we spent a week working together on how our ideas could connect creatively. It seemed that some of my concepts and aesthetics were a perfect vehicle for the tensegrity structures he had been developing using the Java programming language. It was almost strange to both of us how we came to a similar place, although from very different angles, and we knew that both of us stood to gain something from working together. From that point on, we collaborated remotely and did not meet again until the opening of our first exhibition. At UCLA, I also had begun collaborating with David Beaudry, a PhD student in music who moved seamlessly between his clarinet and programming spatialized sound. David composed the soundscapes for the physical installation, programmed video tracking, and worked on the online sound, too. These two talented people started working together on the net on the sound, meeting for the first time just days before the exhibition to set up the work. The three of us are the core of the collaboration, which expanded when we started to install the physical site.[28]

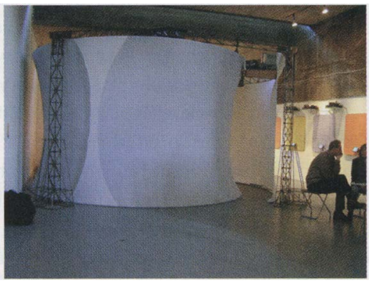
"notime" evolved from an earlier online participatory project, Bodies INCorporated, which was audience-driven. Much of it was developed as a response to certain demands and comments that radically shifted my creative process and thinking about future work. This transition is enacted in the collapse of the avatar bodies from Bodies INCorporated to a tetrahedron, a minimum building block in nature.

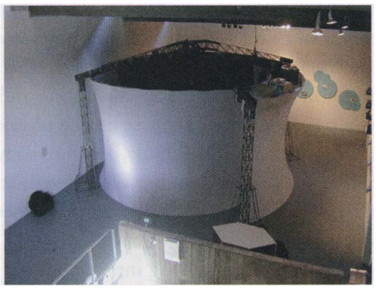
Community

The most persistent demand from the growing number of people who created bodies in Bodies INCorporated (now at over 50,000) was the need for "community," and for a way for participating members to communicate with each other. This made me examine the meaning of community on the net and compelled me to extensively research the existing efforts to create communal spaces on the Web. What very quickly became apparent to me is that the recent efforts to build communities on the net are inexorably connected to e-commerce and that the architects of these spaces are following models of malls and credit card systems. Thus, people shopping and sharing similar tastes are the basis of such communities, and they are increasingly using agent technologies to search through endless data based on their personal information. Yet, while these agents are supposedly empowering us as users, we don't know how or where our information flows, and these information streams tend to remain out of reach and invisible. Few people realize how quickly entire histories can be reconstructed from credit cards and social security numbers that people submit for economic transactions. When I asked myself who the people are who I would like to create community with, I realized that they would largely be composed of people who have very little time. In fact, the more interesting the people, the less time they seem to have. Thus it seemed to me that the logical conclusion was to conceptualize an environment that would act autonomously, largely independent of direct real-time human interaction, and not requiring direct participation by those who are represented by the information they carry. In "notime," databases, and the resultant database aesthetics, would in fact become the representation of people and interaction in this community space. By exploring innovative ways of visualizing the trajectories of evolving human networks in relation to information, access, and navigation, we will explore our relationship to time and the meaning of community in networked public space. New methods of management, known as molecular and nano-political, shift focus from planned communities to emergent communities. These types of communities require the technical infrastructure that allows for collective intelligence work.

I was interested in working with Gerald to utilize these principles of tensegrity for envisioning a different type of body, an "energetic body," meaning a body that is networked and built from information, but not de-humanized. Together, we arrived at the idea of beginning to evolve a persons data body from an initial tetrahedron structure. The tetrahedron is a natural starting point, or "whole system," in Fuller's "Cosmic Hierarchy," and as such contains the axes of symmetry that characterize all the polyhedra of the isotropic vector matrix, or face-centered cubic symmetry in crystallography. Fuller refers to the six edges of a tetrahedron as one "quantum" of structure, because the number of edges in regular, semiregular, and high-frequency geodesic polyhedra is always a multiple of six[29]. I decided to embed some meaning in the intervals of the tetrahedron by connecting to the Eastern representations of the energy centers, specifically the Chakra system. "Chakras," which mean "wheels" in Sanskrit, are points of energy believed to run along our spine. Ancient Hindus formulated that







View of physical structure at the San Francisco Art Institute, February, 2001.

there were seven of these energy wheels, each a different color and spinning in a clockwise direction. Interestingly enough, the spacing of chakras actually matches major nerve or endocrine centers, while the colors correspond to the electromagnetic spectrum.

Gerald refers to the geometric lines as intervals of time when he discusses the structures he is programming in Java. Evolution only happens in time intervals as represented in the emerging shapes. The initial structure has all the base elements for the architecture of the project: six intervals related to time and four memes relates to the four letters of the genome project (ATCG). The six intervals of time connect perfectly to Freeman Dyson's thesis that every human being is a product of adaptation to the demands of six time scales: years (individual), decades (family), centuries (tribe/nation), millennia (culture), tens of millennia (species), and eons (whole web of life on our planet)[30]. It is based on the idea of constant evolution and change, just as the six intervals of the I Ching hexagrams.

Construction of the Initial Tetrahedron

Participants are invited to spend a few minutes to create their initial minimum structure, a tetrahedron, by determining the length of the six intervals that have a base color and meaning attached to them: red represents family, orange: finances; yellow: creativity; green: love; blue: communication; violet: spirituality. The time a person spends on deciding the length of a particular interval is registered and has an effect on the speed of replication. After determining the length, users input four memes in the nexus of the lines and then, as a last step, attach sounds from a library created by David Beaudry. When the structures are in motion, the combination of the chosen sounds with the determined lengths of intervals creates a unique composition for each person. The four initial ideas are meant as a starting point. Since those who initiated the building are too busy to spend time adding ideas, they invite people from their own personal networks to add memes to the structure. This becomes a natural filtering system. Only people whose ideas one trusts will most likely be invited to contribute to their "notime" body. Addition of memes takes place only online and cannot happen unless people viewing the structure on the physical site generate intervals. Each "notime" body becomes a chat room space where people can meet. Conversations are interrupted with random quotes dealing with time and the genome project.

Intervals replicate and keep evolving into a complex structure by the interaction of others who spend time in the museum or gallery, navigating the structures with their bodies, in "real time." Thus the physical and online spaces are interdependent. Because we are limited biologically to having a personal network of 300-500 people, it is programmed to implode when it reaches that point of information overflow. This moment is dramatized by an announcement to the entire communit. The old body is stored and can be accessed for view only, but is not dynamic anymore. It is archived. At that point, the person who owned the "notime" body has a choice: begin from the same initial tetrahedron, create a new one, or discontinue the cycle. The decision is also announced to the community via email.

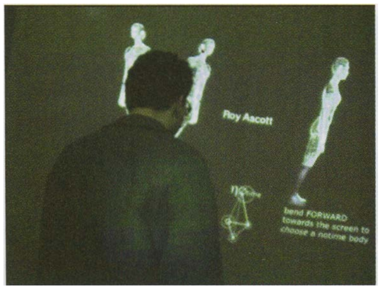
Physical Installation

Initially there was no plan to build a physical structure for the piece, but as we progressed in our development, it became clear that there was a need to control the light and sound. Further, since the "notime" was scheduled to travel with the "Telematic Connections" exhibition,[31] it became necessary to consider that the spaces will change with each location. The idea of simply building a box was not only unsatisfactory but ran contrary to the entire philosophy of the informational architecture. I summoned sculptor Tim Quinn to help build a structure that would reflect the work rather than simply be a "black box." Although I would have preferred to have a true tensile structure that is lightweight and easily transportable, we had to settle for using steel for the spiral structure. With the addition of this massive structure, the project made a major shift towards deliberately making the connectivity and dependency on networks a physical experience.

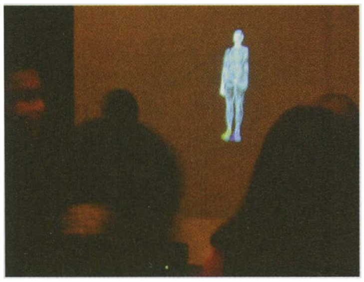
For physical installations, in addition to the undetermined online audience, specific people are highlighted depending on the specific site and context. The physical installation of "notime" allows the audience to navigate these structures with their bodies via sensors. The experience of time and no time is heightened in the physical structure, whose base is shaped as a spiral and creates an enclosed atmospheric space with projections and a reactive 3D sound environment working in conjunction with the elastic interval geometry. By spending time navigating, participants add intervals that replicate from the initial tetrahedron shape.

"notime" is a long term project with many phases envisioned.[32] The description of the project in this paper is merely in relation to what inspired its concept, and the foundation of the piece based on time intervals, memes, and tensegrity principles embodied in a tetrahedron (the minimum structure that nature employs in many of its architectures). The main goal is to move towards embodied information, with all its human qualities, no matter how messy and problematic they may be. As the physical installation moves from site to site, new groups of people connected to that particular space and time will be highlighted. They will include their personal network by design and necessarily involve the audience who will also join in building a community of people with no time. Eventually, new lighter materials will be used for the physical structures that will reside in many locations simultaneously. Extreme experiences are planned: complete immersion in "notime" data bodies together with others in physical locations and instant updates on hand-held devices.

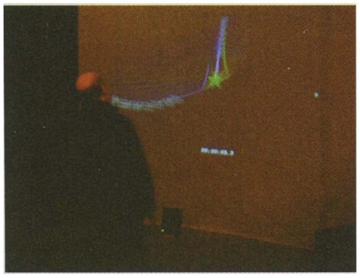
Although inspired by the Y2K moment and a basic question of how we can build community when we are all so busy, "notime" is really moving toward a space of n 0 time. It is a project to which authors, whether they are artists and programmers collaborating to develop the architecture or people who participate, breathe life into it with their attention and time.



The human looking avatar dissolves to a tetrahedron.



Audience physical presence affects the tensile java structures.



Audience physical presence affects the tensile java structures.

View of physical structure.

Notes

1. Hayles, K. (1999). *How we became posthuman: Virtual bodies in cybernetics, literature, and informatics.* Chicago: University of Chicago Press, 47.
2. For instance, the year 2000, anticipated with great fear in the West, was year 6236 according to the first Egyptian calendar, 5119 according to the current Mayan Great Cycle, 2753 according to the old Roman calendar, 2749 according to the ancient Babylonian calendar, 2544 according to the Buddhist calendar, 1997 according to Christ's actual birth (circa 4 B.C.), 1716 according to the Coptic calendar, 1378 according to the Persian calendar, 208 according to the French Revolutionary calendar, and the Year of the Dragon according to the Chinese calendar.
3. Poulsen, K. (1998). The 2YK solution: Run for your life! *Wired Magazine*, August, 6.08:168.
4. The term was coined in 1976 by Richard Dawkins in his book *The selfish gene.* Dawkins speculated that human beings have an adaptive mechanism that other species don't have. In addition to genetic inheritance with its possibilities and limitations, humans, said Dawkins, can pass their ideas from one generation to another, rather than through the longer process of genetic adaptation and selection. Examples ●f memes might include the idea of God, the importance of the individual as opposed to group importance, the belief that the environment can to some extent be controlled, or the idea that technologies can create an electronically interconnected world community. Today, the word is sometimes applied ironically to ideas deemed to be of passing value. Dawkins himself described such short-lived ideas as memes that would have a short life in the meme pool.
5. Bak, P. and K. Chen. (1991), 46.
6. In 1990, Glenn A. Held and his colleagues at the IBM Thomas J. Watson Research Center devised an ingenious experiment with sand piles that put this theory to the test. They constructed an apparatus that added one grain of sand at a time to a pile of sand. The balance had a precision of .0001 gram and a capacity of 100 grams. Each grain of sand weighed about .0006 gram; a sand pile whose base was four centimeters in diameter weighed approximately 15 grams. The group used a personal computer to control the motor and to monitor the balance. Held and his group ran the experiment for two weeks, dropping more than 35,000 grains of sand on the four-centimeter plate. They observed avalanches in a range of sizes (Held et al., 1990, 1120-1123).
7. Haraway, D. (1998). Deanimations: Maps and portraits of life itself. In *Picturing science, producing art.* A. Jones and P. Galison, eds. New York: Routledge.
8. Wave mechanics is the version of quantum physics that was developed initially by Erwin Schrödinger in 1926. The idea came from the work of Louis de Broglie via Albert Einstein. De Broglie pointed the way to wave mechanics with his idea that electron waves "in orbit" around an atomic nucleus had to fit a whole number of wavelengths into each orbit, so that the wave neatly bit its own tail, like the alchemical symbol of the worm Ouroboros (Gribbin, J., 1999, 427).
9. Goldstein, (1993), 115-16.
10. Hayles, K.
11. Wiener, Norbert (1954). *The human use of human beings: Cybernetics and society.* New York: Doubleday, 103.
12. Stelarc's work can be seen at: stelarc.net
13. Langong, C. (1989).
14. Coyne, R. (1995). *Designing information technology in the postmodern age.* Boston: MIT Press, 80.
15. Haraway, D. (1998), 186.
16. In addition to being a professor in pathology and a member of the bioengineering faculty at MIT, Donald Ingber is the founder of Molecular Geodesics, Inc., a company that creates advanced materials with biologically inspired properties.
17. Ingber, D. (1998). *Scientific American*, 30.
18. Ibid., 32.
19. Ibid., 30-39.
20. Edmonson, C. Amy (1987). *A Fuller explanation: The synergetic geometry of R. Buckminster Fuller,* 257.
21. Ibid., 239.
22. Associated Press. (1982).

23. Varela, F. et. al. (1991). *The embodied mind*. Cambridge: MIT Press, 94.
24. Cyber Geography can be accessed at: www.cybergeography.org
25. Claude Shannon, along with Warren Weaver, laid the foundation of modern information theory. See Shannon, Claude, and Warren Weaver. *The Mathematical Theory of Communication*, 1949. Foreward by Richard E. Blahut and Bruce Hajek. Urbana: University of Illinois Press, 1998.
26. Fuller, R.B. (1962). *Synergetics Dictionary*. Citing Oregon Lecture #9, July 12, 326.05.
27. Synergestics shows how we may measure our experiences geometrically and topologically, and how we may employ geometry and topology to coordinate all information regarding our experiences, both metaphysical and physical. Information can be either conceptually metaphysical or quantitatively special-case physical experiencing, or it can be both. The quantized physical case is entropic, while the metaphysical generalized conceptioning induced by the generalized content of the information is syntropic. The resulting mind-appreciated syntropy evolves to anticipatorily terminate the entropically accelerated disorder (Fuller, Synergistics Dictionary, 200.06).
28. We were joined by Ruth West, a graduate student in Design | Media Arts who was a geneticist for eight years before starting her graduate studies; Ingo Tributh, a student in information studies in economics from Germany; and Burt Peng, a student from the film department at UCLA.
29. Edmundson.
30. Dyson, F. (1992). *From Eros to Gaia*. New York: Pantheon, 341.
31. Telematic Connections: the Virtual Embrace is curated by Steve Dietz.
32. "Notime" is commissioned by the Walker Art Center and sponsored by the Independent Curators International and the UCLA Academic Senate.

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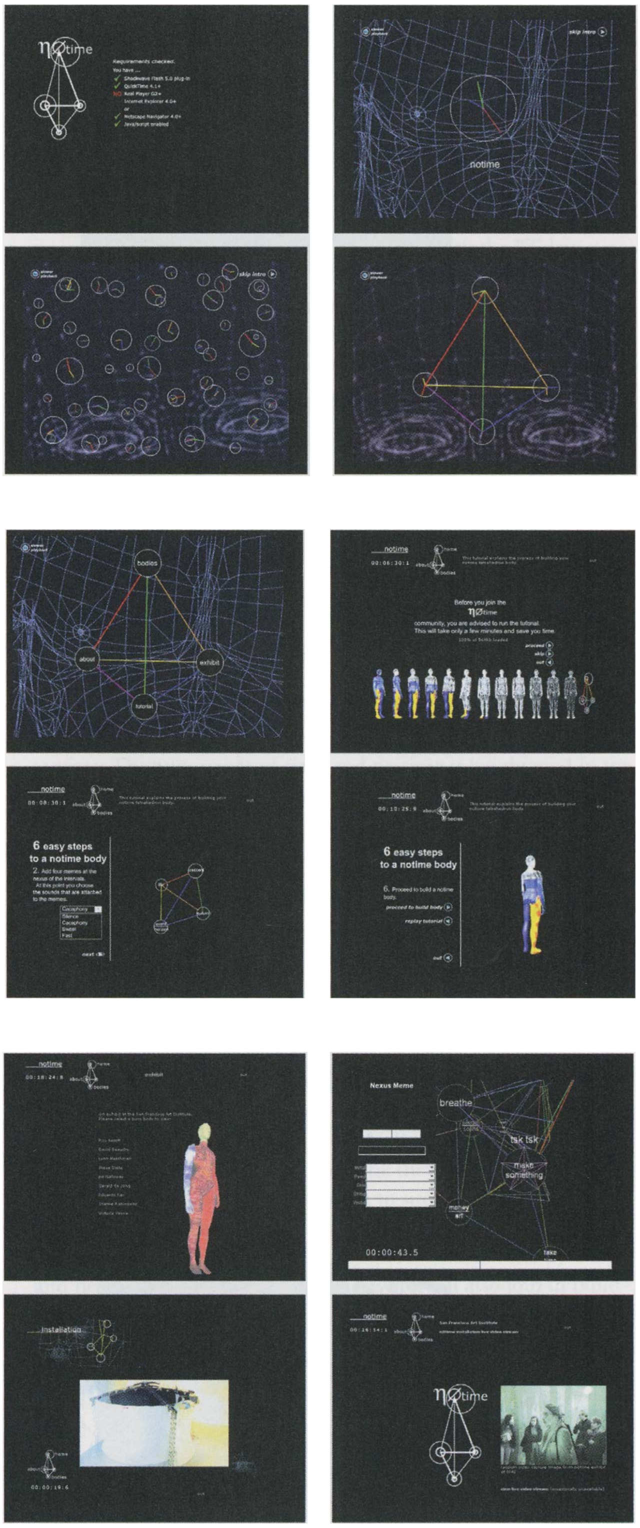

Screen shots from "notime" website, version 1.
For current version, see: http//notime.arts.ucla.edu.