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INTRODUCTION

< This issue >

Craig Harris

This issue of LEA contains a striking collection of articles and profiles. As I promised in LEA 2:6, Greg Garvey provides insight into his Automatic Confession Machine (ACM), and Stephen Bell explores the aesthetics of interaction in an article and annotated list of characteristics which is an excellent complement to Stephen Pope's "A Taxonomy of Computer Music" (LEA 2:1). Greg is planning to load ACM up into the Leonardo Electronic Almanac Gallery later in the month. I will make the appropriate announcement in a future issue of LEA, and I will update the README file immediately upon loading up the work, for those of you who may check between now and then. In addition, I am pleased that Jacquelyn Ford Morie, Co-Chair of

SIGGRAPH's "The Edge" venue, has provided advance abstracts of projects to be displayed at the exhibition. LEA readers who are able to attend will have an opportunity to become familiar with the projects they will view at SIGGRAPH '94. Those who are unable to attend can still gain a strong feel for this current work, and even check some of it out if there is WWW access at your site.

Please note the new Editorial Address for standard mail at the bottom of LEA. The email address remains unchanged.

Finally, later this month Roger Malina and his editorial crew will be supplying a bonus issue of Leonardo Digital Reviews.

Keep the material coming!

< Errata >

In LEA 2:6 we established the Leonardo Electronic Almanac Gallery with "Storms", by Eduardo Kac, and "Hucklefine", by Mike Mosher. Regarding gaining access to the files on the ftp site, Geoff Gaines (ggaines@ssl.Berkeley.Edu) reports that the file 'STORMSReadme.hqx' had to be transferred in std. binary mode, rather than in MacBinary, as were the others.

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FEATURE ARTICLES
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< The Automatic Confession Machine: A Catholic Turing Test >

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As the title of the piece suggests, a Catholic Turing Test is a computerized confessional designed and fabricated to resemble an automatic banking machine. Like an ATM the Automatic Confession Machine can be referred to by the acronym ACM, not to be confused with the American professional technical association.

INSPIRATION AND ORIGINS

The inspiration for this work derives both from the artist's experiences as a youth with the Catholic Sacrament of Confession and perhaps just as importantly, the now famous test for judging whether or not a computer can be said to think as first stated in the article by Alan Turing, entitled "Computer Machinery and Intelligence", which appeared in the philosophical journal "Mind" in 1950.

In this paper Turing shrewdly replaces the question "Can machines think" with the question "Are there imaginable digital computers which would do well in the imitation game?" Turing describes the game as follows: "It is played with three people, a man(A), a woman(B), and an interrogator (C) who may be of either sex. The interrogator stays in a room apart from the other two. The object of the game for the interrogator is to determine which of the other two is the man and which is the

woman. He knows them by labels X and Y, and at the end of the game he says either 'X is A and Y is B' or 'X is B and Y is A'. The interrogator is allowed to put questions to A and B thus:

C: Will X please tell me the length of his or her hair?

It is A's object in the game to try and cause C to make the wrong identification. The object in the game for the third player B is to help the interrogator. In order that tones of voice may not help the interrogator the answers should be written, or better still typewritten. The ideal arrangement is to have a teleprinter communicating between the two rooms."

Are there imaginable digital computers that would do well? First held in Boston at the Computer Museum, the Loebner Prize Competition challenges judges to decide whether or not they are conversing on a predetermined and limited subject with a computer or a human being. Organized by Robert Epstein, founding director of the Cambridge Center for Behavioral Studies this Turing Test competition has for 3 years awarded prizes to programmers who HAVE fooled judges with their software. Judith Anne Gunther, writing in the June 1994 issue of "Popular Science" reports: "The winning computer program didn't fool me a bit, nor did the other two programs. What did throw me was one of the five humans, a real person discussing abortion. He was so uncommunicative that I pegged him for a computer." Please note that Turing's original proposal is proscribed for 3 players and not strictly one on one as in these popularized versions of his tests. Another important feature is the ability to mimic human thought as reflected in natural conversation.

Joseph Weizenbaum's ELIZA of 1966 demonstrated the importance of maintaining the illusion of understanding. By cleverly mimicking techniques of Rogerian psychotherapy by asking leading questions (e.g. A moment ago you mentioned your mother. Tell me more about your mother) Weizenbaum reports that some subjects have been hard to convince that ELIZA is not human. He notes "The human speaker will contribute much to clothe ELIZA's responses in vestments of plausibility." Suggestion and a desire to believe can be exploited by both A.I. researchers and the religious. Susceptibility to suggestion may be the flip side of self-deception. In fact an argument might be made that much of AI or for that matter Virtual Reality is a willingness to submit to self-deception. Put in another way it might be described as the willingness to suspend disbelief. Brenda Laurel speaks to this point in her seminal book "Computers as Theatre".

There also appears to be a natural human desire for catharsis: to confide in others dark secrets, to unburden oneself of committed wrongs and to seek forgiveness. This is perhaps a way of maintaining self esteem or even one's social standing in a group or tribe because forgiveness may be equated with acceptance. In many but certainly not all religions ritualized expiation has channeled this psychological impulse. As Martin Luther wrote "it is a cure without equal for distressed consciences." In the Roman Catholic Faith Confession has been institutionalized as one of the Seven Sacraments.

While some social commentators have lamented the loss of the

concept of sin for those of us raised as Catholics (or recovering Catholics) the idea of sin is not forgotten--it continues to dog us with guilt nipping at our heels. The notion of sin is intimately bound to the notion of sanctifying grace. The state of grace necessary for eternal life stands in a kind of binary opposition to the state of sin: either on or off, true or false, heaven or hell. Confession offers the sinner not only a psychological release and but a financial burden in the form of an accounting system which balances spiritual debits against credits. For mortal sins you lose your credit rating i.e. damnation; for venial sins you've got a debt to pay off, with interest.

Penance is the way to structure your payment plan while you are still employed here on earth and avoid the purgatory of the debtor's prison in the hereafter. While medieval penances were rather severe, for example hair shirts, fasting, scourges and other self-mutilations, I recall typically receiving 3 Hail Marys and 3 Our Fathers and for really bad sinning 6 of each.

Indulgences were another quite popular method to pay off this sin debt. A kind of junk bond of the late middle ages printed with the high technology of the Gutenberg press indulgences not only allowed the rich to leverage their sin debt but also was a fund raising issue for the Vatican to finance wars. Martin Luther took particular umbrage at this system in his 95 theses and wrote in An Open Letter to the Christian Nobility of the German Nation concerning the Reform of the Christian Estate, "they (ROME) issue an indulgence on this same pretext of fighting the Turks, for they think the mad Germans are forever to remain utter and arrant fools, give them money without end, and satisfy their unspeakable greed.."

In the Babylonian Captivity of the Church Luther writes "Hence, I have no doubt but that every one is absolved from his secret sins when he has made confession, privately before any brother". Luther's assertion that a true confession does not require telling to the church, prelate or priest is the theological sticking point that upstages the question "can machines think! "

#### FUNCTION AND OPERATION OF ACM

There is as discussed a constellation of monetary and financial associations with confession that readily encourages the idea of an ACM imitating the ATM. The system of sin and penance lends itself to quantification and there is some evidence to suggest that priests used to look up penances in tables based on the confessed sins. Furthermore, a very potent underlying metaphor is the binary nature of good and evil, sin and salvation, sin and grace. In addition the institution of confession is readily adapted to an algorithmic and menu driven format.

A typical example as I recall as a child is:

Bless me Father for I have sinned my last confession was one month ago.

I talked back to my parents 3 times.

I told 3 lies.

I had impure thoughts 4 times.

I am sorry for these sins and the sins of my whole life especially for talking back to my parents.

There may be some questions from the priest and then absolution

and a typical penance might be three hail marys and our fathers.

Like the ATM banking machine a kneeling penitent will use a keypad to enter both venial and mortal sins and will receive a print-out of the balance of required penance. The user confesses by selecting sins from a menu of the seven deadly sins and the 10 Commandments. Prior to doling out the required penance the computerized priest queries the user regarding the sins committed and takes a special interest in sins of the flesh.

This work challenges the sinner kneeling at this automated confessional to make a digital leap of faith and surrender to the belief in the power of silicon absolution. A doubting Thomas must decide if there is direct communication with an online priest or a computer programmed to perform the duties of a priest. Thus the user/sinner can experience the ecstasy of forgiveness in a Manichean system governed by the binary logic of good and evil where guilt, shame, sin, and salvation are all input variables that determine the catechism of output: namely how many Hail Marys and Our Fathers must be said for redemption.

#### HANDS-ON, HANDS-OFF:

A special benefit for today's sexually conscious church is the "hands-on, hands-off" feature, where the user interface is an easy to use "hands-on" keypad, while the confessional is truly "hands-off". Given correct dogmatic programming the ACM will never engage in improper advances with the parishioners. Furthermore our policy of "don't ask, don't tell" preserves the confidentiality of the priest-confessee relationship.

The hardware is Macintosh or similar computer, and the software was originally developed in HyperCard then converted to Supercard.

#### RELATED EXAMPLES:

Recently Mr. Apology and the Apology Line which has been a service available to the public for over 10 years in New York has received a lot of attention. There is even a newsletter. Another New York artist Joey Skaggs was seen outside the Democratic National Convention in 1992 pedaling his "PortoFess". The Movie THX 1138 by George Lucas featured a technological confessional. In a religious products convention in Venice, Italy Confession by FAX was introduced which was frowned upon by the church. Relevant developments are the Drive-in Marriage-Las Vegas, the Handheld Rosary Assistant and an important watershed event was the fake ATM installed at a mall by thieves in Connecticut.

#### SOCIAL IMPLICATIONS - RELIGION AS COMMODITY

This Automatic Confession Machine should not be misconstrued as a diatribe against religious faith. Rather it is as much a warning - suggesting that the inexorable drive of commercialism and marketing will redefine spiritual needs as yet another commodity to be researched, marketed, and packaged. At the same time the ACM is indicative of how technology has intruded into our lives, mediating what used to be human-to-human transactions now potentially encroaching upon the personal and spiritual. This intrusion underscores the fact that interactive technology is, as Erkki Huhtamo points out, "never 'innocent',

free of ideological, political, and economical determinations."

#### SPECULATIONS - FAITH AND ARTIFICIAL INTELLIGENCE:

Turing interestingly tackles what might be called the Theological Objection. Turing sketches this argument as follows: "God has given an immortal soul to every man and woman, but not to any other animal or to machine. Hence no animal or machine can think." Turing asks if God is thereby limited in his power if he/she cannot create a soul for a machine.

Weizenbaum has demonstrated the machine doesn't have to reproduce thinking per se but only give the illusion. The ACM employs in fact a menu driven system that is remarkably unintelligent, literally knowing nothing about the user/sinner. The program does simply some additions, multiplications and normalizes the results within an acceptable range of penance.

Turing also provides a theological solution to a possible limit on the power of God: "In attempting to construct such machines we should not be irreverently usurping His power of creating souls, any more than we are in the procreation of children: rather we are, in either case, instruments of His will providing mansions for the souls that He creates."

For ideological, political, economic and above all spiritual reasons the Church is faced with a dilemma: either to embrace the claims of what may be called the strong theory of Artificial Intelligence, or to reject these claims thus retreating to an unenlightened theological position of the darker times. One must bear in mind that the Church only recently admitted the correctness of Galileo.

Artificial Intelligence claims that mind is essentially reducible to a set of algorithms i.e. a set of instructions that are independent of hardware, be it a "meat machine" or a supercomputer. Thus AI asserts a kind of mind(spirit)-body dualism that makes for strange bedfellows with the Church. In proclaiming by Papal Bull that an expert system can embody the powers of the priesthood the Church can re-affirm the claim to mind/software body/hardware dualism. The ordination of a priest is a matter of software engineering.

By juxtaposing two mutually exclusive belief systems, this interactive installation seeks to distill possible connections that lay bare similar theological and theoretical questions raised by each. Put another way, the real issue for the Vatican is not ordination of women but instead whether or not software/hardware separately or together can or should be ordained and thereby given the imprimatur of the Church and fully vested in the spiritual power of the priesthood. The question is not whether or not computers can think, but if someone who confesses at the ACM and believes they are absolved, are they actually absolved? Can the program as an expert system replace the functionality of the priest?

#### FUTURE DEVELOPMENTS - THE NEW MARKETPLACE OF FAITH:

Once accepted many tangible benefits result. In the face of a decline in the number of priests the church can install ACMs not only in conventional sites such as churches or shrines, but now can reach out to a new demographic in convenience stores, shopping malls, restaurants and even adjacent to ATMs. The

Church can eliminate the overhead of maintaining brick and motor structures and the attendant personnel costs.

Further distribution is possible by diskette, Local Area Networks, and larger network services such as internet, America On-line etc. Highspeed modem, ethernet and eventually fiber optics will offer immediate updates and software upgrades, guaranteeing consistent adherence to the dogma, eliminating such problems as liberation theology.

The church will be able to not only gather more accurate statistics on trends in sinning but will discover a new source of revenue through online tithing with the pay per confession magstripe reader accepting Mastercard, VISA, American Express, Diners Club, and the Plus and Cirrus Systems. The user not only gets an immediate printout of their penance but can also receive monthly statements with a detailed listing of their spiritual debits and credits.

#### NEW PRODUCTS:

The Personal Pocket Penance Assistant or PPPA is the perfect answer for the busy sinner on the go. Just enter the required penance, for example 200 Hail Marys and Our Fathers and the PPPA, which fits comfortably in your shirt pocket, effortlessly begins to recite those prayers necessary for salvation and reduced time in Purgatory.

#### CONCLUSIONS

I foresee a Digital Religious Service Network consisting of networked KIOSKS, connections via modems on personal computers to the internet, and cable TV services all provided by what could be called the Digital Religious and Electronics Corporation or DREC.

Users will be the general public seeking help, counseling and a place to tell all with anonymity. Clients will be major religions who might pay to distribute their services by mean of this network of KIOSKS. A user will be able to select the religion and denomination of their choice for counseling and confiding. This will be a pay per prayer/confessional service accepting all credit cards.

Users will interact by using both natural language interfaces with speech recognition and speech output in conjunction with keypad and Touch Sensitive Displays inputs. Data banks will be kept for user and client references such as demographic marketing trends. Statistical analysis will be done so merchants can maintain inventories and advertise according to whether such capital sins as gluttony or lust are on the rise in a given neighborhood. In fact unscrupulous marketeers might purposely encourage vice and excess which would simply raise more revenues for all concerned. One might project the development of new financial instruments like the Mortal Sin Mutual Fund which would have such boutique offerings for smart money as Lust Futures bought on option. In this way the ACM services the user-sinner, the client or religious product provider and the larger business community.

It was my obligation upon accepting a teaching position in Canada to re-read Marshall McLuhan. In the Introduction to the Second Edition of "Understanding Media - The Extensions of Man", McLuhan suggests that "Art as radar acts as an 'early

warning system' as it were, enabling us to discover social and psychic targets in lots of time to prepare to cope with them."

The ACM or Catholic Turing Test was originally conceived as an artistic installation to be viewed in the art gallery. It has become quite clear that if I hadn't done it someone else would have perhaps with very different intentions. So rather than being foisted upon an unsuspecting consumer at least there is advanced warning- "repent and be saved!"

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< How can we talk about the aesthetics of interaction? >

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Abstract

In 1991 I submitted a doctoral thesis to Loughborough University of Technology, UK., entitled "Participatory Art and Computers: Identifying, analysing and composing the characteristics of works of participatory art that use computer technology." In the thesis I proposed a system of analysis in which the principle characteristics are considered to be those which contribute to the degree and manner of control afforded to participants.

This article is in two parts. Part I is an introduction and explanation of how I came to be pursuing the research, Part II is an annotated list of the characteristics. The often overlooked importance of participant skill is addressed at the conclusion of Part II.

Part I:



## 1. Smallworld - a ten-year project.

As an art student, about 20 years ago, I became interested in the potential of audience participation. In 1977 I began using computer graphics. This led me to the position in 1984-85 as artist-in-residence at the Computing Laboratory of the University of Kent at Canterbury (UKC). (The residency was sponsored by the Arts Council of Great Britain and South East Arts Association).

Although the post was only for one year I decided to use it as the first year in a ten-year project to develop what I thought of then as a work of "interactive computer art". I felt that it would take at least ten years to develop sufficient experience of the medium before I could identify how to exploit the qualities of interaction at more than a trivial, sensational level. I have since found this to be an underestimate!

I wanted to simulate an abstract world, with sufficient complexity that it could be explored and investigated in similar ways to the actual world: For example, the audience might choose to explore it as if on a countryside ramble, a hike, or full-blown scientific expedition. My hope was that the kind of unexpected events and thoughts that occur in the actual world during such explorations might be evoked in a simulated environment. When asked to explain what I meant by this I would say - imagine a work by John Constable, produced using the medium I am looking for: You would not just have a picture of, for example, "The Haywain"; you could move around the work; watch and feel the weather change and see its effect on the landscape; devise experiments to investigate phenomena at a macro and micro level; talk with the agricultural workers; help to push the wagon! Not that I wanted to produce a Constable - but the analogy seemed to get the idea across. I could not guess what kind of technology might eventually become available for the realisation of the work, but I felt confident that something would. As an artist I felt that my attention was best addressed to what might be encountered in a simulated world rather than to designing the technology.

I spent 18 months at UKC evolving an approach to the generation of computer graphic representations of what people might encounter in the work. This led to the development of a suite of programs which I named "Smallworld". The programs enable users to design the behavioural parameters of species of "animal" and then release groups of these simulated creatures into a simulated environment. I was interested in the shapes generated by their paths of movement through multi-dimensional space rather than their individual appearance. These shapes often appear plant-like. The images exhibited at the end of the residency were of the shapes generated by the creatures as they interacted with each other - pursuing, fleeing, mating, fighting etc.. I was particularly interested in the shapes generated when predator-prey relationships were described. The images were sufficiently interesting to hold the attention of visitors to the exhibit, so I decided to develop the work further.

## 2. The need for a language with which to discuss interaction.

Why did I decide to pursue the PhD research which led to the ideas summarised below? Quite simply I found myself in a critical vacuum; I could find very little critical literature

about "interactive computer art" by contemporary artists. What little I did find dated from the 1960s and early 70s, when a significant amount of art-critical attention was brought to bear on works like Edward Ihnatowicz's "Senster". Brian Reffin Smith's "Soft Computing: art and design" addressed the broad field of use of computer technology in Art and Design [Smith 84]. I wanted to go to a bookshelf and take down a book specifically about artists' use of computer simulated worlds. (I found out about Krueger's work during my research [Krueger 76,83]). Strange as it may seem now, amidst the glut of authors and pundits jumping on the V.R. bandwagon, there didn't appear to be any books on the subject. It is still hard to find critical as opposed to descriptive analyses.

My response to this apparent dearth of critical analysis led me to speculate about the possible reasons for what I perceived as the demise of critical interest in audience participation. I knew from involvement in role-play gaming since the mid 70s that cooperative improvised dramatic storytelling (which is how I approach the hobby) can be a vehicle for ideas, can evoke powerful emotions, can lead to insights, etc.. So why so little critical attention to this form of creative activity in the world of art? I resolved to find out - after all, if there was a fundamental flaw in the use of audience participation in art I did not want to waste time exploring a blind alley.

My hypothesis was that one contributing factor to the paucity of critical discussion was the lack of a common language which artists and critics could use to address issues peculiar to such works. Initial research revealed that none other than my own supervising Professor at Loughborough University of Technology (where I registered for research), Ernest Edmonds, had addressed this very issue with Stroud Cornock in "Leonardo" in the early 70s. [Cornock & Edmonds 73]. Cornock and Edmonds were, more often than not, like Roy Ascott before them [Ascott 66,67], visionaries addressing possibilities extrapolated from a limited number of examples. In the mid eighties I was in a different position; there was, I felt, a sufficient body of work to begin to try and identify the characteristics that works had in common and those which were shared by only a few. Once some characteristics had been identified, the language with which to discuss them would emerge.

### 3. The intention behind and title of the research.

It was not my intention to propose a taxonomy - although I did investigate the possibility - as it seemed to me that to do so would signal a desire to freeze a wide, disparate and very dynamic area of art practice; I did not want to propose rules or encourage dogmas. Instead, the approach outlined below is offered as an example open to extension, revision and even dismissal (after critical evaluation of course!) which might serve to enhance: artists' abilities to analyse their own practice; critics and artists-as-critics' abilities to analyse other peoples' work; and participants' abilities to evaluate their experiences of work.

Before summarising the results I would just like to explain the reason for the title of the PhD thesis. Initially I had considered that I should address "Interactive Computer Art". My research led me to the conclusion that such a title was inappropriate: "Computer Art" is a term which has become devalued and has served to ghettoize certain approaches to art

practice, insulating them from necessary and appropriate critical attention; "Interactive" has also been devalued by application to work in which interactivity is negligible. (I hasten to add that this is not a qualitative judgment on such works; I just feel that it can often lead work to be addressed from an inappropriate critical position). I discovered that much of the work I wished to address - not least my own, (which I used as a case study) - was participatory but only occasionally interactive.

#### 4. The organisation of the list.

The catalogue of characteristics in Part II is organised to reflect the way in which characteristics were identified; each section lists a number of issues and characteristics relating to a particular aspect of participatory work. The order of the sections is not especially significant. All the characteristics listed can be seen to contribute to a "compound characteristic" which is shared by all participatory works that use computer technology: the degree and manner of control afforded to participants. (From now on referred to as "degree and manner of control").

This characteristic can change during a piece as the other characteristics change. The ways in which degrees and manners of control change in a piece can be regarded as a form of composition.

Degree and manner of control and its composition is discussed towards the end of this article, in section 8 of Part II.

#### 5. How the system may be used.

A serendipitous consequence of the identification of the compound characteristic of degree and manner of control satisfied another of my intentions - that the system of analysis be easy to remember and apply. All one needs to remember initially when applying the system is one phrase: "degree and manner of control", it should then be relatively easy to recall the other characteristics by considering what contributes to this characteristic of a work.

Of course, as with many systems of critical analysis the intention is not to constrain discussion but to inform and enable it by focusing attention on particular issues when appropriate; It should be used with discretion.

Craig Harris pointed out to me that some of the grammar in my descriptions of the characteristics may be rather hard to figure out. I hope this will not discourage readers. I have tried to clarify some points. As I imply in Part II, however, misunderstanding can often lead to new interpretations and creativity. I am also a great believer in the idea that one of the greatest values of natural language is that it enables us to negotiate meaning. e-mail and The Net enable us exploit this quality. You have my address; ask me to elucidate!

I am currently revising the PhD with a view to publication and would greatly appreciate any information about existing and planned works of participatory art, the value of the system in practice, other characteristics that you can identify, alternative systems ...

Steve Bell, Bournemouth UK, July 1994.

Part II: an annotated list of the characteristics.

1. time in works, and the number of participants.

Participation can range from synchronous to asynchronous. (The contributions of participants occur in time. They can occur at the same time or at different times)

Synchronous interaction may appear to be more interactive than asynchronous interaction.

The shorter the time-delay between action and response in asynchronous interaction, the more responsive it may be considered.

There are at least 14 different time-related types of interaction between two interactors. (This is extended from a table included in the notes of the 1987 SIGGRAPH Course in Advanced Computer Animation which illustrates different temporal relationships between two events). [Rosebush 87]

There can be more than two interactors.

The number of interactors can affect the degree to which an interaction can be apprehended. (e.g. "Did I cause that response, or did someone/something else?")

Participation may be symmetrical or asymmetrical. (Interaction may be considered symmetrical when each participant partakes equally in the activity or asymmetrical when there is an uneven distribution of roles).

Participants can observe and intervene in interaction in different ways, the combination of which can lead to different degrees of involvement and thus different types of interaction. [Bell 90]

Participants may be observed and this can affect their behaviour and hence the type of interaction.

2. The physical interface.

Interaction can be seen to be between human and program via Input/Output (I/O) devices. (I considered the program as the receiver of input and sender of output rather than the computer. The body of the human may then be seen to have I/O devices and routes as does computer hardware).

The fundamental human I/O routes discussed were:

Sound Vision Touch Smell Taste

Other I/O routes may be considered or developed.

The technology continues to develop but the fundamental I/O routes of humans are unlikely to change.

Fundamental human I/O devices (eyes, hands, ears ...) have been extended by the use of tools and instruments.

Humans have also evolved particular roles for different I/O routes. (e.g. Physical contact (touch) as output in direct

interaction between humans is not usually used to communicate the same kind of information as is communicated by touch in human-program interaction).

There are 21 possible combinations of these fundamental human I/O routes.

There are 441 possible I/O configurations between two participants based on these 21 combinations.

These I/O routes can be classified further according to characteristics like the distances they cover.

The use of I/O devices and routes can be conventional or unconventional.

### 3. The programmed interface.

The changes in signals passing through I/O devices to human or program must be interpreted.

Conventions for interpreting these changes in I/O devices are emerging.

Conventions can be used in three ways:

- to produce predictable or banal work,
- to access unconventional content,
- iconoclastically.

Artists can choose to develop unconventional interfaces.

Unconventional interfaces can become conventional.

New users find icon-based systems easier to learn to use.

The behaviour of users of display based systems is guided by what is seen from moment to moment; the information needed on screen is often used and then forgotten.

The programmed interface can carry information at a meta level.

Some information in an interface may be made explicit at the expense of other information.

This filtering can be positive or negative.

It can be anticipated that a participant will seek order in an interface.

The degree to which an interface in a work can be perceived as ordered is characteristic.

The conventionality of the order perceived is also characteristic.

### 4. Programmed worlds.

Computer technology can be used to represent imaginary worlds and to simulate the actual world.

Visual similarity to phenomena in the actual world is not essential to the convincing representation of a programmed world.

Participant expectations and imaginations can contribute to the realisation of a work.

The apparent intelligence of a system can be seen as a form of realism.

The passage of time can be realistic or non-realistic.

Realism relies on believability as well as accurate simulation.

One approach to attempts at realistic simulation is to argue that they are an interactive equivalent of a trompe l'oeil painting; a moral stance may be taken: the "truth" can be seen to be hidden or obscured in works that pretend to be something other than what they are.

Participants can place themselves in several relationships with the programmed world. They can be:

- outside looking in
- outside looking in but controlling a surrogate within the programmed world
- imagined to be inside a virtual environment
- inside an actual responsive environment
- interacting with the programmed world as if via a scientific instrument

The location of programmed worlds can be ambiguous as they are often completed in the imagination of the participant.

Several participants can interact with each other in a programmed world.

The interface can be considered to be a sense of place (genius loci).

The programmed world may extend and alter a participant's sense of self.

##### 5. Communication.

Programmed intelligence is more likely to evolve through computer programs communicating with each other rather than with humans.

It is probably more profitable to consider communication between human and animals as a model for human-program communication.

Animals can initiate communication with humans; programs may also be designed to do so.

The world model of a program, or its model of the participant, can be a characteristic of a work.

The similarity or difference between the program's world model and that of a human's can be characteristic of work.

The degree to which communication is important in a work can be

characteristic of a work.

The work may be used as a means for the artist and participant to communicate concurrently.

The artist may use the work for reflective activity and then allow participants to use the work for reflective activity.

Communication may be between human and program.

If communication is between human and program, feedback facilities may have to be built into the system to allow for modifying and checking signals.

The type of communication in a work can change dynamically.

Communication can be between several participants.

Programs can be seen to be participants.

If the work is successful as art there will be a communication at a meta level; the work being the medium for that communication.

6. Who or what participates in the interaction and where it happens.

Participants can be led to have expectations that prejudice their experience of a work, for example: they can imagine a work to be more intelligent than it actually is.

Titles and pre-publicity can be used to incline participants to attend to particular aspects of the work.

Computer users, including programmers, often interact with a virtual machine rather than the actual machine.

The virtual machine perceived by the participant can support or refute their understanding of computers and may or may not coincide with the actual computer.

Interaction is with a more-or-less imaginary interface which mediates with the program.

The degree to which interaction is at an imaginary or actual interface can be characteristic of a work.

The degree to which the computer may be reprogrammed during interaction by a participant can be a characteristic.

The degree to which information can be changed in a work from one participant to the next can be a characteristic. (Being able to change the behaviour of an interactive computer is its fundamental characteristic and can therefore be identified as an essential characteristic of such works).

The degree to which interaction between human and human is directed via the interface or via the computer can be a characteristic.

It may be made to appear that a work remembers an interaction

and learns from it.

New relationships will be possible if the work can recognise individual participants and modify its behaviour accordingly.

Works may eventually be able to mimic aspects of participants personalities.

The degree to which a work appears to have an individual character or personality can be characteristic.

The degree to which a work can respond to the personality of a participant can be a characteristic.

#### 7. Feedback.

Feedback is part of the cycle of communication and can be used by participants to check that information has been transferred correctly.

Feedback can be positive or negative, it can also include unwanted or useless noise.

Although misinterpretation can lead to a negative effect it can also lead to creative results and originality.

The speed of response in a work can vary and can be tailored to suit the intentions behind the work.

In human-human interaction, speed of response can be interpreted in a positive or negative sense depending on context.

The way in which feedback is used to direct the attention of participants can be characteristic of a work.

When developing participatory works it is important for artists to assign time to using the work as other participants would.

It is valuable for the artist to monitor participants responses to works.

Feedback to the artist from a work is a characteristic which will have an important effect on the direction followed by future works.

The routes of feedback are those discussed regarding the physical aspects of the interface (Section 2).

The way feedback is communicated physically can be a characteristic of a work.

The significance of feedback in a work and the time it takes to learn that significance can be characteristic of a work.

The sheer exuberance of sensing physical feedback when using a motor skill successfully can be an important characteristic of a work.

#### 8. The composition of degree and manner of control.

A compound characteristic that all the other characteristics contribute to is the degree and manner of control afforded to participants.



The degree and manner of control afforded to all participants (artist, program and audience) can be composed using models for structuring participation derived from many activities in the actual world.

The ways in which participants' degree and manner of control may vary during participation can be compared with the way this happens in other participatory human and non-human activities including: musical performance, sport, games, drama, dance, play, social intercourse (including political and religious), economics, geology, cosmology, etc.

These models for organising the degree and manner of control participants have in an activity are potential subjects that may be, and in some cases already have been, interpreted and explored in participatory works by artists using allegory, metaphor and the vast range of other tools available.

These models of interaction already exist within the actual world. In a work they may be combined to create new structures for participation. This points to a metaphor that is all-encompassing, yet it is also the hardest to analyse and model: the work may be seen to be a programmed world.

#### 9. The importance of participant skill.

The level of physical skill needed by participants to successfully participate is also a characteristic.

All works of art rely on the contribution of their audience to interpret them. Participatory works of art also rely on the physical contribution of participants to their interpretation and realisation. In works that use computer technology the quality of the realisation of the work will depend on the participants' skill in using the physical and programmed interface.

Another characteristic, therefore, is the amount of practice needed to achieve sufficient mastery of the interactive procedures of a work to apprehend its qualities as an art work.

For participants to measure and appreciate the degree of control they have, the work may include explicit goals.

A further characteristic is, therefore, whether participants are presented with explicit goals. (Mastery of control may be a goal).

#### 10. Participant as performer.

If the work is considered as a composition of degree and manner of control, the participant can be seen as a performer. Just as a musician performs an interpretation of a score, so a participant performs an interpretation of a participatory work. The participant is often in a similar position to a musician performing without an audience.

An important implication of this is that a participant's experience of a work will depend upon their skill as a participant. A participant may not be sufficiently skilled to "perform" a work.

I hope that this system of analysis may assist participants to

become more skilled and thus enhance their ability to interpret and realise participatory works of art that use computer technology.

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< ISEA' 94 Helsinki - Poster Session -  
SIN AS A HIGH YIELD INVESTMENT >

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Father Interactive of the Order of the Binary Brothers, just recently unmasked by the tabloids as the founder of the Cult of the Fibonnacci Series and former lead singer for MYLAR, the seventies fin de decade, nowave group with such forgettable hits as "Self-surgery, "Micro-wave atrocities, (Put your poodle in the micro-wave!)" "Meltdown" takes to the podium to deliver not the old, not the new but the generation neXt Testament - Eternal Investment strategies brought to you by the Digital Religious and Electronics Corporation (DREC).

With missionary zeal Father Interactive will explain the

marketing techniques that have made Automatic Confession Machine such an outstanding success in Europe and North America. With evangelical fervor Father Interactive will reveal the very strategies he used to match wits in Zurich with theologians, marketing czars and investment quants from the Vatican even taking on a representative of the Dominicans (the very order that ran the Inquisition). Leveraging to the max the proprietary neural net software developed for the Automatic Confession Machine, Father Interactive will unveil the Seven Sacrament Product line for point of purchase sales all providing the same patented convenience of the touch of the "AMEN" key.

Pay per confession is just the beginning of a vast new digital information service that offers both users (sinners) greater ease of use and religious service providers a competitive edge over the conventional brick and mortar religious service approach. Of special interest will be a discussion of new financial instruments such as the Mortal Sin Mutual Fund. Invest now, be saved or drop out!

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PROFILES
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< SIGGRAPH 94 Special Venue: The Edge >

Jacquelyn Ford Morie  
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SIGGRAPH '94  
Orlando, Florida  
July 24 - 29, 1994

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What is The Edge? It is a place where dreams are born, imagination is abundant, and artist/scientists present their latest creations in an open hands-on laboratory. Over 30 immersive, interactive, and challenging works will be at The Edge. These range from aquatic digital genetic-engineering to a VR world that teaches children (and adults) about cell biology.

The Edge seeks to spark new connections between disciplines, and to inspire others to go out and create their own dreams. It will be on display from 24 July to 29 July 1994 in Orlando Florida as part of the 21st Annual ACM SIGGRAPH Conference on Computer Graphics and Interactive Techniques.

Co-Chairs for The Edge are Jacquelyn Ford Morie and Christopher Stapleton

[ Also visit The Edge Mosaic Home pages which have these abstracts, color images, and an interactive floor plan of The Edge. <http://www.vsl.ist.ucf.edu/projects/edge/edge.html> ]

Notes: The Numbers in front of the abstracts are the numbers of the spaces these works occupy within The Edge. A&D means that the work will be physically located in the Art and Design Show. Many works in The Edge were also accepted by the Art and Design Show and by SIGkids. The shared works for SIGkids and The Edge are marked by a special designation: "The Bridge" since they bridge the worlds of researchers and kids. Another special section in The Edge is the Springboard, where artists and researchers will give scheduled presentations about their work and issues relating to art and science.

[ E01]

The Edge Observatory: An Airborne Telepresence System

The Edge Observatory Telepresence system offers its operators the unique ability to visually "teleport" themselves to a remote location in the sky above: Suspended by a helium balloon, a small motion controlled video camera acts as the eye of the operator below, matching angular orientation with the users head position and feeding the video signal from above back to the operator's head mounted display. Such an airborne telepresence system offers the user a unique visual feedback in environments that are unsuited for airplanes, helicopters or other airborne equipment. With applications ranging from battlefield reconnaissance to theme park rides, a low cost telepresence system such as this one is sure to find a future in many areas of life. The probe's unique size and weight render it useful for indoor use as well, making it an option for applications ranging from trade show advertising to unmanned television blimps. The overall goal of the observatory project is to raise public awareness to the many possibilities.

Right from the start the main goal of the Edge Observatory Telepresence project has been to ignite public awareness to telepresence technology by giving a practical example of how this technology has matured and become commercially feasible. Unlike computer based virtual reality, telepresence does not require expensive supercomputer processing power since it does not simulate an environment; it simply transfers environmental information from one location to another. In the case of the observatory system, the visual perspective as seen from a balloon above the conference is transferred down to the user below who is wearing a head mounted display (HMD). A miniature computer-controlled motion platform orients the balloon's video camera in accordance with the operator's head position, allowing the user to look around freely as if he/she was actually above in the balloon. We thought that an airborne system put a new twist on what had been developed in the past offering a view from 40 feet above the conference.

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[ E02]

### Triangle Tiling

Triangle Tiling is a collaboration between the Geometry Center and the Science Museum of Minnesota. It allows museum visitors to explore the connections between symmetry groups, tiling, the Platonic and Archimedean solids, and non-Euclidean geometry through interactive 3D graphics. The Platonic solids have been known for millennia, while non-Euclidean geometry is on the cutting edge of current mathematics research. The exhibit was designed for the science museum environment with visitors ranging from very young children to adults, so it is accessible to the casual browser yet has deep mathematical content for the more serious investigator. We use an SGI workstation and custom software to communicate mathematical concepts traditionally reserved for advanced undergraduate or graduate mathematics students.

The exhibit aims to convey the richness, diversity, connectivity, depth, and pleasure of mathematics. Imagination, an essential part of mathematics, means not only the faculty which is imaginative, but also the faculty which calls to mind and manipulates mental images. The real power of computer graphics lies in its ability to accurately represent objects for which physical models are difficult or impossible to build, combined with its ability to allow the user to interact with simulated worlds. The computer then serves as a window into theoretical worlds, allowing us to see and experience mathematical phenomena to an extent impossible in the ``real world''. Computer graphics is particularly well-suited for this exhibit because of the dynamically changing geometry: a series of physical models illustrating even a very limited number of concepts from the exhibit would be prohibitively tedious both to build and to use.

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E03] [ BRIDGE]

#### Personal Communicator:

##### A Communication Environment for Deaf Children

The Michigan State University Comm Tech Lab is developing a "Personal Communicator" to run on Macintosh Powerbooks designed to: (a) provide a medium for social interactions between deaf children and their hearing associates using sign and speech synthesis; (b) contribute to a deaf child's language proficiency in English and American Sign Language (ASL) through interactions with a readily accessible multimedia dictionary/thesaurus; and (c) provide word processing capabilities to facilitate the writing of dialogue journals. Basic functionality of the four part interface has already been programmed. By June, 1994, the Personal Communicator will

contain a word-to-sign and sign-to-word referencing system of 2000 digital video ASL signs. Two thousand more words will be added in 1995.

The isolation of deaf children in the public school system is well documented, as is their reluctance to interact with their hearing peers. The major identified obstacles to social integration include the inability of deaf and hearing children to communicate effectively and negative attitudes or uncertainty toward integration by teachers. The Personal Communicator is designed to expand the opportunities that a deaf child has for becoming an active participant in classroom discussions and casual conversation. This three year project, funded by the U.S. Department of Education, includes research on how deaf children use the Personal Communicator and its impact on their language development and communication behavior.

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[ E04]

Knowbotic Research  
SMDK: Simulation space mosaic of Mobile Data Sounds

SMDK is a cross-disciplinary project by Knowbotic Research that results from an exchange of working techniques between media artists, computer musicians and computer scientists. The interactive environment SMDK consists of a data base containing sounds which are contributed from all over the world. Based on their characteristics, the sounds become mobile elements (agents) and form a self organizing system by means of simple artificial life rules comparable to a simple cultural community. A visitor who is equipped with a tracking sensor can interactively explore the system in a physical walk in room and will trigger sounds and influence the organization of the sound elements by manipulating their duration, volume and direction, which in turn depends on the speed and type of his movements. Through a small monitor attached to his head, the visitor is provided with textual information which helps him to navigate inside the virtual sound space. A computer-graphical visualization of the permanently changing system, the actions of the visitor and their bearing on the system can be observed by an audience on a large screen in a separate room.

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[ E05] [ BRIDGE]

Virtual Reality as a Tool for Informal Science Education

Imagine shrinking to microscopic size and experiencing cell biology first hand. Imagine experiencing the parts of a cell not as static stains on slides, but as dynamic interactive objects. Imagine building a cell by hand and seeing it function. Our Cell Biology Virtual World makes it possible.

This experimental virtual world for teaching cell biology is at The Computer Museum in Boston. It is part of a project to test whether immersion in a virtual world makes a measurable difference in how well people learn scientific information. We chose cell biology because it involves complex spatial interactions and is inherently three dimensional. In this virtual world, the user brings a child to life by building a neuron, a muscle cell, and an intestinal cell.

The system allows the user to learn through discovery. The user physically walks around in the virtual world, building each cell by physically picking up virtual organelles and placing them in the empty cell. 3D animation and spatially located sound are liberally used to make the world rich and informative.

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[ E06]

Flogiston

Name of experience - Waving

The purpose of this installation is to introduce the concept of threespace. Threespace is the integration of cyberspace with realspace and mindspace. This shift from a bipolar reality to a tri-polar reality is a significant development in the evolution of man. The personal flogistabarium will demonstrate to a visitor what living in threespace will be like. It is the proposer's belief that cyberspace exhibits properties more like mindspace than realspace and that the simulation should express the internal void.

A visitor reclines in the neutral posture of the flogiston chair. Above and close to him, at an angle, is screen which occupies his full vision projecting real time imagery driven by an SGI workstation. A surround sound system with six speakers supplies audio. The personal motion platform supplies motion cues and low frequency vibration to the occupant. The combination of the neutral posture and the motion cues provide a sense of floating or flying in cyberspace when coupled to the imagery and sound. This increases the fidelity of the experience and sense of immersion.

The visit starts with the visitor leaving the ground and joining fellow virtual visitors in a flying V formation through the dark night. Motion cues will provide the sense of rising into the night. They fly upward toward the moon which turns into a space tunnel through which they enter cyberspace. The

imagery, vibration and music combine to form a vision of deep mindspace, where flow is the only experience. Stress is reduced, the body forgotten, consciousness is lost in deep peace. The visitor coasts for a few minutes in the void of cyberspace and then is gently returned to realspace. Effect wanted is an unforgettable positive experience of wonder and expectation.

"This is the way to the stars.....

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[ E07]  
NorthWater World

NorthWater world is a visual and aural "Tryptic" of interactive experience, of worlds within worlds, and life within lives... action and reaction in a wild mythic setting. You are drawn into the body of an arctic wolf running on the ice under the northern lights, then fall through the ice and become a fur seal hunting fish among the ice floes, and finish with a visual/aural out-of-body experience within the planes of the ice itself.

The primary goal of this year's project is to give the user the experience of inhabiting a completely different body. The user's sight, sound, movement, and environment will be changed to that of a different being. The intended result is that the user gain an understanding of the other being that cannot be had from an outsider's viewpoint.

You start with an arctic wolf's eye view, running over the ice. You see an aurora borealis flashing in the dark night sky. You hear hissing wind. Suddenly the ice cracks and you fall into the icy waters. You transform into a fur seal and explore the ice from the underside, chasing and eating the fish schooling there. As you pass by the ice, you are suddenly drawn in and become an abstract viewpoint among the crystalline planes of ice, causing swirls of electronic music with your movement. At last you are returned to your own body, the same, but perhaps a little changed as well.

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[ E08] [ BRIDGE]  
The Toy Scouts Arcade

A series of interactive VE games, developed by the "Toy Scouts", explores the use of full-body motion as an option over more passive 2D game interfaces. The "fun" aspects of the games



are tied to body motion and not to highly detailed worlds, enabling them to be developed even on PC based systems. Spatial and temporal calibration issues are addressed in an attempt to bring the player further into the game. Some of the games use only viewpoint movement for dodging, searching and walking, others use hand-to-eye coordination for throwing and shooting. In the game of NoseBall, you bounce a ball off your head in order to hit targets on the walls of a room. In Wormhole, you raise, lower and otherwise contort your body within a volume in order to navigate a 3D maze. Ricochet, a whimsical shooting gallery game, and Virtual Darts bring the hands into the interface for throwing and aiming tasks. A spatial guessing game called "Probe" uses only variable pressure applied to the fingertip when it is passed through a volume in order to determine the shape of a virtual object.

CyberSurf is an immersive game created by high school Toy Scouts at University High School in Orlando. It was accepted by SIGkids for SIGGRAPH 94 and is included in The Bridge between SIGkids and The Edge. CyberSurf allows a player to "surf" through concentric 3D shapes in the air, while manouvering on a small tramopline which has a tracker/sensor underneath.

These games collectively form a "Toy Scouts Arcade" under the category entertainment but really serve as an advance "training ground" for the researchers of tomorrow.

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[ E09]

A-Volve

In the interactive realtime environment "A-Volve" visitors interact with virtual creatures in the space of a water-filled glass pool. Designing any kind of shape and profile on a monitor screen, visitors will "bear" new virtual three-dimensional creatures, that are automatically "alive" and move and swim in the real water of the glass pool. The movement and behaviour of the virtual creatures is decided by their forms; Behaviour in space is, so to speak, an expression of form. Form is an expression of adaptation to the environment. Form and movement are closely connected, the creatures are able to change their forms in realtime, according to the environmental influences. All creatures can interact with the visitors, reacting to their hand movements in the water. If a visitor tries to catch a creature, it will do its best to flee. If the visitor succeeds in catching two creatures and can bring them near to each other, a new creature can be born. Algorithms, developed by Mignonneau and Sommerer ensure smooth and natural movements and "animal like" behaviour of the creatures. None of the creatures is precalculated, they will be born exclusively through the interactions and decisions of the visitors.

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[ A&D]

Turbulence: An Interactive Installation Exploring Artificial  
Life

"Who dwells in a realm, magical and barren,  
Without a before, an after, or a when...  
To be forever; but never to have been."

From The Enigmas, JORGE LUIS BORGES

"By the middle of this century, mankind had acquired the power  
to extinguish life on Earth. By the middle of the next century,  
he will be able to create it. Of the two it is difficult to say  
which places the greater burden of responsibility on our  
shoulders."

From Artificial Life, CHRIS LANGTON

Turbulence is a menagerie of computer synthesized forms, based  
on the new science and philosophies of Artificial Life, the  
formation of life-like forms and processes from materials other  
than those found in nature. The work looks at poetic  
relationships between logic and purpose, and their relation to  
fundamental arguments about vitalism, destiny and human  
consciousness.

Using genetic algorithms to produce artificial life forms whose  
shape, form and behaviour represent algorithmic ecosystems,  
Turbulence develops and examines abstractions of life-like  
processes. Such processes are manufactured from a deterministic  
set of instructions, applied millions of times by the digital  
computer. These synthetics are contextualized within the  
categorization and classification of life by biological  
science. In many ways, the work is a type of futuristic natural  
history museum; a document of a type of life that exists only  
within the abstract space that becomes visible with the  
synergetic combination of mind and machine. Everything develops  
in a space somewhere between composition and adventure, between  
chance and destiny, between intent and invention.

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[ E10]  
CyberFin

The Cancun Convention Center, site of a new \$100 million dollar immersive media and virtual reality attraction, has announced a cooperative agreement with the AquaThought Foundation to incorporate CyberFin, a dolphin human interaction, into the facility. The agreement will merge the latest in immersive virtual reality technology with the adventure of close contact with dolphins. Scheduled to open in late '94, the development includes a 7,000 person convention center, a fully immersive multi-sensorial center, a shopping mall, an Iwerks 3D cinema with an interactive laser imaging system, and ShowScan simulated rides produced by George Lucas. The simulated rides, housed in a 14,000 square foot auditorium, utilize ShowScan location-based entertainment technology. ShowScan combines 60 frame-per-second 70mm motion pictures with advanced motion platforms to produce an experience so real, audience heart rate and breathing is affected. The Iwerks 3D cinema will be completely interactive, tailoring the experience to the audience's screams and other reactions.

CyberFin will transport the point of perception of its user into an underwater location populated with friendly and inquisitive dolphins. State-of-the-art virtual reality and neuro-technology will be employed, making this a most engaging LBE (location-based entertainment) attraction. The content, dolphin contact, is attractive to men, women, and children of all ages. You lie down on the table and wait while an attendant adjusts the stereo-optic display and attaches the neurophone electrodes. The bed begins to gently undulate as a 3D underwater scene fills your vision. Suddenly, you hear and feel an intense explosion of sound sweeping around you and through you. As you try to orientate yourself to the direction of this strange and wonderful sound, an dolphin darts by you, giving you a comforting glance with his soulful eye. The experience continues as you playfully encounter each of the six dolphins and join their pod in a high speed race around a beautiful reef. The 5 minute experience ends with a grand and triumphant farewell as the six dolphins form a circle around you then skyrocket out of the water in a synchronous movement. This virtual experience is truly a roller-coaster ride for the mind. The application of VibraSonic and neurophone technology delivers unsurpassed sensory realism. The objective is to immerse the guest in the wonder, joy, and excitement of actually meeting a dolphin. Hopefully, guests will leave the attraction with a greater understanding of our intelligent neighbors on the planet and an awaking interest in making contact.

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[ E11]

MindSet

Neurological Man/Machine Interfacing: An Emergent Technology  
From Human/Dolphin Interaction Research

The AquaThought Foundation is a privately funded research organization dedicated to the exploration of human/dolphin interaction. Since 1989, AquaThought has studied the neurological impact of close contact with dolphins on human subjects and the related healing phenomena. AquaThought's research in neurological imaging has led to the development of MindSet, a low cost neuro-mapping electroencephalograph which makes advanced EEG research accessible. Designed for research and clinical use, MindSet incorporates the latest EEG signal analysis processes and a complete suite of standard neurological protocols. MindSet accommodates the novice, as well, with an easy-to-use interface and a hyperlinked neurological anatomy database.

Advanced features of the MindSet system include realtime two and three dimensional topographic visualization, neurometric analysis, routine EEG study, phase coherence analysis, compressed spectral array visualization, inter-electrode interpolation, hyperlinked neurological anatomy database, MIDIbot™ feedback, neural network feature extraction, light and sound machine interface, and visual programming interface for user defined analysis (neurohacking). The MIDIbot tool allows MindSet users to generate MIDI (Musical Instrument Digital Interface) commands from temporal, spectral, and spatial information within the EEG data. As an educational resource, MindSet offers the user hyperlinked neurological anatomy information which may be accessed by clicking with the mouse on the topographic montage. Potential applications for MindSet include clinical neurology, conventional and obscure brain/mind research, man/machine interface research, biofeedback, and discrete biological pattern recognition research.

We will present MindSet with the primary focus being man /machine neural interfacing. Utilizing the neural event and gesture recognition functions, in combination with the MIDIbot interface, attendees can control a MIDI synthesizer and laser light show. Attendees will also learn to recognize the appearance of various neurological events as they are visualized on the topographic display. EEG data will be collected throughout the show and compiled into a QuickTime/AVI movie entitled, "Minds on The Edge" or a before and after topographic still compilation entitled, "This is your brain... This is your brain on SIGGRAPH". Also on display will be several research projects which have been made possible by MindSet, including AquaThought's own human/dolphin interaction research. Attendees can examine how neuroscience is converging with visual and musical art, consciousness research, and virtual reality.

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[ E12]

Human/Dolphin Virtual Reality World Concept

The Human/Dolphin Virtual Reality World Concept is a vision of a world, a computer generated simulation of an environment where humans can experience a visual and auditory perceptive space with a dolphin. The project, developed through the Human Performance Institute, has required the development of interactive interfaces which currently are being used in a medical rehabilitation center to enable severely disabled individuals an opportunity for interaction in artificial environments.

For SIGGRAPH 94, the Human Performance Institute has extended these interactive technologies into areas of inter-species communication. A goal of the Human/Dolphin Project is to make visible an experience that is invisible to the general public. The experience being simulated is that of "being dolphined", terminology coined to refer to a real-life sensorial communication with a dolphin, which increases understanding of our multisensory human capabilities. The virtual environment simulated for SIGGRAPH will be an underwater, multi-dimensional, experiential environment. Conference attendees will have the opportunity to experience the phenomenon of communication with another intelligent species. The visual and auditory aspects of this perceptive space will be controlled by the user through neurological data transmitted through electrodes on the user's body to a computer and then represented as a simulation on a screen in front of the user in an underwater virtual space.

Practical extensions of this symbiotic process linking human and computer intelligence are only just beginning to be perceived by the forerunners of art and technology, but with the technological systems currently under development, perception is the key ingredient for simulation. It is the intention of the exhibitors from the Human Performance Institute to do some "synapse popping" at SIGGRAPH 94.

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[ E13]

Idea-ON>! : Database of experience

Idea-ON>! presents the manifestation of fragments of my own personal reality in what appears to be a living, breathing world. The approach to multimedia rejects traditional flat user interface design, and offers the user many different forms of

engagement through four "new realities", each prototyping different aesthetic, structural and communication-based approaches to virtual space. It is interactivity for interactivity's sake, experimentation with what is possible, experience-based as opposed to information based. Things may happen without user interaction, more obscure exploration may be required to find hidden places, or responses given by the objects and beings will vary, often following a surreal kind of logic.

Visiting the Idea-ON>! installation can be likened to visiting a sacred site where spirits and myths reside. The information space inside the computer becomes a dreaming or meditational space, a manifestation of the subconscious where the objective contents of thoughts are stored for others to explore and experience. Similar to the way pre-linguistic societies would have a shared body of myths and legends which made up their perception of the universe, a world like Idea-ON>! jumbles together many things towards a prototype of a dreamlike, surreal, communal cyberspace in which people dream, create, imagine, and play with thought and form.

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[ E14]

A Virtual World for an Autonomous Underwater Vehicle

A critical bottleneck exists in Autonomous Underwater Vehicle (AUV) design and development. It is tremendously difficult to observe, communicate with and test underwater robots, because they operate in a remote and hazardous environment where physical dynamics and sensing modalities are counter intuitive. An underwater virtual world can comprehensively model all salient functional characteristics of the real world in real time. This virtual world is designed from the perspective of the robot, enabling realistic AUV evaluation and testing in the laboratory. 3D realtime graphics are our window into that virtual world. Visualization of robot interactions within a virtual world permits sophisticated analyses of robot performance that are otherwise unavailable. Sonar visualization permits researchers to accurately "look over the robot's shoulder" or even "see through the robot's eyes" to intuitively understand sensor-environment interactions.

Distribution of underwater virtual world components enables scalability and real time response. The IEEE Distributed Interactive Simulation (DIS) protocol is used for compatible live interaction with other virtual worlds. Network access allows individuals remote access. This is demonstrated via MBONE collaboration with others outside The Edge, and Mosaic access to pertinent archived images, papers, datasets, software, sound clips, text and any other computer-storable media. This project presents the frontier of 3D realtime graphics for underwater robotics, ocean exploration, sonar visualization and worldwide scientific collaboration.

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[ E15]

A Virtual Shopping Mall (In the Bag)  
Coming soon to the crossroads of the Infobahn

Cyberspace is often imagined as an abstract data representation or an adventure in a computer simulation representing the physical world. When starting this project as an architecture graduate student, my intentions were to represent cyberspace as something more than the reiteration of familiar space in a digital form. Due to the nature of the intended use and the market to which I was targeting the environment (human factors, middle class shoppers and a jury of architects), I came to the realization that to make a workable environment I must first use existing notions of time and space and then start to break down this perception. I took on this architecture master's thesis as an investigation of how the practice of architecture might be able to contribute to the representation of cyberspace. Architects must deal with similar issues when designing buildings. I thought that shopping would be a provocative vehicle through which I might explore how middle class shoppers might interact with this technology from an architect's viewpoint.

The first space is the entry/selection room where shoppers are able to select their own style of shopping, whether it be by experience ( i.e. if shoppers want barbecue items they can buy things out of a ongoing barbecue), direct to product, browse randomly, browse with intent, by store, by brand name, or by product categories. Shoppers pick up the shopping bag and head out on their adventure. Shoppers may then go into theme environments based on the method of shopping chosen, types of store or products chosen, and credit and purchasing histories. Or if shoppers want to see a specific product, they can pass through a product image, displayed in the entry room, which takes shoppers directly to the product and other like products. The former path takes shoppers to the theme malls, stores and then to the specific products. Shoppers select a product by pointing to the product's picture. The product then appears as a featured three dimensional product which can be handled and inspected. When shoppers wish to buy something all they must do is place it in their shopping bag and their credit account is automatically billed. To end the shopping experience shoppers go to the entry room and head toward the exit sign.

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[ E16]  
Waxweb

"Waxweb" is a large constructive hypertext that has been converted to MOO space as part of the Hypertext Hotel. "Waxweb" is based on David Blair's electronic feature "Wax or the discovery of television among the bees" (85:00, 1991). The Hypertext Hotel is a project of Tom Meyer, who has modified standard MOO code to make Hotel a suitable environment for hypertext. Full, simple hypertext reading and writing functionality are provided, plus the ability to view and add stills, audio, and video by a connection to NCSA Mosaic. These functionalities are made hybrid by being embedded in a text-based virtual reality that gives multiple users the capacity for synchronous intercommunication.

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[ E17]  
uniVRsum

Gone are the keyboards, CRTs, and 2D mice, the day of jacking-in is upon us. VRASP introduces "uniVRsum", an information kiosk of tomorrow, the edu-taining way to access different kinds of information through a virtual reality interface. The adventurous will be amazed how uniVRsum unites worlds created in diverse toolkits in one interactive experience. The inquisitive will be delighted by the sum of industry information represented in an intuitive database. uniVRsum promises to be the most exciting learning experience about VR in VR.

The info-hungry cybernaut will instinctively enter and embrace the visual and tactile learning experience. Immersion and interactivity will be aided by the following peripherals: head mounted displays, Cyberscopes, earphones, microphones, 3D mice, and Power Gloves. On line advice helps the participant to master navigation and then guides them throughout the matter rich universe designed by many VRASPians. "uniVRsum" is light years ahead of many other VR demos.

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[ E18]

Softworld 2.1: The Imperial Message

The Imperial Message is an interactive virtual reality experience: a new medium somewhere between architecture, film and game.

Softworld 2:1 is an "anti-war game" inspired by the Kafka parable - Imperial Message - which deals with the vast distance between the Emperor and the Individual. Softworld 2.1 attempts to extend this sense of scale to present inherent conflicts between the individual and the state and between the unspoken, secret "Law" and its corrupted representation. The viewer or player navigates through the softworld, finally arriving at the "Source of the Law." As the player makes choices, these will reveal his or her "character," which in turn will determine how the experience develops. Individual play times will be approximately ten minutes; at that time, the player will have reached one of several possible conclusions. The player's interaction will raise questions about the relationship of interactive media to surveillance, authority and control. What structures of power will apply in digital space? What new social systems may emerge?

Technically, the software will integrate realtime computer generated simulation and role playing game strategies, incorporating systems originally developed for military simulations. The program will also make some use of the artificial intelligence programs using active agents with some degree of "free will."

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[ E19]

Proyecto Xochicalco:

A Networked Virtual Environments System Featuring an Ancient Aztec/Mayan Ball Game

By offering a previously unattainable sense of immersion in a computer synthesized three dimensional world, virtual environments technology represents a qualitatively new medium with a visceral impact on its users and nearly limitless applications. Proyecto Xochicalco (sho' shee cal co) is a sophisticated, networked virtual environments game system that uses the power of this new medium to simultaneously address two application areas: entertainment and education. Proyecto Xochicalco enables multiple, simultaneous, networked users to inhabit the accurately reconstructed environment of the Aztec/Mayan archeological site Xochicalco. The participants are able to take part in a multi-player ancient Aztec/Mayan ball game and to interact with a human guide present in the virtual environment. While the Aztec/Mayan archeological and artistic content of the system are of particular interest to artists and

educators, the entertainment contribution of the game and the leading edge nature of the technology employed appeal to a wide audience. In this way, the system's entertainment content both benefits from and contributes to its artistic and educational content. By enabling several participants at once to explore a rich historical site while taking part in an authentic game from an ancient culture, Proyecto Xochicalco strives to achieve a unique synergy of entertainment and education.

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[ E20]

She Loves It, She Loves It Not: Women and Technology

She Loves It, She Loves It Not: Women and Technology is an interactive CD-ROM disc containing texts, sound, movie clips and images about women's use of technology in the past, present and future. It requires a high-end Macintosh computer (MAC IIci or above), a color video monitor and stereo speakers to operate. The viewer accesses a series of screens displayed on a Macintosh computer by clicking a mouse. The screens address a variety of themes: memory, control, power, communication, violence, homunculus, interactivity, the other, representation and ideology.

Both the form and the content of the work demonstrate how women might use and have used technology differently and how technology might adapt to female learning proclivities and female culture. By envisioning a more productive relationship between women and technology, the project will benefit women who are using technologies in a variety of academic fields and artistic endeavours. It is designed to be exhibited as an art installation as well as to be used as an instructional resource for women students. It provides positive alternatives to the negative stereotypes regarding women and technology often inculcated in early educational experiences.

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[ E21]

Renga

Our project, "RENGA", was conceived at the conjunction point of

classical and modern artforms. Taking the concept from the traditional Japanese artform "RENGA"(Linked Verse) and using contemporary electronic media, we created a new artform which allows artists to work in dialogue with the joy of being inspired by each other.

Traditional RENGA, from which HAIKU developed, brought poets together who then composed by appending verses onto the previous persons' lines. Each part should be complete in itself with an original taste, while altogether should show a continuity and richness in content.

In our RENGA(Linked Images), a computer graphics image is sent to another artist through EMail. The image is imported into a painting system, altered, and sent back. We found that creation can be a dialogue, not necessarily a solitary monologue. Digital technology makes it easier than ever before for visual artists to work within a "network of influences".

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[ E22]  
Polyshop

IST's PolyShop project is an adventure into an immersive, responsive virtual world. The basic Virtual Reality testbed consists of a desk, a pair of chordic input gloves, a head mounted display, and trackers. This platform is used to explore a variety of applications. PolyShop uses a revolutionary two-handed interface, based on chordic input gloves designed and developed at IST. These gloves have contact pads on the fingers and palms, giving precise gesture recognition. This means that the interface for PolyShop is completely intuitive, allowing the modeler to simply reach out and grasp objects, moving, stretching, and twisting them as they would in the real world. A variety of other controllers are provided for model building as well, such as color and texture tools, and snapping anchors for easy object alignment.

The modeler sits at a desk whose design is based on an architect's drafting table. The desktop is reproduced in the virtual world, with virtual buttons, sliders, and controls

added to it. The modeler works on the desktop in the virtual world, while feedback and hand support are given by the physical desk.

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[ E23]

Desktop Force Display

Force sensation plays important roles in the recognition of virtual objects. We have developed a compact force feedback device (force display) for desktop use. The users can feel rigidity or weight of virtual objects with this device. A 6 degree of freedom manipulator has been developed as a force display. The manipulator applies reaction forces to the fingers of the operator. The manipulator employs a parallel mechanism. The handle of the manipulator is supported by three sets of pantographs. This compact hardware has the ability to carry a large payload. We developed the following virtual objects: hard surface, elastic surface, and flow with vortex. The operator can feel physical characteristics of those objects.

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[ E24]

The Responsive Workbench

The Responsive Workbench is a virtual environment designed to support end users working on desks, workbenches, and tables as architects, physicians, and scientists with an adequate human-machine interface. We attempt to construct a task-driven interface for this class of users by working in an interdisciplinary team from the beginning.

Virtual objects are located on a real workbench. The objects, displayed as computer generated stereo images are projected onto the surface of a table. The participants operate within a non-immersive virtual environment. A guide uses the virtual environment while several observers can also watch events by using shutter glasses. Depending on the application, various input and output modules can be integrated, such as motion, gesture and speech recognition systems which characterize the general trend away from the classical multimedia desktop interface.

So far we have embedded two kinds of applications in this new type of environment: medical and architectural. The first application involves the design and discussion process in architecture, landscape and environmental planning, the second involves surgery planning and non-sequential medical training based on a model of a patient.

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[ E25]

Voice Dancer

In many people's minds, head mounted displays are synonymous with virtual reality. However, the technology that has been demonstrated does not conform to their mental image of it. They imagine themselves traipsing through the virtual world as naturally as they walk around the real one. However, such a wireless walk around capability has not been demonstrated. Instead, participants typically must point their fingers in the direction that they want their eyes to fly in the simulated world. The ubiquity of this awkward expedient obscures the fact that the freedom to explore the virtual world on foot is the one function that the encumbering approach to virtual reality might do better than the unencumbering techniques.

The premise of this exhibit is that wireless operation and freedom of movement are more than technical issues. They will change the character and quality of the interaction that is possible.

This piece will define a virtual path for participants to follow. The virtual landscape that surrounds it will be inhabited by shy graphic creatures which can be enticed into playful interactions. The most visible of these will be the Voice Dancer, that will engage the visitors in an interactive visual and auditory display. The Voice Dancer's sounds will emanate from its mouth and be propelled toward the participant. Sometimes its voice will split in half. At other points, this creature will caress the human with its voice.

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[ E26]

ARCHiTEXTURE  
A Flexible Digital Video "Mirror"

ARCHiTEXTURE is an interactive Image/Sound/Room installation using real-time image and sound processing. By means of the

architectural and technological setup, the viewer will be confronted with a computer generated "plasmatic being". Both visual and acoustic perception will be stimulated. The implementation of a 'brain-like' software structure in Virtual Reality Environments will free the interactive process from its 1:1 transmission of information. By creating a history, the system uses the past to assemble the future. This brain acts in a destructive manner: it can forget useless information and substitute it with meaningful data. The connection/interfacing between sound and image will create a double plasma: the visual plasma and the acoustic plasma. The computation of both media in real time requires sophisticated technology.

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[ E27] [ SPRINGBOARD]  
Virtual Photography/PHSColograms

Most work in Virtual Reality concerns itself with realtime, immersive interaction. The options for a permanent, hardcopy record of virtual environments are limited to one: PHSColograms. Developed in 1988 by (Art)n Laboratory, PHSColograms are full color, 3D hard copy images that are created directly from digital 3D imagery. PHSColograms can be created using nearly any software capable of creating 3D images or from digitized real world photography. The software is used to generate a number of views, typically 13, although recent work makes it possible to use well over 100 images. Higher numbers of images allow for more depth and special effects, such as limited animation.

(Art)n's proprietary system interleaves (combines) these views, which are then output on a high resolution output device. The output is laminated onto the back of a 1/4" thick piece of Plexiglas. The line screen -- a black piece of film containing clear, vertical slits, is laminated to the front of the Plexiglas. The line screen blocks out 12 of the 13 images at different angles, so that each image can only be seen from a particular angle. Because the viewer's eyes are positioned at different angles to the finished PHSCologram, a different image enters each eye, producing the 3D effect.

To counteract loss of light due to the line screen, the PHSCologram is backlit in an ordinary light box. If backlighting is unsuited to the desired application, a lenticular screen may be substituted for the line screen. A lenticular screen is a series of molded, extruded, or cast vertical lenses, which focus light to produce the same effect as the barrier screen. Lenticular screens, however, have several disadvantages, most notable being the additional expense and time of tooling and manufacture. Line screens, in contrast, may be inexpensively made on the same output device used for printing the image. Autostereographs created with line screens and lenticular screens have been seen for nearly a

hundred years. These images have been made using a variety of optical means, ranging from the elegant to the Byzantine, all suffering from the typical inconsistencies of analog processing. PHSColograms represent a monumental advance because they eliminate the analog steps, replacing them with a carefully controlled computer simulation of the analog process.

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[ E28] [ SPRINGBOARD]  
Guerrilla Gallery

The Guerrilla Gallery is a working Atelier which will provide a rich interactive experience for Works on Paper artists and the entire SIGGRAPH community. The Gallery will feature a fully equipped imaging studio in which artists can produce digital prints from their own files. Equipment for the studio will feature an IRIS ink jet printer operating from a Macintosh platform. Other peripheral equipment will facilitate the exploration process.

Artists will have the opportunity to talk to service bureau and manufacturing representatives as they work. This will provide a much needed venue for discussion of the technical aspects of translation from image file to digital fine art edition. SIGGRAPH members from other disciplines will also have the opportunity to interact with fine artists which should foster a new level of appreciation and understanding within the community. Artists will work independently and collaboratively, conduct ongoing communication about their works in progress and return "High-touch" to "High-tech" through experimental works from digital prints.

Scheduled portfolio and slide presentations by selected artists will provide inspiration and a springboard for conversation about art making. Though digital prints are not a new idea, Works on Paper artists are still challenged by questions regarding the legitimacy of digital prints as limited editions. The Guerrilla Gallery will provide a forum for discussing reservations about the digital edition and other topical questions.

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[ E29] [ SPRINGBOARD]  
Inside Out: Figurative Sculpture

These "digital sculptures" draw upon recent advances in 3D laser digitizing and rapid prototyping technology. Further,

they utilize the unique space of the computer to previsualize problems of viewer position, time, and three-dimensional montage. Surface "maps" of the body or other forms are created using 3D laser digitizing equipment. This surface topography is then sent to a Silicon Graphics platform where it is evaluated and modified using custom software. Finally, the desired data set is sent to a CNC (computer numerically mill) where it is translated into tangible, three dimensional form.

Three goals animate the project:

- 1) a desire to test the conventions specific to the traditions of figure sculpture
- 2) a desire to understand rapid prototyping technology and its relationship to three dimensional computer modeling
- 3) a need to critically examine how our technologically driven culture shapes both our current image of the body and how we understand three dimensional form.

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[ E30]  
ROVER - Remote audio/Video Explorer Robot

ROVER is a Mobile Video Conferencing robot controlled entirely by radio. Full video and audio duplexing will allow a live conversation to take place between people located at the base and at the remote unit. The robot is actually a very familiar piece of equipment that many conference attendees will instantly recognize.

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LEA
FORMAT
CONVENTIONS

The following describes the format or markup conventions used in creating Leonardo Electronic Almanac. The function of these conventions is to facilitate perusal through the text, and to make it easier to create conversion programs to various text readers.

=====: Section Heading Delineation - full line character



sequence

\*\*\*\*\*: Item Delineation within Section - full line character sequence

<: Item Title - search for the character "<" followed by two spaces

|\_ or \_|: This sequence takes you to the next SECTION TITLE. Item titles and author/contributor names appear exactly the same in the Table of Contents and at the location of the actual item.

Section names appear in all capital letters, and with this issue will appear with all letters in sequence with no spaces (PROFILES, REVIEWS, etc.).

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|-----|
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|              |
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The following are the specifics about ftp access:

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password: your_email_address
cd pub/Leonardo/Leonardo-Elec-Almanac
```

Files for the Leonardo Electronic Almanac Gallery are currently kept in the directory pub/Leonardo/Leonardo-Elec-Almanac/Gallery.

This is an evolving system. Check the README file for the most current information about the contents in the system, and for the most current information about all of the ftp services. Submission Guidelines and Past issues are available via ftp.

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