And all you touch and all you see
Is all your life will ever be.

Pink Floyd
Dark Side of the Moon

63 | Introduction

66 | Toco the Toucan

67 | The Grimm Show

68 | JPL Space Garden

69 | Nerve Garden

70 | d·rhum

72 | Bodymaps

74 | Multiple Identities MAP

76 | Kaleidoscope

78 | Virtual Basketball

79 | ants under a mushroom

80 | The Multi-Cultural Recycler

81 | Virtual Orchestra Performance

82 | Fixed-Base Driving Simulator

83 | Garnet Vision

84 | Journey into the Brain

85 | Multi Mega Book in the Cave

86 | Alice: Easy to Learn Interactive 3D Graphics

87 | Cyber Bunraku

88 | Journey to Anahuac

90 | Project ScienceSpace

92 | Mind Garden

93 | Wango: COMPOST

94 | Cyber Space Adventure

96 | Dancing Fire and Water

98 | Fantasy3

99 | PRoP: Personal Roving Presence

100 | Advanced Technologies for Virtual Environments

102 | Sunset Boulevard

103 | Faery Garden

104 | The Land of Time

106 | Virtual Environment ATC Tutor (VEAT)

107 | MEDIA^3: the Virtual Hologram

108 | Big Head Racer

109 | Ultra Magic Paper Interface

110 | Virtual Explorer

111 | WonderSpace

112 | Direct Manipulation Scene Creation in 3D

113 | HORIZONS by TeleCommunity

114 | 3D Imaging Sensing Technology

116 | Point of Vue, Point of You / Body to Body

117 | Optical Gesture Recognition System

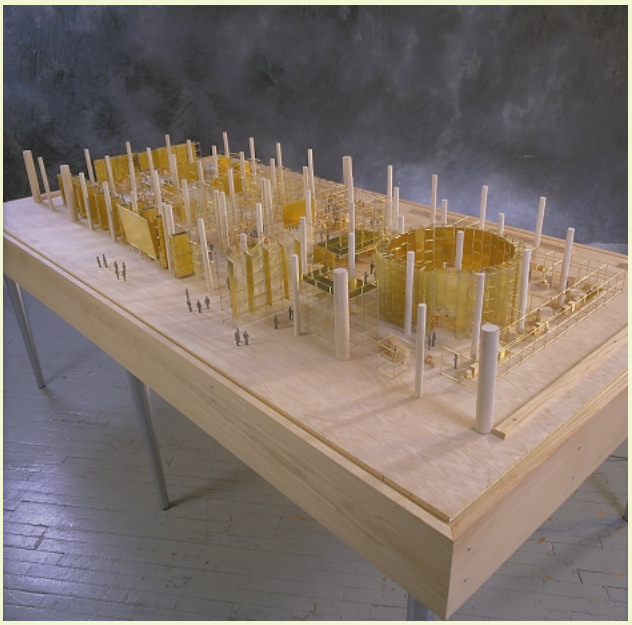
118 | Talking Head

119 | Traffic Control

120 | Magic Morphin Mirror

I like to think
(right now please!)
of a cybernetic forest
filled with pines and electonica
where deer stroll peacefully
past computers
as if they were flowers
with spinning blossoms

David Greene
Gardener's Notebook
Archigram



Electric Garden model

In 1961, Archigram published a series of experimental projects that began to explore the new and emerging technologies of the period. This small group of British architects adopted audio/visual display systems, projection television, computer technology, entertainment facilities, exhibits, gantries, and electric lights as the building blocks of their designs.

They imagined temporary cities of activity and light.

Through their projects and proposals, they predicted a blurring of boundaries and a convergence of technologies. They realized that these technologies would begin shaping and altering the world in ways that they could only begin to imagine.

The Electric Garden at SIGGRAPH 97 is inspired by this group.

Over 30 years later, Archigram's vision of the future is being realized through the inventors, artists, programmers, and designers of today. The fabulous machines they imagined and the wonderful speculations they engaged in are now becoming a reality. As they predicted, these machines are shaping and altering our world in many ways.

The Electric Garden is an instant city that celebrates new and emerging technologies. Our garden is full of beautiful technology that we can experience today. There are remarkable things to see, hear, and touch in this rich, sensual environment.

Computer-generated images displayed by a variety of 2D and 3D systems provide color, motion, and beauty in the garden. Motion-capture systems and electronic cameras capture your gestures and expressions, and allow you to manipulate a synthetic world. Computer-controlled electric motors and machines provide surface information, telling us about the density, weight, and texture of a virtual object.

In the garden, you experience the power of a volcano or the cool breeze of a mountain glacier. You can play basketball in cyberspace and feel the weight of the virtual basketball. You can travel to another planet and hover in its atmosphere. Visit Berlin, Tokyo, or a remote part of Finland and learn about their cultures. Digitally transport your body into a computer-generated world by walking in front of a camera array and laser range finder.

The Electric Garden is a place where we can experience and celebrate our spectacular new electric toys.

It delights and amazes us.

It challenges all that you know.

It allows you to forget convention and law.

It seduces us.

The projects described in these pages are the life of the Electric Garden. Contributors from around the world have come to SIGGRAPH 97 to show us their wonderful creations. They have filled the Electric Garden with sights and sounds. For a few days, we can see their inventions and experience all they have to offer.

We are delighted by the possibilities and we thank them for sharing their flowers with us.

RICK HOPKINS
CHAIR, Electric Garden

The Selection Process

On 1 March 1997, the Electric Garden jury met at Sony Pictures Imageworks in Los Angeles for a full day of discussion, debate, review, and selection. Seventy-two proposals from four continents were reviewed on the basis of creativity, technical innovation, quality of content, presentation, and potential cultural significance. The proposals were numbered sequentially and ranked on a scale from A to F in a three-stage jury process:

1 Unanimous Rejection

- The chair cited the proposals one by one and asked the jury whether any of them received unanimous F (unacceptable) rankings. Six were rejected at this stage.
- Projects were rejected if they were considered incomplete, poorly presented, or inappropriate because they did not meet the criteria defined in the Electric Garden Call for Participation.

Selected comments on unanimously rejected proposals:

- "This one is not appropriate for the Electric Garden."
- "Number 20 is incomplete. It's not a proposal. It's just an abstract of a paper."
- "This is a product demo, and I don't see any interesting technology here that should be in the Garden."

2 Unanimous Acceptance

Another proposal-by-proposal review revealed the projects that received unanimous A (outstanding) rankings. Eleven were selected as "must-haves."

Selected comments on unanimously accepted proposals:

- "This one is either an A or an F. But we should select it just to see if it works."
- "Very cool. But I don't know if they can pull this off, and there are some liability issues here. Is this legal?"
- "It has a large Internet component, and Steve will make it happen!"

3 Debate

Before they debated the remaining proposals, the chair noted that, with its unanimous decisions in stage 2, the jury had allocated about 25 percent of the 50,000 square feet planned for the Electric Garden. "But one project is very large, so if we keep them in, we are implicitly saying that some of those remaining can't be accepted."

In stage 3, jury rankings were averaged to create a priority list of remaining projects. Those with the highest average rankings were assured of acceptance. Those at the low end of the average rankings would be accepted only if space was available at the end of the jury process.

Selected comments from the stage 3 debate:

- "The Call for Participation specified that we were looking for fun projects, and seductive projects. This one will be a real crowd pleaser."
- "I've been trying to do this kind of thing for the past year. I'd like to see if they can do it."
- "This is an interesting project, but it's largely arrogant and dumb."
- "Why do we need the violence? This is a technology in search of an application."
- "This one tells me that I don't matter. The piece is going to do what it does no matter what I do. There's no interaction."
- "But I gave it a higher ranking because it involves people outside the conference, via the Web."
- "I have a moral question about this project. All the sounds and reactions of the image seem to be painful, as if the image is being tortured. If I'm forced to participate in something that disturbs me, then I feel exploited by the process."
- "Yes, the content is strange, but it's the producer's vision. Are we censors?"
- "This one is pure SIGGRAPH. It's interesting. It's fun. And it's attacking a new problem."
- "Is this new? They've been at SIGGRAPH for several years. Is it the same as last year or not?"
- "Here's an A! I love this. They have some big technical problems to overcome. It's high risk, but compelling."
- "Another one where you're irrelevant. Confusion without learning does not lead to insight."
- "There's a gazillion dollars worth of technology behind this, and this is all they can come up with?" (Verdict: unanimous Fs.)
- "Very rich data, but there's no way to know if they can finish this project by August. If it works, it's very, very cool." (Verdict: unanimous As.)
- "We need to remember that we have a particular bias in this room, and it's not consistent with the larger SIGGRAPH audience."
- "Technologically, this is very basic, but artistically, creatively, it's pretty wonderful."
- "Very impressive VRML work. We don't have much VRML so far, and this illustrates the state of VRML right now."
- "I started out at D-plus for this one. I'll move up to B."

The jury also considered a proposal from its own ranks: Frank Foster's summary of a proposed multi-company collaboration, showing the potential of the new IEEE 1394 standard (Firewire). After some debate, the jury unanimously recommended, "outside the jury process," that SIGGRAPH 97 install this "glimpse of the digital video future."

In the course of its deliberations, the jury decided to reject all proposals that received a unanimous ranking of D or below. Final decisions on which projects would make the final cut, and where each accepted project would be located in the Electric Garden, were referred to the chair.

Adele Newton, Rick Hopkins, David Newton, Cheri Stacey,
Rosemary Ratkaj, Craig Applegath

The Electric Garden Committee

Adele Newton
Public relations, student volunteer coordination, selection committee, planting and weeding

Rick Hopkins
Design, direction, production, care, and feeding of the garden

David Newton
Database master, Web boy, and person responsible for watering the plants

Cheri Stacey
Office management, coordination, travel, and everything-under-the-sun department

Rosemary Ratkaj
Model maker, trimming, and pruning

Craig Applegath
Project manager, architect, and all things bright and beautiful

Rob Pringle
Research and growth formulas

Greg Papp
Organically grown CAD systems

The Electric Garden Jury

CHAIR
Rick Hopkins
Side Effects Software, Inc.

JURY
J. Craig Applegath
Architect

Tom Brighton
Landmark Entertainment

Frank Foster
Sony Pictures Imageworks

Andrew Glassner
Microsoft Network

Rob Hennigar
DreamWorks

Adele Newton
Side Effects Software, Inc.

Special Thanks to:

Kim Davidson, Greg Hermanovic, and the entire **Side Effects Software staff** for their patience and support.

Frank Foster and **Sony Pictures Imageworks** for their donations and generous support.

Sony for their donations and their snapshot of the future.

Clark Dodsworth and **Brian Blau** for their assistance, guidance, and excellent example.

Laura Hopkins for her help and understanding.

The **SIGGRAPH 97 committee members** and **contractors** who have helped make The Electric Garden a reality.

Last but not least, I would like to thank the **Electric Garden Selection Committee** for donating their time and expertise.

Contact

Rick Hopkins
Side Effects Software, Inc.
477 Richmond Street West, Suite 1001
Toronto, Ontario M5V 3E7 CANADA
rick@sidefx.com

Toco the Toucan: A Synthetic Character Guided by Perception, Emotion, and Story

Deb Roy, Michal Hlavac, Marina Umaschi, Tony Jebara, Justine Cassell, and Sandy Pentland

Toco the Toucan is a synthetic creature created at the MIT Media Laboratory. Participants can walk up to the display, sit down, and begin interacting with the toucan using a combination of speech and gesture. A constrained, but not entirely predetermined, story ensures that the highly interactive experience includes some structure and an overall plot.

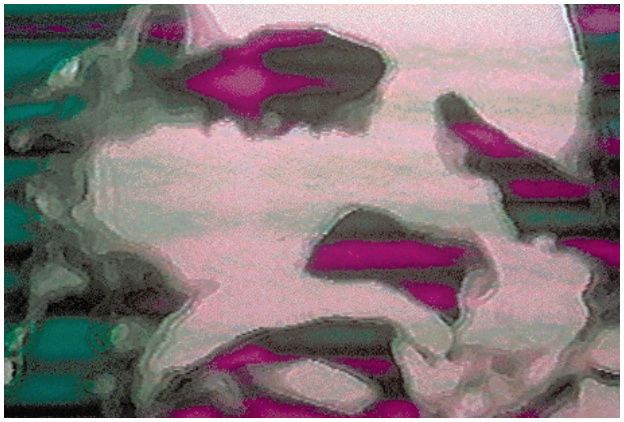
An underlying emotion model drives Toco's facial expressions, sounds, and body motions. Changes in the creature's emotional state are determined by four factors:

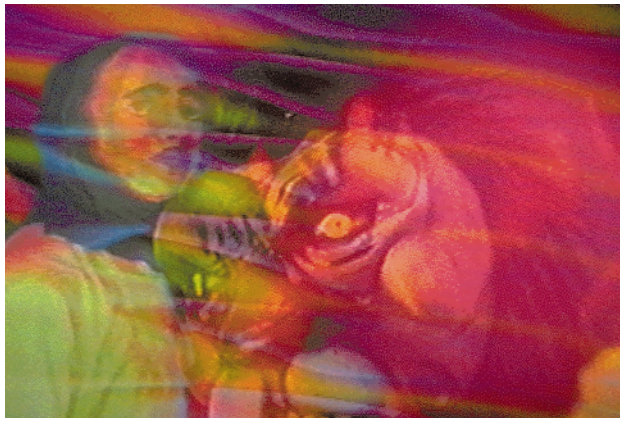
- Speech and other sounds produced by the participant.
- Hand and body motions produced by the participant.
- Constraints from an underlying story-based interaction.
- Innate tendencies toward certain emotional states (personality).

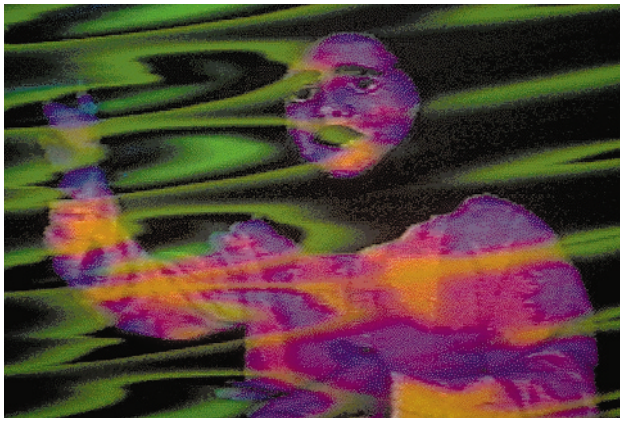
This exhibit demonstrates the integration of several key technologies including behavior-based animation, interactive storytelling, robust computer audition and vision, and affective computing.

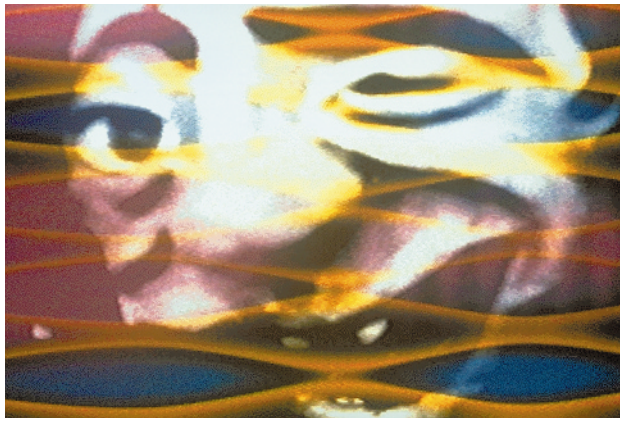
CONTACT
Deb Roy
Perceptual Computing Section
MIT Media Laboratory
20 Ames Street, Room E15-388
Cambridge, Massachusetts 02139 USA
dkroy@media.mit.edu

The Grimm Show (or The Story of the Youth Who Went Forth to Learn What Fear Was) is a 60-minute multi-media performance / interpretation of the parable by the Brothers Grimm. The story recounts the experiences of a youth who goes forth into the world to learn the meaning of "shuddering in fear." The performance incorporates pre-recorded video, live camera feeds, animation, text, and sound. The pre-recorded and live video, as well as the animation, are mixed live. Video and animation events are triggered by a continual midi / music soundtrack, which is both pre-sequenced and performed live on midi keyboards, drumpads, and wind instruments. Midi is also used to trigger a variety of sound samples and create abstract audio beds. The video (both individual sources and the live mix) appear on multiple monitors and video projectors.









CONTACT
M.R. Petit
104 Suffolk Street, #3
New York, New York 10002 USA
petit@echonyc.com

COLLABORATOR
Jeremy X. Halpern

The JPL Space Garden features systems in current use at JPL for processing and visualization of science data returned by instruments flown on various NASA spacecraft:

1 The Science Analysis Graphics Environment (SAGE), a graphical interface used to control processing of imaging data returned by solar system exploration spacecraft, including the Galileo spacecraft currently returning data from Jupiter.

2 Mission operations support software used by the Mars Pathfinder mission that landed on Mars on 4 July 1997, providing stereoscopic mission planning tools that support rover navigation on the Martian surface.

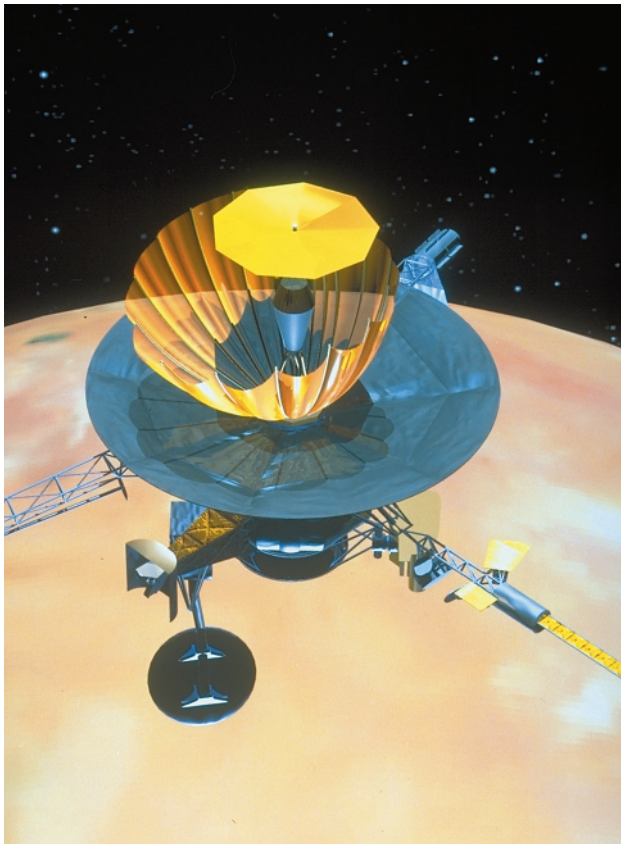
3 Animated "fly-over" sequences produced from data of the Earth and other planets.

4 VISTAS, an interactive tool for query/retrieval of earth observations data acquired by the TOVS sensor.

5 A prototype of software for processing Atmospheric Infrared Sounder (AIRS) data.

6 Internet-accessible image database browsers and navigators that provide public access to space mission image archives.

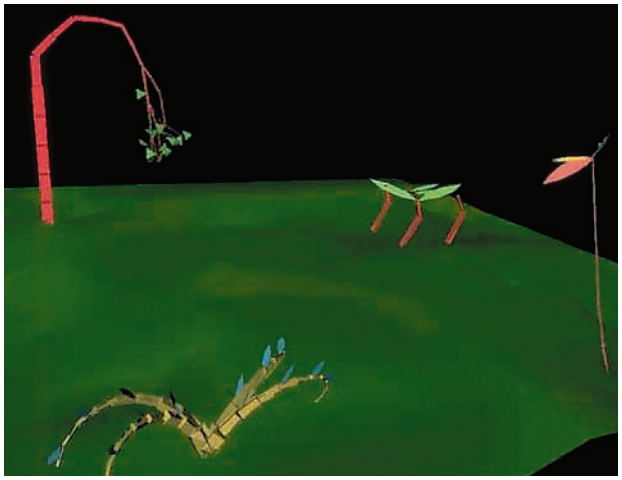
7 Other examples of processing operational data.



CONTACT
William B. Green
Jet Propulsion Laboratory
Mailstop 168-527
4800 Oak Grove Drive
Pasadena, California 91109-8099 USA
Bill_Green@iplmail.jpl.nasa.gov

COLLABORATORS
Ray Bambery, Kris Capraro, Steve Carpenter, Jerry Clark, Bob Deen, Eric DeJong, Dave Freda, Jeff Hall, Tom Handley, Danika Jensen, Sue LaVoie, Justin McNeill, Mike Mueller, Vadim Parizher, Vince Realmuto, Allan Runkle, Mark Sarrel, Ken Starr, Tom Thaller, Charles Tompson, Felix Vanshelbaum, Bob Vargo, and Pam Woncik

How can we forget the fascination that our terrariums, aquariums, or chemical crystal gardens held over us when we were children? Watching beautiful and functional structures emerge and then decay taught us a great deal about life and our own ultimate destiny. The Nerve Garden allows users to plant seeds in a digital terrarium and witness the growth of familiar and strange plant and animal structures. Through an artful combination of L-systems, VRML, neural networks, Java, the Web, and a mouse and dataglove interface, participants sow seeds in cyberspace. Participants leave the Nerve Garden proud of their petunias or unnerved by the realization that life may find a way into digital space.



CONTACT

Bruce Damer
BIOTA Special Interest Group of the Contact Consortium
P.O. Box 66866
Scotts Valley, California 95067-6866 USA
bdamer@ccon.org

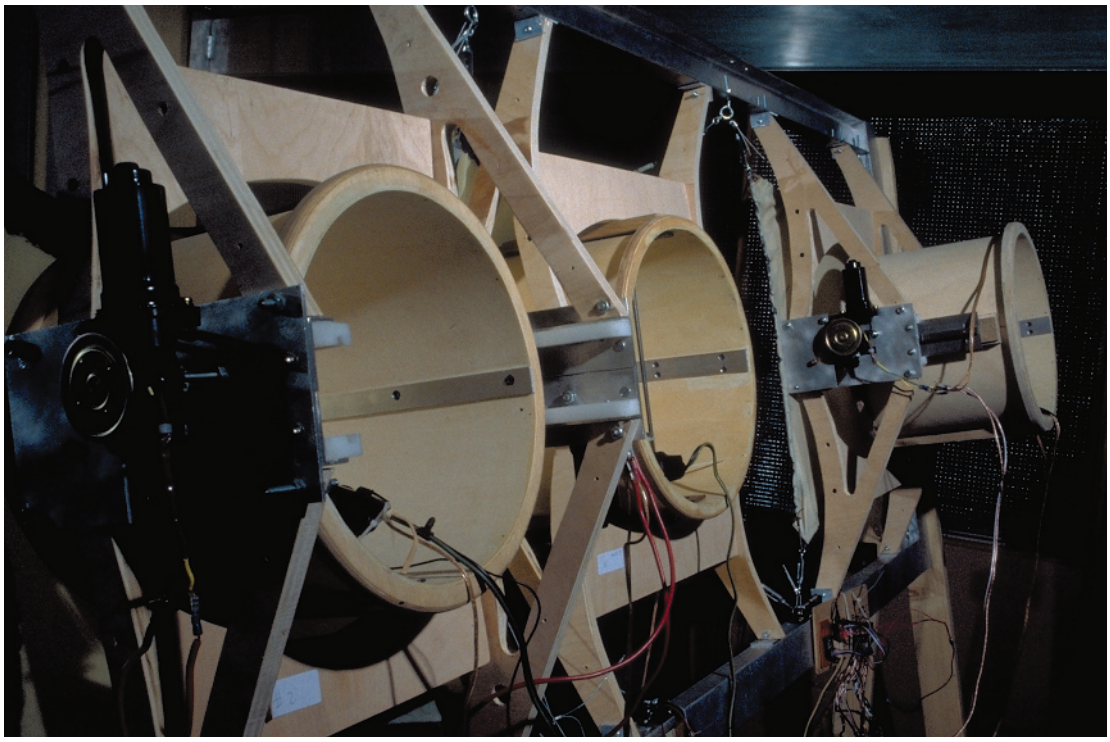
COLLABORATORS

Peter Hughes, Charles Ostman, Tim Riley, Patrick Mahoney, John Shiple, David Story, Dominic Sagolla, Ben Vigoda, Laurens Lapre, Ales Holecek, Pavel Slavik, Christopher Blohm, and Todd Goldenbaum

"...Decisions of time and space were out of my hands... I could become tied into another person's time and space... " Vito Acconci

d-rhum (drum room) is a room that responds to the presence and movement of its occupants. Computers translate sensor data into commands sent to motors. The motors stretch, push, strike with mallets, and move sections of the walls or the walls themselves. The walls are built of malleable materials such as latex and silicone.

As participants enter and move around the room, they notice that the walls move, change shape, and emit percussive sounds. Upon further investigation, they discover that they can interact with aspects of the movements and sounds of the room by coordinating their own movements. They are

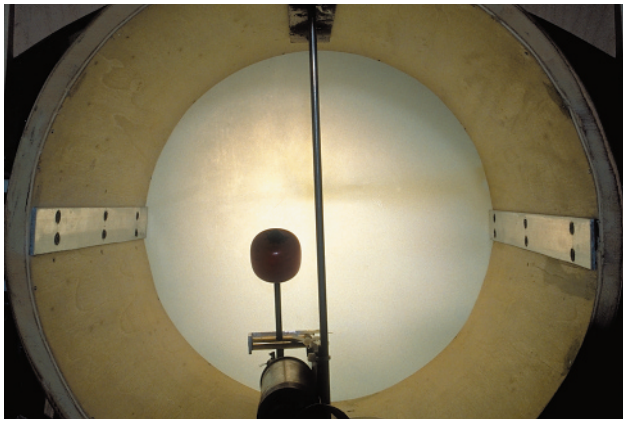


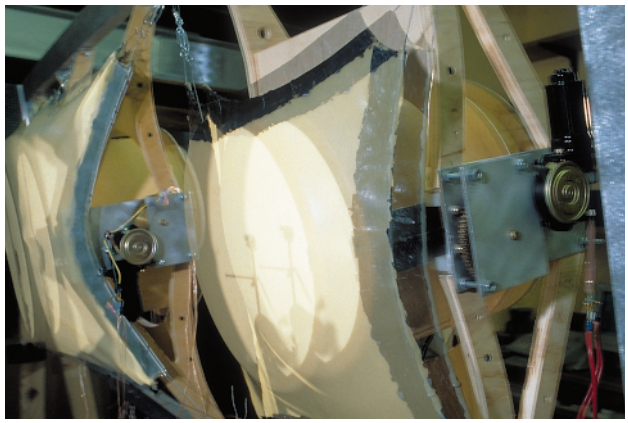
encouraged to play the room like drums with random and/or deliberate movements around the sensors.

The spatial configuration of d-rhum and its participants is dynamic and constantly evolving. Within this fluid environment, participants begin to see that their personal boundaries are fuzzy. As they move, so do the walls, thus blurring the traditional limited expectations of architectural space. Certain combinations of movements cause deformations and sound emissions, but it is never clear which movements generate which reactions.

Our intentions in creating d-rhum are to explore two related issues. First, we wish to create an environment in which the understanding of one's boundaries is examined. Second, we wish to create an environment in which the biases of learned language can be overcome.

Movement and percussion are basic modes of communication that evolved from the most primitive cultures. By overlaying d-rhum's technological apparatus on such basic human communication techniques, we connect the participant to the long history of cultural evolution.





CONTACT
Daniel Schwartz
RomeBlack, Inc.
180 Varick Street, Suite 12A
New York, New York 10014 USA
dls@romeblack.com

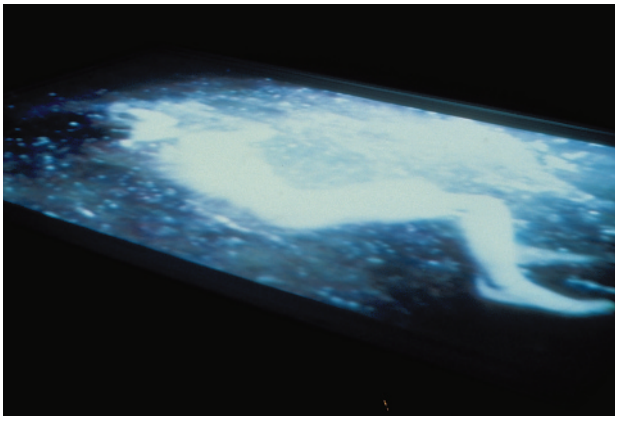
COLLABORATORS
Peter Franch, Richard Hughes, and Eugene James Flotteron

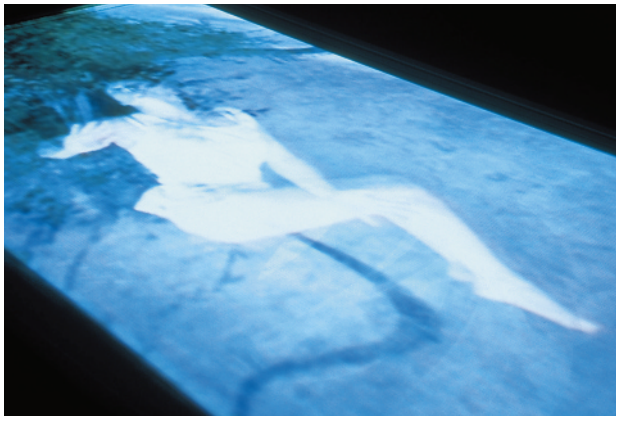
Bodymaps: Artifacts of Touch
(The Sensuality and Anarchy of Touch)

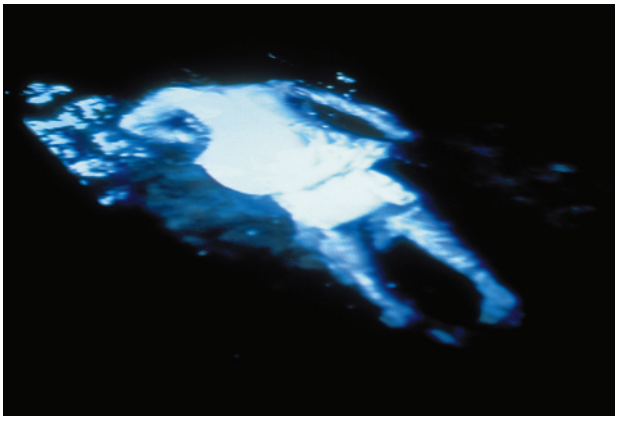
• Thecla Schiphorst

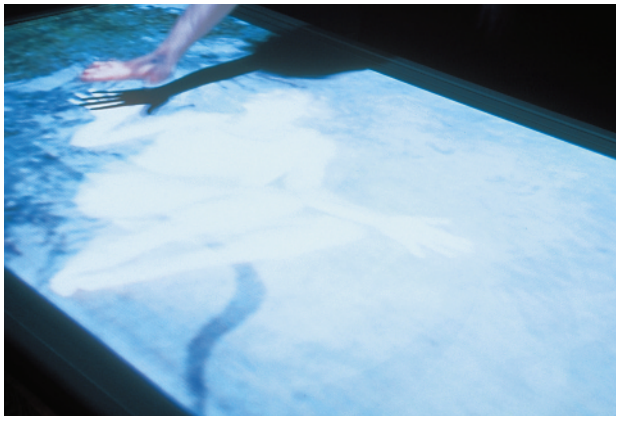
Bodymaps: Artifacts of Touch is a computer interactive sound and video installation. The piece uses a specially designed sensor surface embedded with 15 electric field sensors, which operate very much like 15 theramins, and 8 force-sensitive resistor sensors, which detect touch, pressure, and the amount of force applied to the surface.

These sensors lie beneath a white velvet surface upon which are projected images of the artist's body. The surface yearns for contact and touch. Its rule base is complex and subtle, impossible to decode. The effect is disturbing, erotic, sensual, and subjective.



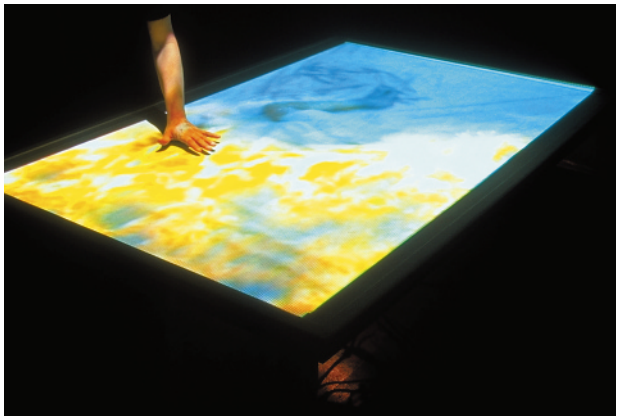


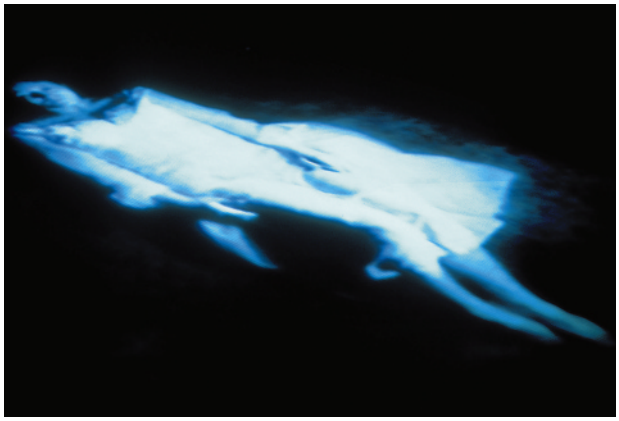


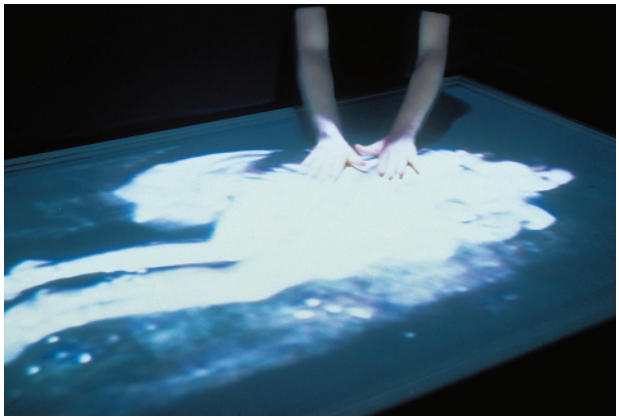


The intent of the work is to subvert the visual/objective relationship between the object and the eye, between click and drag, between analysis and power, to create a relationship between participant and technology that transgresses rules of ownership and objectivity, and begs questions of experience, power, and being.

The piece and interface was designed by Thecla Schiphorst, researched and engineered by Infusion Systems, programmed by Ken Gregory and Grant Gregson, and constructed by Hanif jan Mohamed and Ewen McNeil.







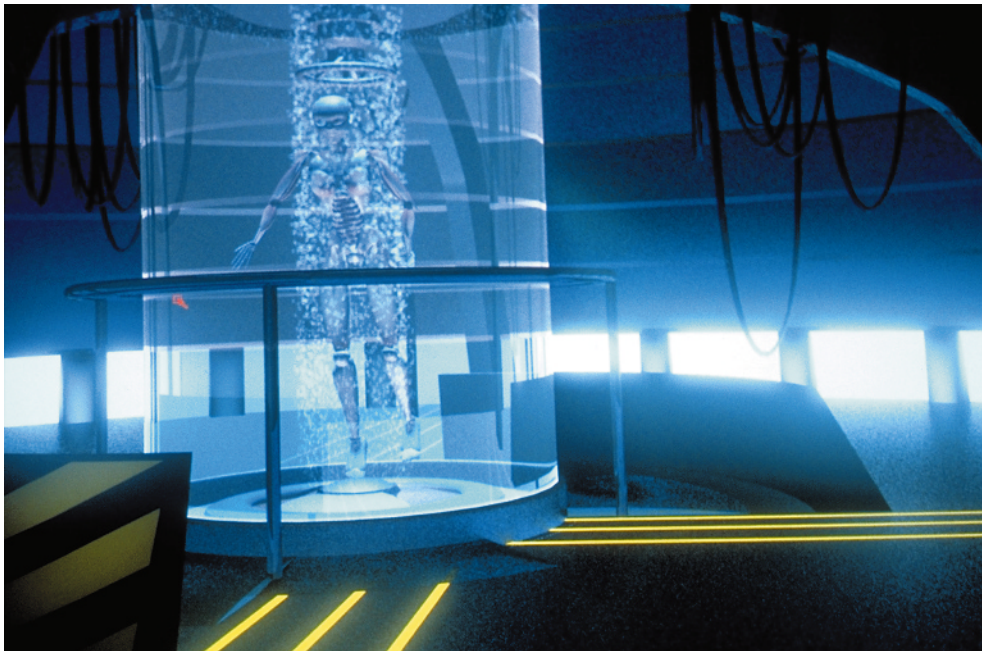
CONTACT
Thecla Schiphorst
Digital EARTH
1128 Rose Street
Vancouver, British Columbia V5L 4K8 CANADA
thecla@cs.sfu.ca

COLLABORATORS
Ken Gregory, Grant Gregson, Hanif jan Mohamed, and Ewen McNeil

Multiple Identities is a digital map of New York City that incorporates avatars (visual embodiments of concepts, personas, identities, or intelligence in virtual reality) acting as urban guides who lead travelers through unique experiences in the metropolis.

Maps have traditionally been commissioned to accumulate "detached" observations and "impersonal" facts regarding a physical location. Unlike typical navigational tools, the Multiple Identities Map acknowledges and reports on urban quantities that are less quantifiable. It collects and dispenses information that is inherently qualitative and subjective. Inspired by the research of Howard Gardner (The Theory of Multiple Intelligences, Leading Minds) and others, we have identified unique personae that emphasize multiple viewpoints as a way to identify and digest information. Each identity renders a personal experience and fashions stories that reflect unique observations and challenges.

The Multiple Identities Map does not intend to chronicle the city with efficient facts, but instead formulates compelling experiences that render the richness of a metropolis like New York.

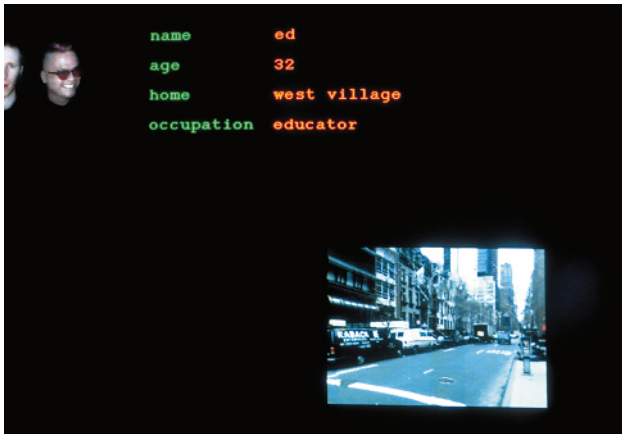


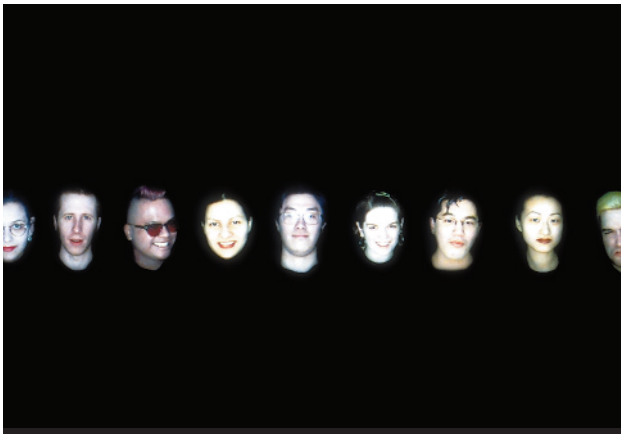
CONTACT

Richard Yelle
Parsons School of Design
66 Fifth Avenue
New York, New York 10011 USA
yeller@newschool.edu

COLLABORATORS

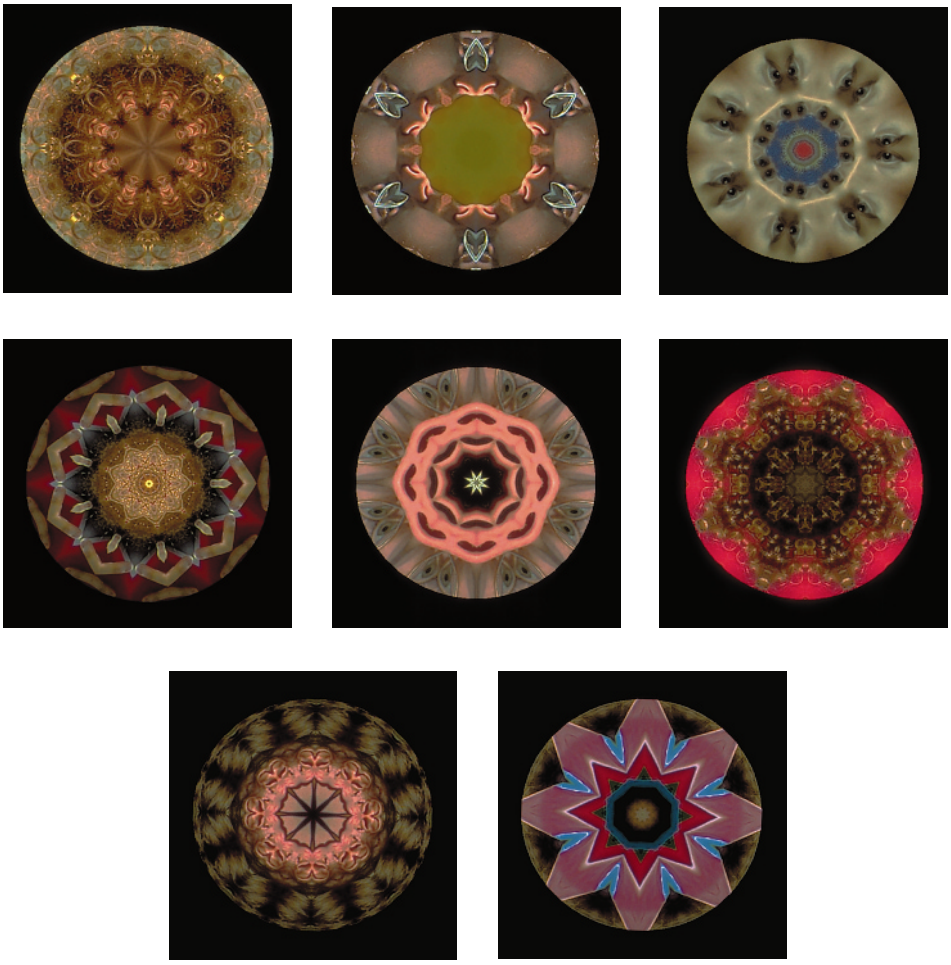
Richard Yelle, Sven Travis, Richard Day, Edward Lucero, and Christopher Kirwan


name ed
age 32
home west village
occupation educator



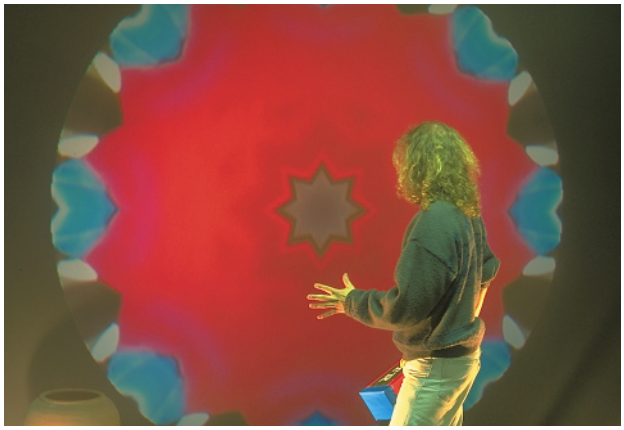
This interactive project introduces a multimedia experience using an interactive kaleidoscope. The Iamascope uses a video camera lens as the eye of a kaleidoscope and projects a kaleidoscopic image of the participant onto a large screen. A vision subsystem is coupled to the electronic eye to control musical tones using a sustain algorithm. A wireless microphone produces echoes corresponding to the audio analogue of the kaleidoscopic reflections.

Once inside the Iamascope, participants can gesture, dance, sing, and speak to control and choreograph the imagery and music in real time. Novices can easily produce beautiful images and music, while experts can continue to refine their skills for complex forms of expression. Both the audience and the participant engage in a rich aesthetic interactive experience.



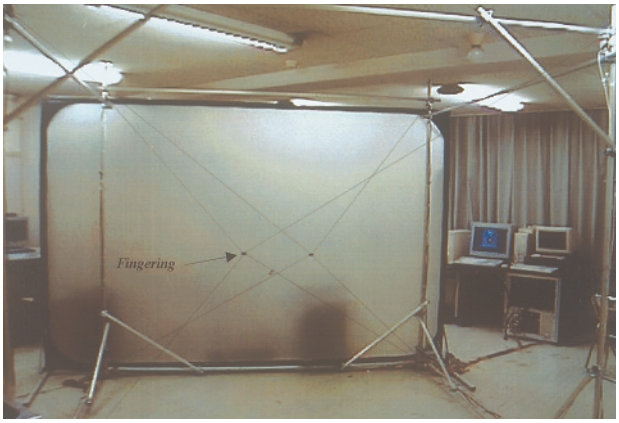
CONTACT
Sidney Fels
ATR Media Integration & Communication Research Laboratories
Seika-cho, Soraku-gun
Kyoto 619-02, JAPAN
fels,mase@mic.atr.co.jp

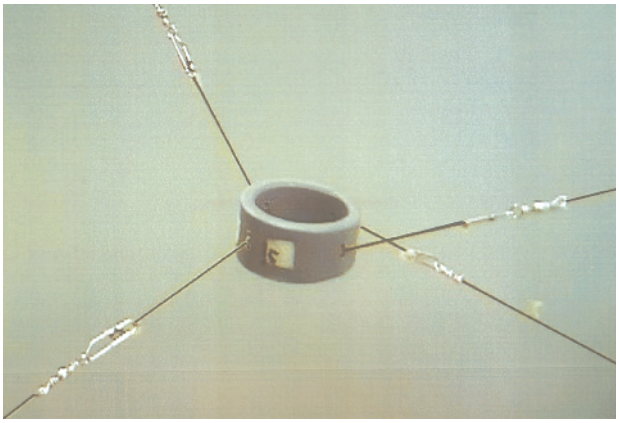
COLLABORATORS
Dirk Reiners and Kenji Mase

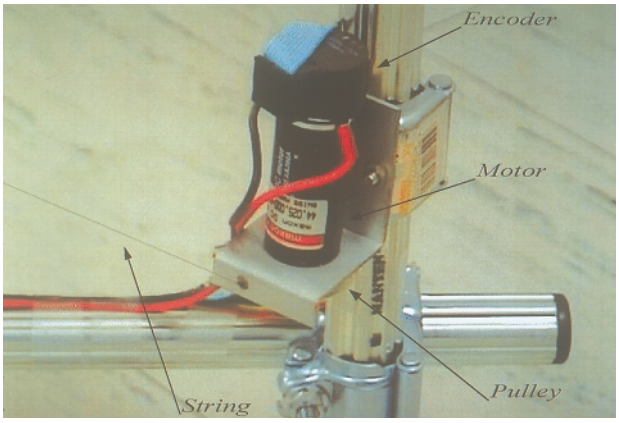


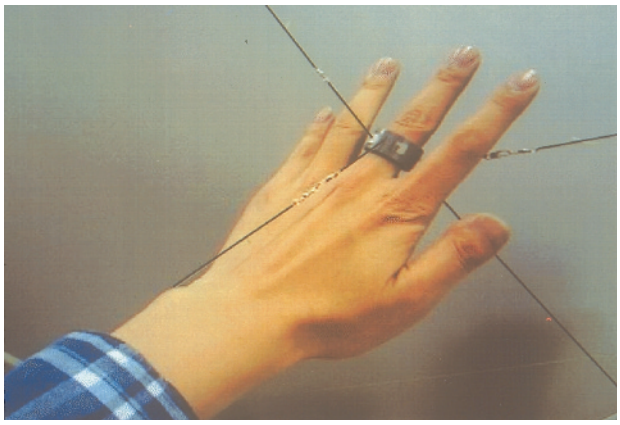
In this cave-like virtual space, participants use visual, auditory, and tactile sensations to perceive and interact with objects. A new human-scale haptic device, Big SPIDAR, couples haptic sensations with vision and audition, and displays various aspects of force feedback associated mainly with contact, weight, and inertia.

In Virtual Basketball, players feel the weight and the spherical shape of the virtual ball at any position inside the playing space and experience the illusion of natural control over the ball.







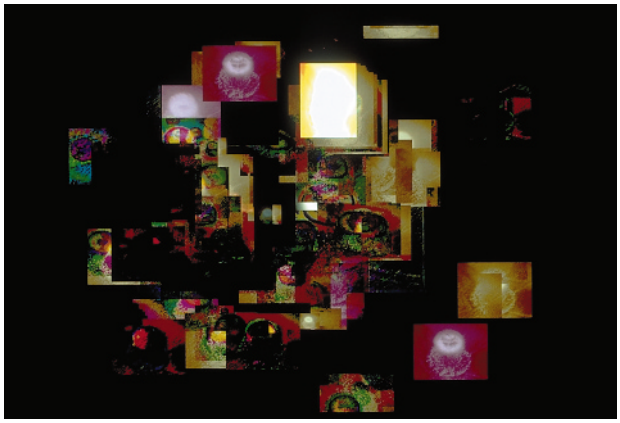


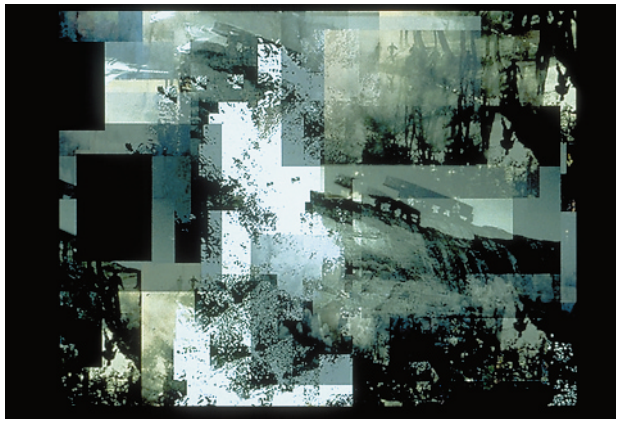
CONTACT
Makoto Sato
Precision and Intelligence Laboratory
Tokyo Institute of Technology
226 Yokohama
4259 Nagatsuta-cho
Midori-ku, JAPAN
msato@pi.titech.ac.jap

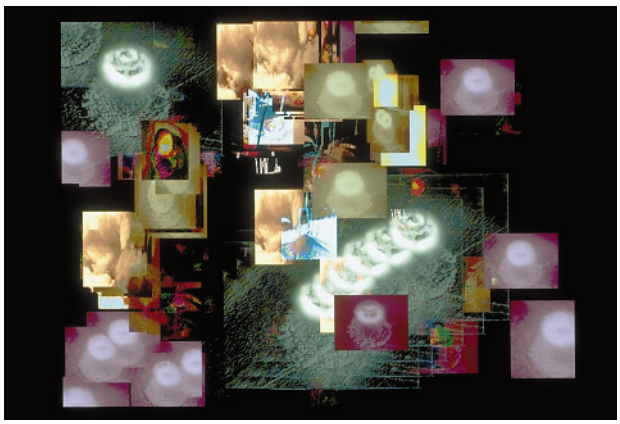
COLLABORATORS
Iguchi Yasuo, Hatano Ken, and Laroushi Bouguila

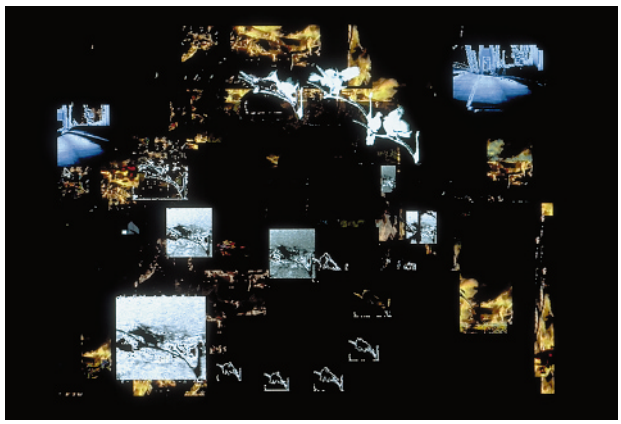
In perceiving an event, we alter that event to suit our own purposes. In making an image of an event, we apply this alteration of the real to the image-making process. Thus, in perceiving an image of a non-fictional event, we generate a perception that is twice removed from the actual event. How much of the meaning perceived in a non-fiction image is derived from the subject matter, and how much is derived from formal visual elements? Where does the real become abstract?

ants under a mushroom, an interactive collage in which the participant "paints" with moving and still images, addresses these issues by examining the relationship between the formal elements of a non-fiction image and its content, and in the process examines the notion that an image can be real (non-fictional, representational) or non-real (abstract).







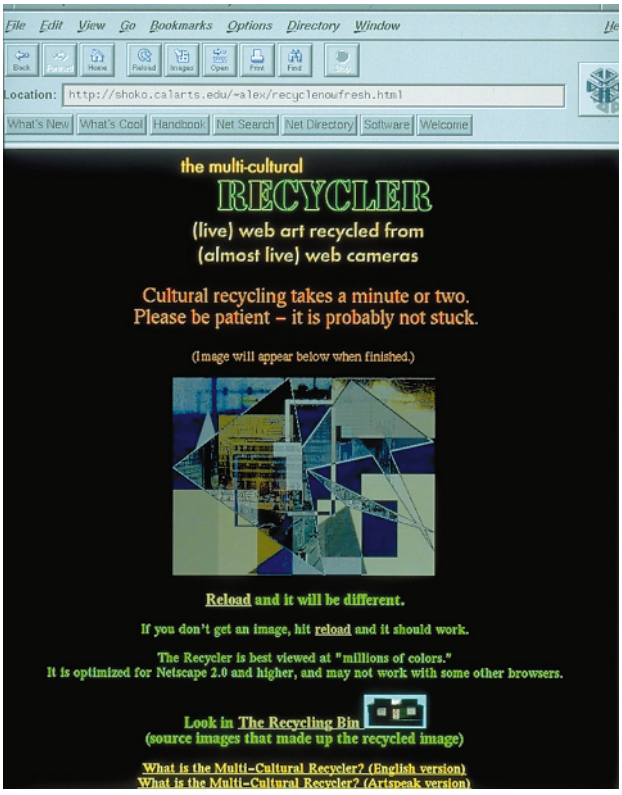


CONTACT
Amy Alexander
School of Film/Video
California Institute of the Arts
24700 McBean Parkway
Valencia, California 91355 USA
amy@emsh.calarts.edu

There has been a recent proliferation of video cameras on the World Wide Web. Ordinary people and places are instantly subject to becoming part of the mass culture and are also potentially subject to cultural recycling. The Multi-Cultural Recycler puts a tongue-in-cheek spin on this phenomenon.

When a visitor accesses the Multi-Cultural Recycler, the Recycler selects two or three camera websites at random and captures the live or latest image from their cameras. The Recycler then performs digital image processing on these images to "recycle" them into a new image. Since the actual process used is also selected at random, each access to the Recycler site produces a unique image.

Visitors can also look in "The Recycling Bin" to see the source images that comprise their recycled image and link to the images' original websites to learn their original context.

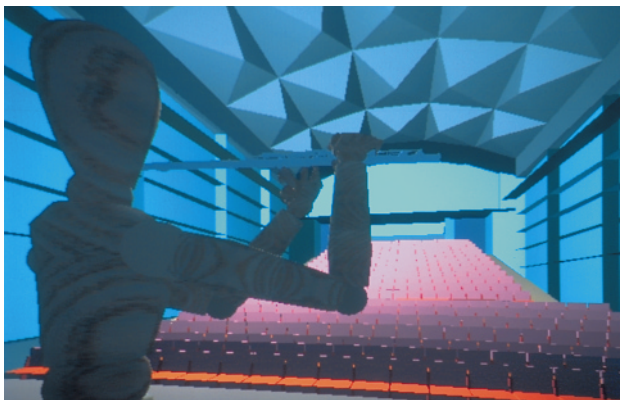


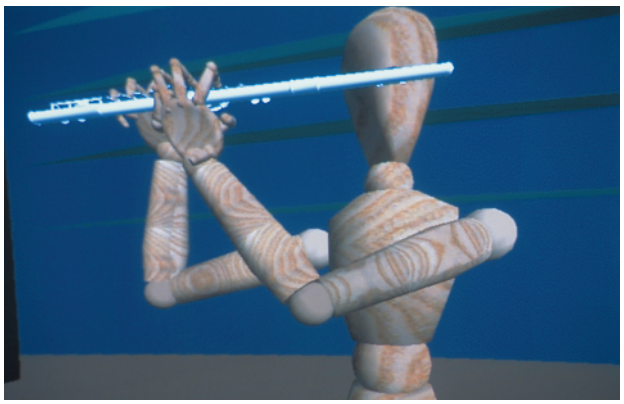
CONTACT
Amy Alexander
School of Film/Video
California Institute of the Arts
24700 McBean Parkway
Valencia, California 91355 USA
amy@emsh.calarts.edu
http://shoko.calarts.edu/~alex/recycler.html

COLLABORATORS
Tom Erbe, Palle Henckel, Sara Roberts, Steev Hise, Michael Scroggins, and Jeff Ballard

In a room with large-screen walls, where animated virtual players hold different musical instruments, the visitor, wearing data gloves, conducts a musical performance, leading the tempo with one hand and, with the other, directing aspects of the performance (a string crescendo, for example). The players show features of human behavior: they pay attention when the conductor begins, and they continue playing for awhile if the conductor ceases, but they soon return to playing nonsense. Through amplified speakers, the visitor can also experience the acoustics of the surrounding virtual concert hall. Alternative acoustic environments (open space, concert hall, church) and pieces in different musical styles can be selected from a menu.

Various techniques are used to produce this fully synthetic experience: rule-based agents for players' behavior, neural networks for response to the conductor, physical instrument modeling for the sound synthesis, real-time reverberation simulation for the hall acoustics, and auralization filters for 3D sound.





CONTACT

Tapio Takala
Department of Computer Science
Helsinki University of Technology
02150 Espoo, FINLAND
tapio.takala@hut.fi
http://www.cs.hut.fi/~tta/

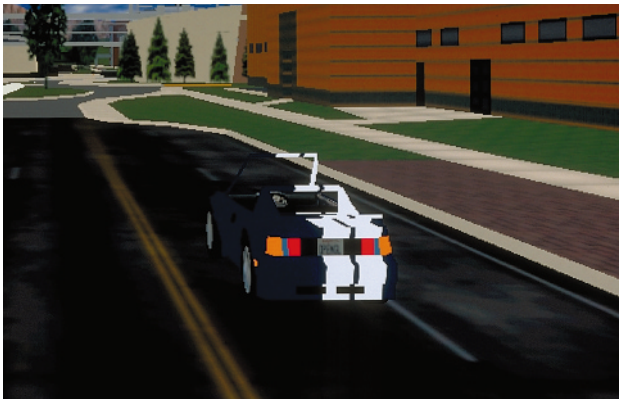
COLLABORATORS

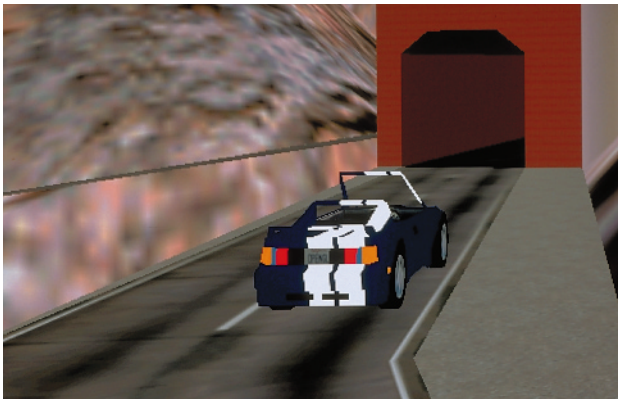
Jarmo Hiipakka, Rami Hånninen, Tommi Ilmonen, Hannu Napari, Tapio Lokki, Lauri Savioja, Jyri Huopaniemi, Matti Karjalaninen, Tero Tolonen, Vesa Välimäki, Seppo Välimäki, and Tapio Takala

This virtual reality application is used as a testbed for Intelligent Vehicle Highway Systems and virtual prototyping. One of its main goals is to investigate the level of fidelity required for various human factors studies.

Vehicle dynamics are computed by a 13-degree-of-freedom vehicle simulation with over 130 parameters. The vehicle is controlled by inputs obtained from a steering wheel, an accelerator pedal, and a brake pedal. From these inputs, the vehicle dynamics provide visual, aural, and haptic feedback to the driver. The simulation also uses the inputs to update the vehicle's positions, speed, and orientation in the virtual world. A unique low-speed algorithm allows the vehicle to come to a stop without the singularity caused in classical vehicle dynamic simulations.

To provide drivers with a realistic steering feel, control loading (haptics) has been carefully implemented. Real-time vehicle dynamics generate the torque applied to the steering wheel, which greatly enhances the driver's immersive experience and creates a more compelling driving scenario for testing and evaluation





CONTACT
James Gruening
Iowa Center for Emerging Manufacturing Technology
Iowa State University
2062 Black Engineering
Ames, Iowa 50011 USA
honyamda@iastate.edu
http://www.icemt.iastate.edu

COLLABORATORS
James Gruening
Chris Clover
James Bernard
James Oliver
Iowa Center for Emerging Manufacturing Technology

ACKNOWLEDGEMENTS
Uli Lechner
Allen Bierbaum

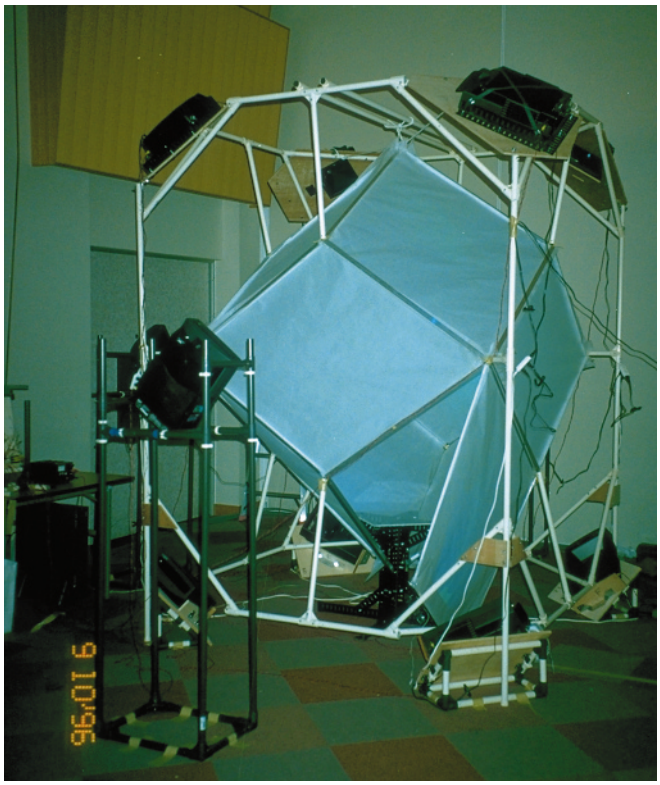
Visual immersion plays an important role in virtual environments. A head-mounted-display (HMD) provides full solid-angle views of virtual space. However, the HMD's optical system limits its field of view. One alternative display system is a large screen. Another alternative is a dome screen or a cubic screen. But those alternatives require large theater-like spaces, which restricts their general use for computer-human interaction. Moreover, existing configurations of large-screen systems do not provide full solid-angle perspectives around the viewer.

In Garnet Vision, the emphasis is on how to build a full solid-angle display in a limited space. Two criteria were established to optimize space utilization:

1 Pixel efficiency (how many pixels are projected on each polygon of a polyhedral screen).

2 Space efficiency (the ratio of displayed polyhedra to overall dead volume of the rear-projection screen).

Thorough examination of these criteria led to selection of a rhombic dodecahedron. The dodecahedron screen, in which a viewer can stand, was built with 12 projectors in a space the size of a normal room. Each projector also has a speaker that generates sound.



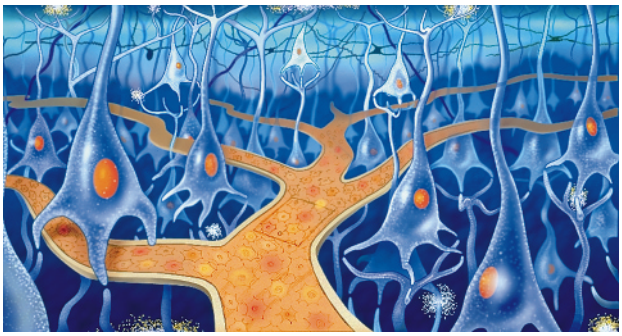
CONTACT
Hiroo Iwata
Institute of Engineering Mechanics
University of Tsukuba
Tsukuba, 305 JAPAN
iwata@kz.tsukuba.ac.jp

COLLABORATORS
Wataru Hashimoto, Atsuro Zchigaya, and Yoshinori Asada

Journey into the Brain is a story-based interactive CD-ROM funded by a research grant from the National Institute of Mental Health. It takes children between seven and 11 years of age on an adventure inside the most complex and mysterious organ of all: the human brain.

It's the year 2050, and something inside the brain of your best friend Celeste is causing her to act strangely. You must find out what it is and solve the mystery. Your guide and vehicle for this adventure is an advanced computer mouse that uses nanotechnology to shrink you for travel into Celeste's brain.

You collect bits of memory scattered throughout the various parts of the brain to solve the mystery. Twelve landscapes and twenty characters representing diverse facets of brain structure provide the backdrop and content for your journey. The program has three parts: a story/game, six activities, and a Brainarium filled with fascinating neuroscience material.



CONTACT
Karen G. Littman
Morphonix
94 Windsor Drive
San Rafael, California 94901 USA
KMorphonix@aol.com

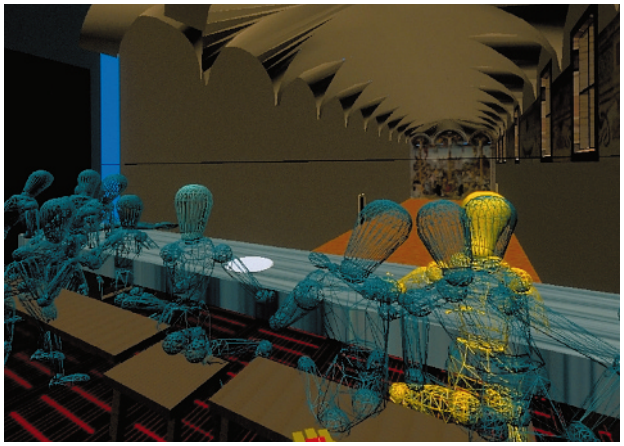
COLLABORATORS
Jay Leibold, Mary Brewer, Christine Gralapp, Madeline Preisner, John Allison, Gerald McDermott, Floyd Bloom, Steven Glotzbach, Margo Nanny, Richard Manzullo, Morgen Smith, and Andrea Silvestri

The Multi Mega Book is an up-to-date electronic book sculpture – a magic and stimulating journey through some of the most intense moments of media, technology, science, architecture, culture. It was developed as a fully immersive interactive installation with high-resolution stereoscopic images.

Users explore and freely experience the different dimensions of the 15th Century and the 20th Century through virtual reality, stereoscopic 3D sound, and holophonic effects that generate a magical interactive navigation technique.

The past and the future converge on a unique, interactive, and navigable present as users walk, interact, and live in the revolutions of two very different eras: the Renaissance world and the cyber world, integrated in one unique environment.

The ambiance of the 15th Century features Italian buildings of the epoch (the Tempietto, the Laurentian Library, the New Sacristy, the Campidoglio, Il duomo Santa Maria del Fiore, Palazzo Pitty, Loggia degli Uffizzi, etc.) integrated in one unique space. Sculptures extracted from their original context appear in imaginary squares. Paintings are displayed as gigantic scenery. Users explore the revival of the classics, the heliocentric theory, movable type, the printing press, and the printed book.



CONTACT
Yesi Maharaj Singh
F.A.B.R.I.CATORS
Via Fratelli Bronzetti 6
20129 Milano, ITALY
fabricat@galactica.it

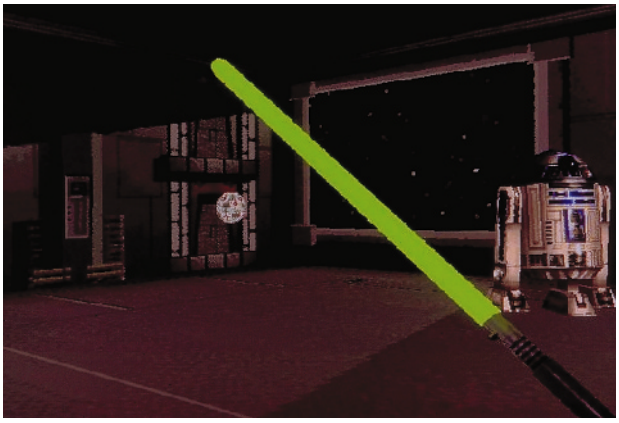
COLLABORATORS
Dave Pape, Josephine Anstey, Daniele Marini, and F.A.B.R.I.CATORS staff

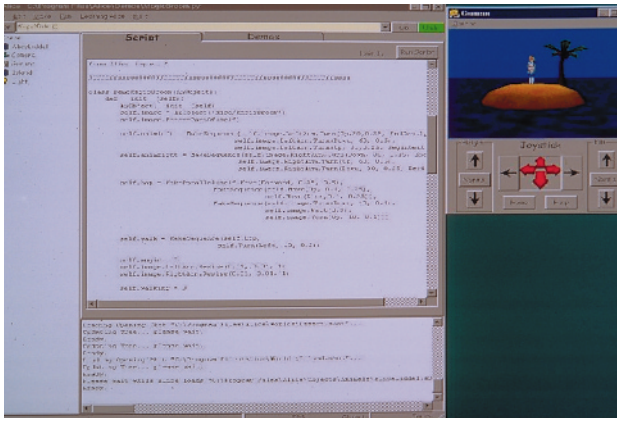
Alice is a development environment for creating interesting and interactive 3D worlds. It is designed for ease of learning and use by non-engineering high school and undergraduate students.

The typical state of the art in interactive 3D graphics development environments requires the author to know a high-level programming language such as C or C++, and to understand fairly high-level mathematical concepts like linear algebra and the behavior of 4x4 homogeneous transformation matrices. The goal of the Alice project is to lower these stiff entry requirements by providing an easy-to-learn toolkit and a set of powerful abstractions that cover a wide variety of interactions and behaviors across a broad range of 3D graphics application domains.

This latest version of Alice runs on Pentium PCs. It offers attendees the chance to gain some hands-on experience with the development environment, build their own worlds, and try their hands at both desktop and virtual reality applications built with Alice.

Alice is available free for Windows 95 platforms from:
http://alice.virginia.edu





CONTACT
Jeff Pierce
User Interface Group
Carnegie Mellon University
5000 Forbes Avenue
Pittsburgh, Pennsylvania 15213 USA
jpiercet@cs.cmu.edu

Kiyoshi Arai (Hitachi, Ltd.)

Bunraku, the traditional Japanese puppet show, was originally established as one of the most popular entertainments in Japan a few hundred years ago. In a Bunraku play, a puppet is manipulated by three puppeteers: one for facial expressions and the other two for body movement.

Cyber Bunraku is an experimental system that supports manipulation of CG characters in real time. A facial expression tracker is used by the facial performer, while the puppeteering device for body movement is used by a traditional Bunraku puppeteer. The two performers create the 3D CG character's movements, behaviors, and emotions, which allows the audience to enjoy a brand-new traditional art form. The system was developed by Hitachi, Ltd. and Fuji Television Network, Inc.

CONTACT
Kiyoshi Arai
Central Research Laboratory
Hitachi, Ltd.
1-280 Higashi Koigakubo, Kokubunji
Tokyo 185, JAPAN
arai@crl.hitachi.co.jp

COLLABORATORS
Ken-ichi Anjyo, Yasuhiro Higashide, and Hiroshi Sakamoto

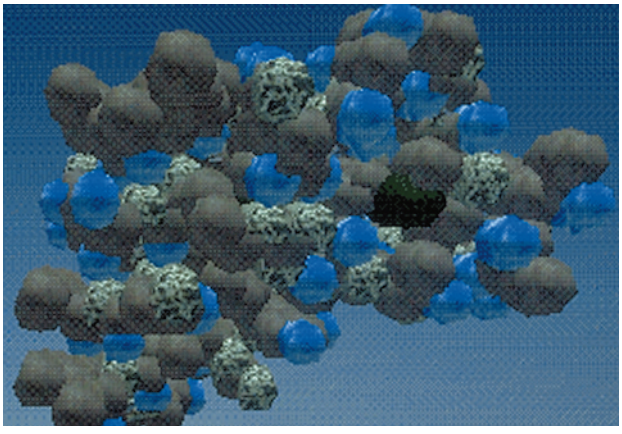
Ensconced in a structure suggesting an Aztec ceremonial temple, participants discover a richly detailed, interactively evolving map illustrating the rise and fall of civilizations in the Valley of Mexico over 3,000 years and the ensuing ecological transformation of the basin. Throughout the map, portals allow virtual visits to selected sites as they are believed to have looked at the heights of their development and as they appear today. Prehispanic music, performed on period instruments, provides an aural accompaniment to the visual experience, and the subtle scent of capal augments the sensation of presence in a different time and place.

CONTACT
Tomas J. Filsinger
Apartado postal 5-325
Las Palmas
Cuernavaca, Morelos C.P. 62051 MEXICO
http: / / www.emersis.com.mx

COLLABORATORS
Antonio Gonzalez Cuesta and Luis Perez Ixoneztli

With the support of the National Science Foundation, this project explores the utility of physical immersion and multisensory perception to enhance science education. One objective of Project ScienceSpace is to investigate whether sensorially immersive, constructivist learning can remediate typical misconceptions in the mental models of reality held by many students. Another is to study whether mastery of traditionally difficult subjects (relativity and quantum mechanics, for example) is enhanced through learning-by-doing.

These subjects are difficult to teach because learners cannot draw analogies to personal experiences that provide metaphors for many science phenomena. ScienceSpace enables learners to experience these phenomena and inculcates an instinctive, qualitative understanding as a motivation and basis for future study. ScienceSpace now consists of three virtual worlds that address Newtonian mechanics, electrostatics, and molecular structure. So far, research has shown significant learning gains (compared with traditional approaches) on the part of both high school and college science students.

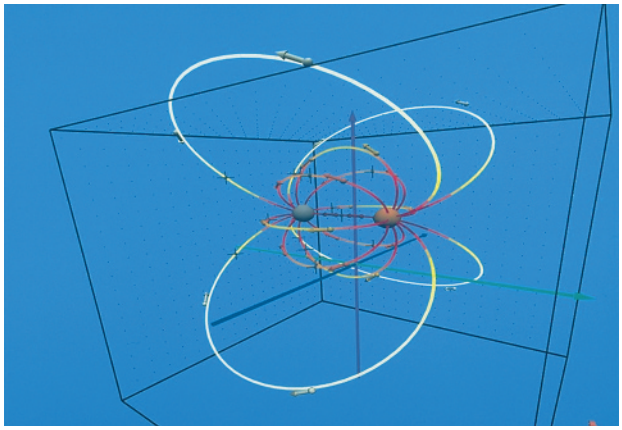


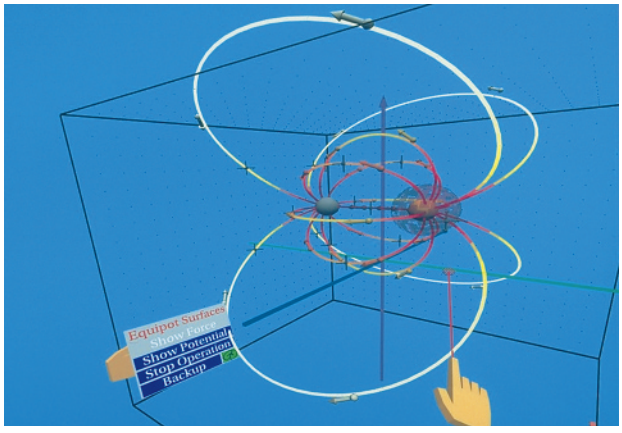
CONTACT

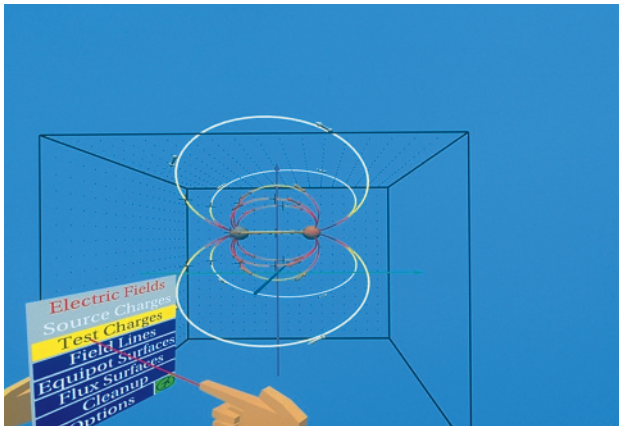
R. Bowen Loftin
Virtual Environment Technology Laboratory
University of Houston
4800 Calhoun, MS CSC-3475
Houston, Texas 77204-3475 USA
bowen@uh.edu

COLLABORATORS

Chris Dede and the National Science Foundation




Equipot Surfaces
Show Potential
Stop Operation
Backup


Electric Fields
Source Charges
Test Charges
Field Lines
Equipot Surfaces
Flux Surfaces
Cleanup

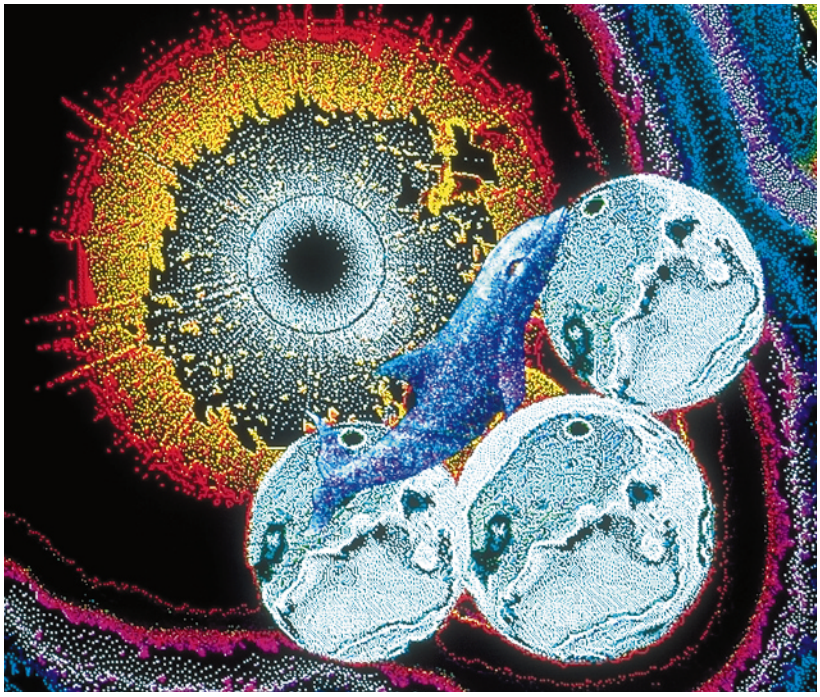
Mind Garden is a three-dimensional audio, visual, and neurolinguistic journey through a fractal garden environment. Using MindSet, a state-of-the-art interactive brainwave software, human brainwaves activate fractal forms, sounds, and words as objects in this VRML world. Growth in the Mind Garden is viewable on the World Wide Web and can be monitored at the Mind Garden Web site:

http://www.leonardo.net/virtualdesign.

The project combines the technologies associated with EEG, digital brainwave analysis, system design, the World Wide Web, and the synthesis of digital audio, visual, and linguistic media. Participants are asked to relax and focus their attention, which generates frequency variations in their brainwave signals, which in turn determine forms, sounds, and word objects.

The journey is determined by the brainwave activity derived from each user's own imagination. Participants who predominantly signal theta wave activity will experience a journey of greater complexity and focus, and participants experiencing beta brainwave activity may find the journey confusing and/or uneventful. The challenge is to experience the garden as controlled by theta and delta brainwave activity, thus perceiving a deeper and more complex view of the simulated reality. The goal is to achieve the ultimate experience in the Mind Garden by tuning one's frequencies to the deepest level.

The journey is best when participants have no food or alcohol in their digestive systems prior to their interactive experience.



CONTACT

Paras Kaul
Paras West Productions
University of California, Santa Barbara
11714 Goshen Avenue, #204
Los Angeles, California 90049
parasw@well.com

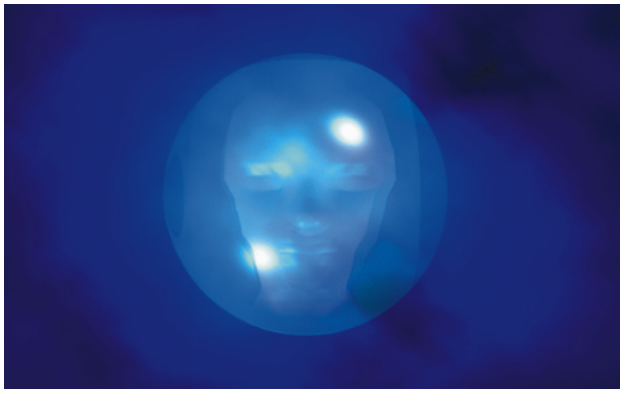
COLLABORATORS

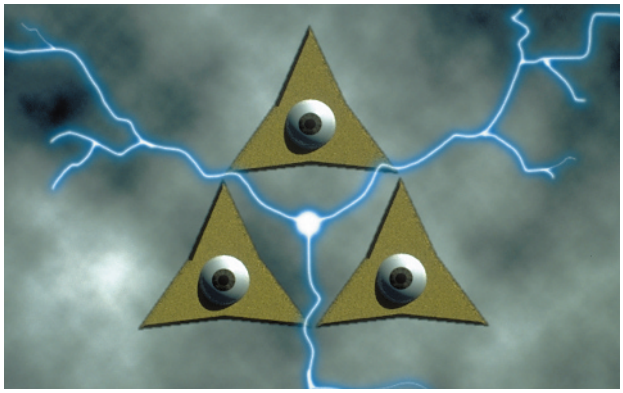
kf.Oe, Create Studio/University of California, Santa Barbara; Barry Keys; Crystl Peritore; Chris de Giere; Sergio Robledo; and Curtis Kosky

SPECIAL THANKS TO:

Terence McKenna, Shaman Au, Dave Cole, and Sunil Gupta

Wango: COMPOST (Compost) is an interactive system that places the audience in control of live video and audio feeds while they navigate through a real-time interface. The Wango Compost Processing Center (WCPC) combines data generated by portable recording technology attached to human vehicles called Decomposing Agents. At SIGGRAPH 97, these agents transmit audio/video information back across the Internet via the WCPC. Hosted by a virtual cyber-presence, both live and virtual attendees explore new ways of controlling media types through live interaction. The primary goal is for people not physically in Los Angeles for SIGGRAPH 97 to be able to experience as much interaction as a person attending the conference.





CONTACT
Cassandra Lehman
The CADRE Institute
San Jose State University
One Washington Square
San Jose, California 95192 USA
cas@riverview.com

PROJECT LEADER
Jeffery Cheung

PROJECT MANAGER, FINANCE COORDINATOR, CYBERHOST ANIMATOR
Paul Leuvano

WEBMASTERS
Thad Jones
Lamberto Alvaro

DIGITAL VIDEO DIRECTOR, TECHNICAL DIRECTOR
Sean Roach

DIGITAL VIDEO AND TECHNICAL ASSISTANTS
Tony Troung
Gerald Willie

AGENT AGENDAS
Mike Covington
Tony Troung

COMPOST PROCESSING, VIDEO TRANSMISSION
Mike Covinton
Jack Furlow
Mike Pyrch

CYBERHOST ANIMATOR
Will Ogden

COLLABORATORS
Ian Atchison, Jeffery Cheung, Corrine Jew, Lamberto Alvaro, Monica Arman, Don Hart, Thad Jones, Candy Murillo, Ed Muyco, Anthony Scannel, Lorena Vidrio

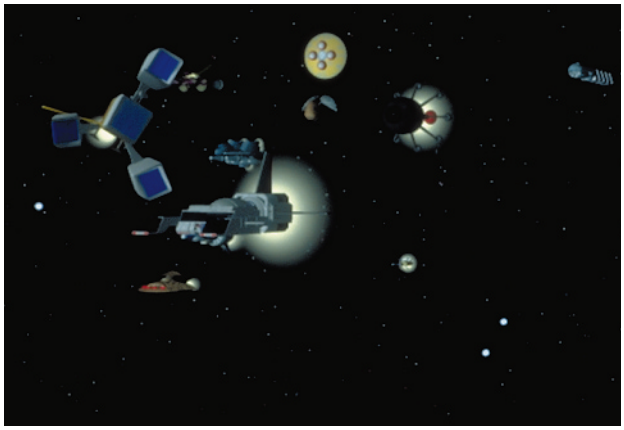
This simulation program was developed as a children's attraction for a municipal science museum. The scale of the venue did not permit a 60-fps projection system or computer-controlled moving seats. The system uses a network of personal computers to create a simulated experience that involves children in imaginative team play in an exciting space adventure.

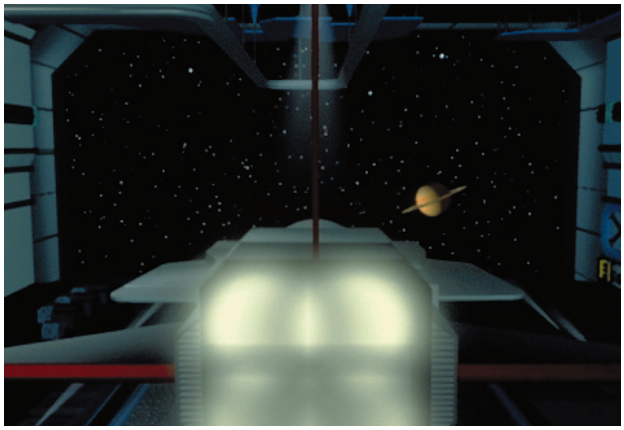
Participants choose one of two roles. They either join a team of astronauts on an interstellar voyage or stay in Mission Control here in our Solar System, where they help the spaceship crew look for the secrets of the universe.

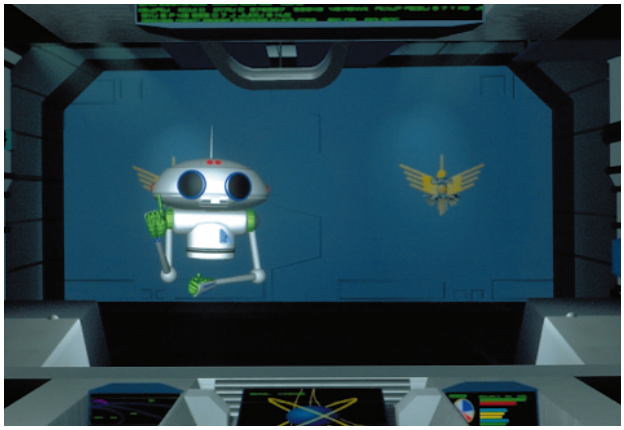
CONTACT
Yuichiro Kamata
Cyber Network, Co. Ltd.
4th Floor, Shio-Seven Building
7-4 Honshio-cho
Shinjuku-ku, Tokyo 160, JAPAN
you@cyber-net.co.jp

CONTACT
Nobu Masuda
Cyber Entertainment, Inc.
5111 Denny Avenue, #10
North Hollywood, California 91601 USA
masuda@cyber-net.co.jp
CYBERENTER@aol.com

COLLABORATORS
Tanseisha, Co. Ltd.
Yaizu Discovery Park

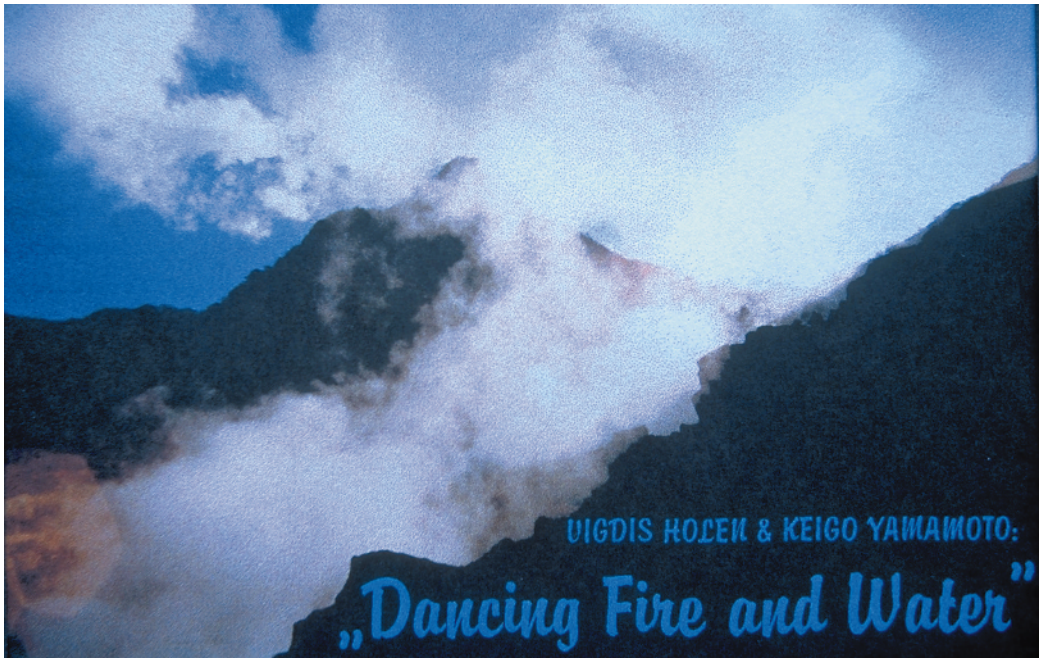






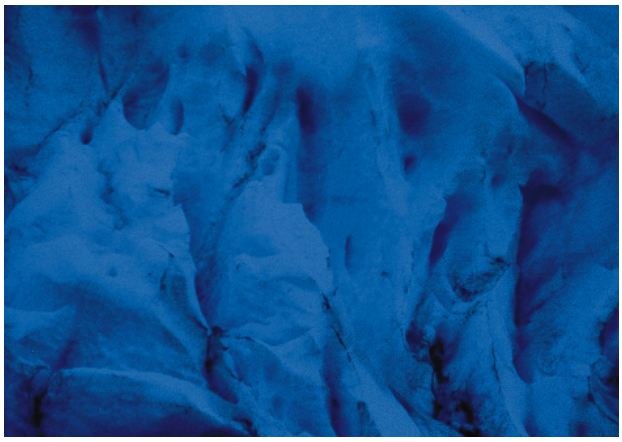
Dancing Fire and Water is an artistic expression of sounds and images of two of the earth's great energies: Norway's Jostedal glacier and Japan's Owakudani volcano. It is an encounter between fire and water, two of the four fundamental elements in the universe. Live communication via ISDN is maintained between Jostedalsbreen, a growing glacier; Owakudani, an active volcano in Japan's Hakone; and SIGGRAPH 97 in Los Angeles.

The essential dilemma for artists is how to involve themselves with humans' inner feelings in life beyond terminals. There are digital and analog networks in the human world, and there are two kinds of worlds: virtual reality and authentic reality. Like a dream, these networks come and go between the space-time of these two realities. These worlds also generate new, imaginative, and creative art. These circumstances will radically change human existence in the future.



CONTACT
Vigdis Holen
Vig's Kunstlab
Firdavegen 22
68960 Sandne, NORWAY
vigdis@axp1.vestdata.no

COLLABORATORS
Keigo Yamamoto, Jaroslaw Hollan, Ole Johnny Devik, Akihiko Shibata, Junji Tsudada, Ayuka Yamazaki, Tomoko Shibata, Kazumi Kinoshita, Sachiko Kurihara, Hisashi Wakabayoshi, Tadahiro Tazumi, Chiaki Matsumura, and others



Fantasy^3

J. Michael Moshell, David Haxton, Charles E. Hughes, Mark Kilby, and Jerry Gardner

Theme parks, movies, and virtual environments have much in common. Some have even claimed that simulated experiences will render theme parks obsolete. A partnership between the University of Central Florida and Disney i.d.e.a.s in Orlando is experimenting with the concurrent creation of an animated movie and a Web-based virtual experience above a theme park: Disney/MGM Studios. The key question: how can virtual world-building and animated film-making inform each other?

Fantasy^3 is a year-long Senior Design Project involving 30 undergraduate students from six academic departments, four faculty members, and several graduate students. The animated film concerns a group of aliens in a tour bus/spacecraft who visit the park and have typical tourist experiences, with a twist. The virtual world is similar, and some of the same experiences are available, but the story may turn out differently.

CONTACT
J. Michael Moshell
University of Central Florida
Computer Science Department
Orlando, Florida 32751 USA
moshell@cs.ucf.edu

COLLABORATORS
The students of the CREAT Program

PRoP: Personal Roving Presence

Eric Paulos

In the rush into cyberspace we leave our physical presence and our real-world environment behind. The internet, undoubtedly a remarkable modern communications tool, still does not empower us to enter the real world of the person at the other end of the connection. We cannot look out their window, admire their furniture, talk to their office mates, tour their laboratory, or walk outside. We lack the equivalent of a body or Personal Roving Presence (PRoP) at the other end with which we can move around in, communicate through, and observe with. However, by combining elements of computer graphics, the internet, and tele-robotics it is possible to transparently immerse users into navigable real remote worlds filled with rich spatial sensorium and to make such systems accessible from any networked computer in the world, in essence: globally accessible tele-embodiment.

We have populated the Electric Garden with several special tele-robots including several ground based surface cruisers and few space browsing airborne blimps to provide the sensation of tele-embodiment. Drivers and pilots control these PRoPs and experience their remote world through live two-way audio and video. Attendees can also control and interact with separate virtual PRoPs inhabiting a simulated world that exhibits realistic physical and dynamic behavior.

CONTACT
Eric Paulos
University of California, Berkeley
Computer Science Department
387 Soda Hall
Berkeley, California 94720-1776 USA
paulos@cs.berkeley.edu

COLLABORATORS
John Canny and Francesca Barrientos

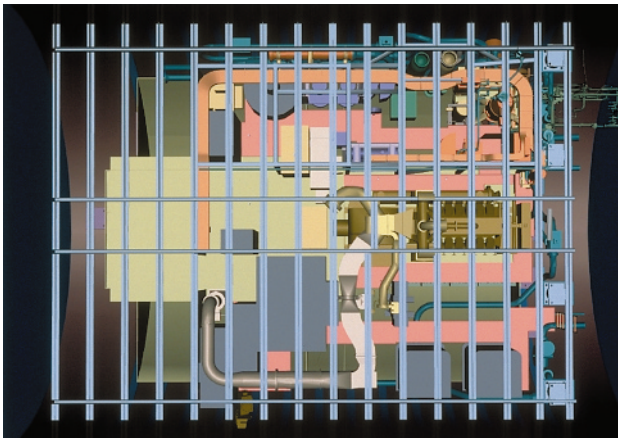
• Mary Whitton, Gary Bishop, Fred Brooks, Nick England, Henry Fuchs, Anselmo Lastra, Dinesh Manoch, John Poulton, and Russell Taylor

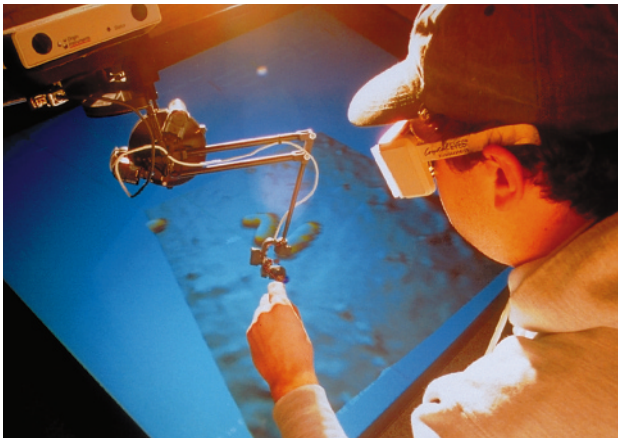
Walkthrough
Interactive visualizations for design of complex environments containing millions of primitives, such as those of houses and ships, are severely limited by the frame rates obtainable using current graphics workstations. Use of advanced model-management techniques to reduce model complexity, while retaining essential visual information, makes interactive walkthroughs feasible. In this interactive experience, the user walks through a very large, complex model. It illustrates a variety of model-management techniques, such as visibility culling, dynamic tessellation of higher-order surfaces, static and dynamic model simplification, and textured impostors, to enable rendering at interactive rates.

http://www.cs.unc.edu/~walk

nanoManipulator
The nanoWorkbench adds a PHANToM force-feedback device to a rear-projected display to allow the user to touch the objects that are displayed. This overlay of the visual with haptic spaces provides the sense of a solid object that can be prodded and molded by the user. The nanoManipulator system is connected to an atomic-force microscope to allow participants to move, bend, and stack "bucky tubes" on a sub-micron playing field.

http://www.cs.unc.edu/Research/nano.





CONTACT
Mary Whitton
Department of Computer Science
University of North Carolina
Chapel Hill, North Carolina 27599-3175 USA
whitton@cs.unc.edu

Image-based Rendering

In the past few years, a new method of rendering has received a great deal of attention. This new approach, image-based rendering, uses one or more reference images as the basic primitive in contrast to the geometry used in traditional rendering. Since the reference images may be directly acquired from the environment through photography or video, image-based rendering promises to deliver a level of realism that has, so far, been unobtainable using traditional rendering. In this experience, the user walks though a real-world scene rendered from a set of captured reference images, rather than from traditional geometric models.

Sunset Boulevard

• Margaret Crane, Dale MacDonald, Scott Minneman, and Jon Winet

Interactive narrative hits the street. Motorists on Hollywood's legendary Sunset Boulevard activate and control a drive-by soap opera playing on two outdoor billboard-sized TVs at Billboard Live, a high-tech nightclub.

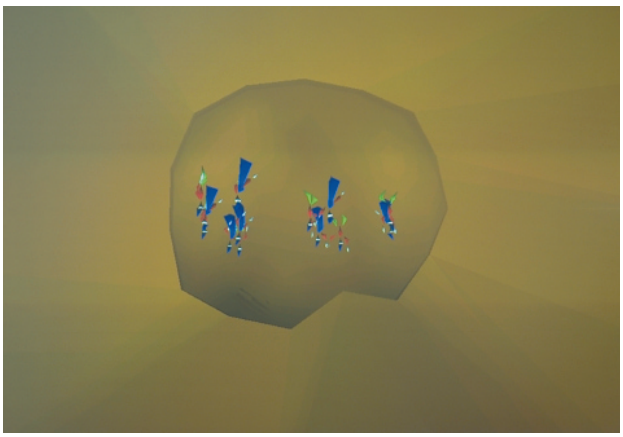
Two ubiquitous consumer technologies (radio car-security keyfobs and garage-door openers) allow the story to be steered by radio signals from the passing vehicles of this driven metropolis. Viewer participation ignites curiosities about quotidian dramas and life behind closed doors as the electronic garage door, on the screen, opens to reveal unexpected secrets. A soundtrack is transmitted on an ultra-low-power radio station associated with the displays.

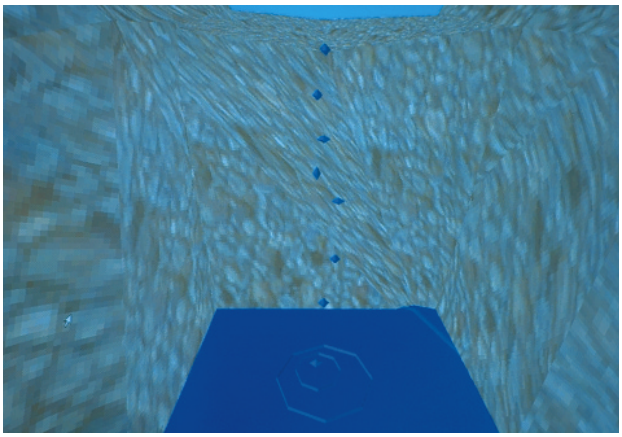
Viewers at the Los Angeles Convention Center also observe and participate in the Sunset proceedings.

CONTACT
Scott Minneman
Xerox PARC
3333 Coyote Hill Road
Palo Alto, California 94304 USA
minneman@parc.xerox.com

This is an experience of being in a fey place with an active population of "little people." You are standing in a fairy ring of mushrooms in a tiny valley surrounded by bushes and rock walls, lit by the golden glow of the late afternoon sun. The bushes are real, the rock walls are cloth, the golden glow comes from the far end of the valley, which is a virtual reality projection wall. In the real bushes around you, you hear the rustle and squeak of tiny people, busy with their unseen lives. In one of the real side walls is a tiny grotto in which tiny virtual shapes are dancing to bright music. When you approach, they "poof" in alarm. In the other side wall is a tiny virtual waterfall that "splashes" off your hand when you reach out to touch it. In the virtual end of the garden, you see small people who go about their errands until you get too close, when they squeak in dismay and hide.

Faery Garden uses virtual reality, MIDI sound, theatrical techniques, and real world objects to blur the real and imaginary worlds together into a compelling visit to a magical place.





CONTACT

Eben Gay
2 Moore Road
Southboro, Massachusetts 01772 USA
eben@ergeng.com

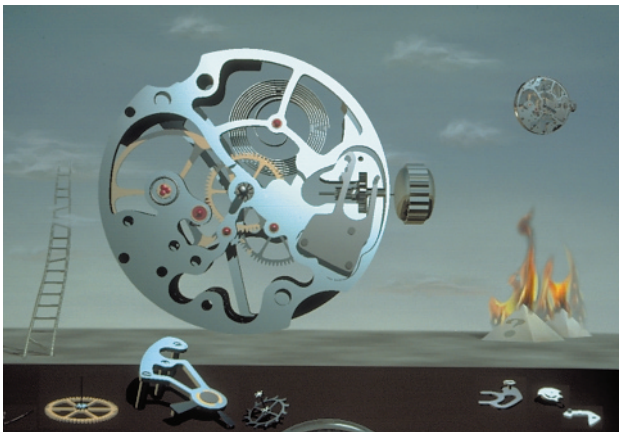
COLLABORATORS

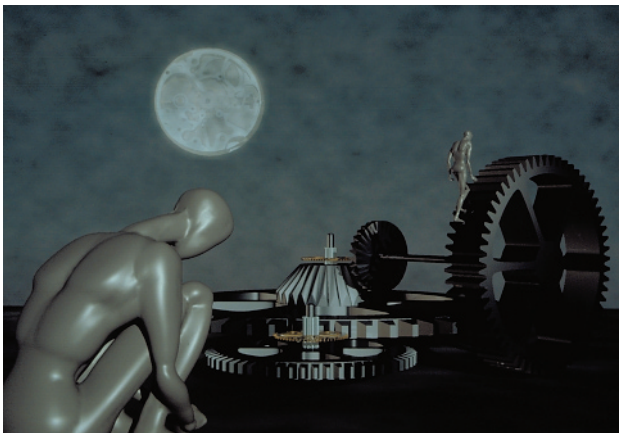
Eben Gay, Amatul Hannan, Brenden Maher, Colin Owens, Eric Pierce and Ann Powers

The Land of Time is a 3D puzzle that consists of two different stages. In the game part, a puzzle is presented. Clock parts are delivered onto the stage. When dragged, they move, snap, drop and bounce. By solving the puzzle, or just playing with it, the user creates the other stage: the result stage. At first, the result stage is just blank. As the clock is assembled piece by piece, the result stage accumulates more and more elements. When the puzzle is completed, the clock starts ticking, and "time starts to flow" in the result stage.

The images and/or animations in the result stage are personal impressions of time and people. We are all bound to time; there are no exceptions. While time itself is rather hard for us to feel, a clock provides the illusion that it is controlling us with its own power.

CONTACT
Youn H. Lee
11215 Research Boulevard, #2168
Austin, Texas 78759 USA
youn@sva.edu

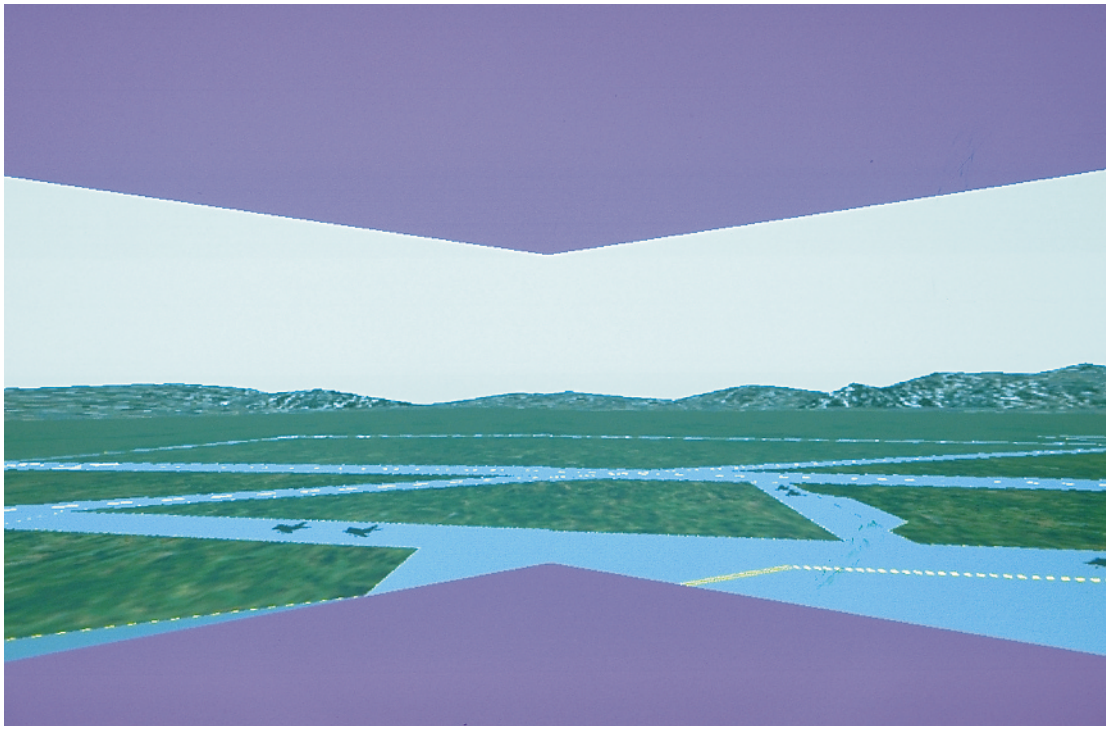




Virtual Environment ATC Tutor (VEAT)

• Chuck Lexa

The VEAT is a three-dimensional interactive tutor designed to teach and refresh students on the fundamentals of air traffic control. It utilizes virtual environments, voice recognition, 3D sound, and artificial intelligence (AI) to provide a complete adaptive training system. AI allows the tutor to adapt to individual students, which ensures that they receive proper training without the presence of an instructor. In addition, the virtual world can be made specific to an airport, providing on-site training and allowing for faster site certification while reducing training costs.

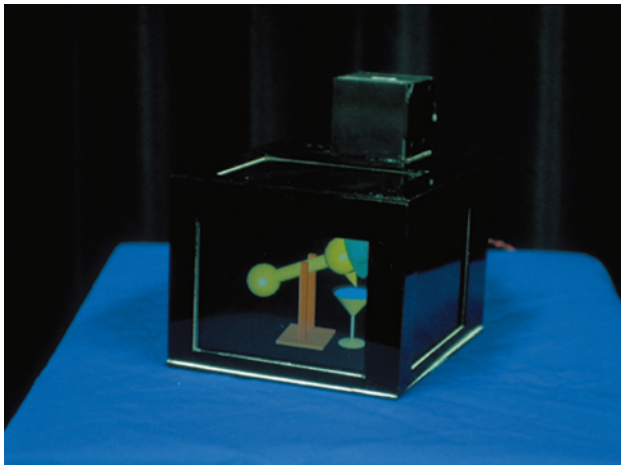


CONTACT
Chuck Lexa
Human Resources Directorate
Armstrong Laboratory
7909 Lindbergh Drive
Brooks Air Force Base, Texas 78235 USA
lexa@alhrt.brooks.af.mil

COLLABORATORS
Jim Fleming, Iler, James Marvin, Amn Shan Pomeroy, and Wes Regian

• Masahiko Inami, Naoki Kawakami, Taro Maeda, and Susamu Tachi

The MEDIA^3 (MEDIA CUBE) consists of liquid crystal displays arranged in the shape of a cubic body. In coordination with the motion of an operator's head and the MEDIA^3, synthesized images of virtual objects (an insect, a tropical fish, artworks, a medical image, etc.) located inside the MEDIA^3 appear on each LCD. The effect is exactly the opposite of that generated by an OMNIMAX or CAVE system. Instead of an operator located inside the virtual world, operators of the MEDIA^3 see an inner virtual world from outside. In other words, the MEDIA^3 is an object-oriented display.



CONTACT
Masahiko Inami
Tachi Laboratory
MEIP Faculty of Engineering
University of Tokyo
7-3-1 Hongo, Bunkyo-ku
Tokyo 113, JAPAN
minami@star.t.u-tokyo.ac.jp

COLLABORATORS
Fumihiro Endo and Toshitomo Ohba

A revolutionary, entirely new prototype, Big Head Racer has been created with the objective of personalizing video racing entertainment experiences. It allows participants to see a live video image of themselves in the cockpit of a futuristic racing machine, competing against other drivers (whose heads also appear in their cars) in a race for the finish line!

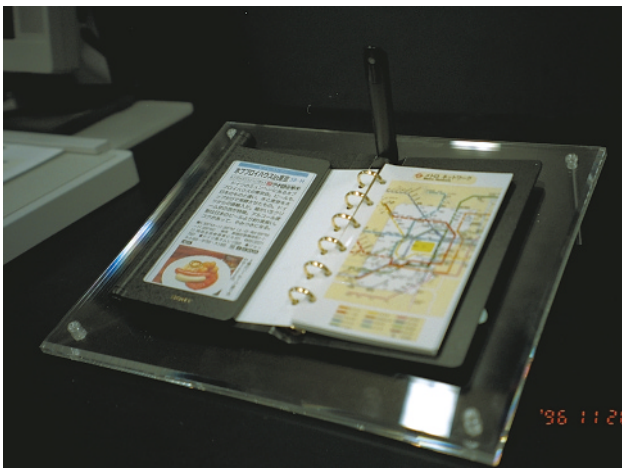
For the first time, players pilot their own machines! Unlike games that provide generic heroes (or no driver at all), Big Head Racer does not require users to imagine that they are in control of the vehicle, because they're right there on the screen! Big Head Racer modules are linked for the ultimate in competitive experiences, so players can go head to head for the checkered flag!

CONTACT
Valerie Dunford
VIVID GROUP
317 Adelaide Street West, Suite 302
Toronto, Ontario M5V 1P9 CANADA
valerie@vividgroup.com
http://www.vividgroup.com

COLLABORATORS
David Bennett and Jim May

Currently, the personal computer is the core of most intelligent, integrated consumer electronics and communication systems. Like GUI's in the computer industry, these intelligent audio/visual, computer/communication (AVCC) systems lack a standardized, truly intuitive user interface. This presents a serious problem for novice users.

Ultra Magic Paper Interface is a new type of user interface based on tactile input on plain paper, featuring ease-of-use and unified operation for AVCC systems. The system's ease of operation and extensibility have been enthusiastically received by test users.



CONTACT
Hiroshi Usuda
Architecture Laboratories
Sony Corporation
6-7-35 Kitashinagawa, Shinagawa-ku
Tokyo 141, JAPAN
usuda@sys.ptg.sony.co.jp

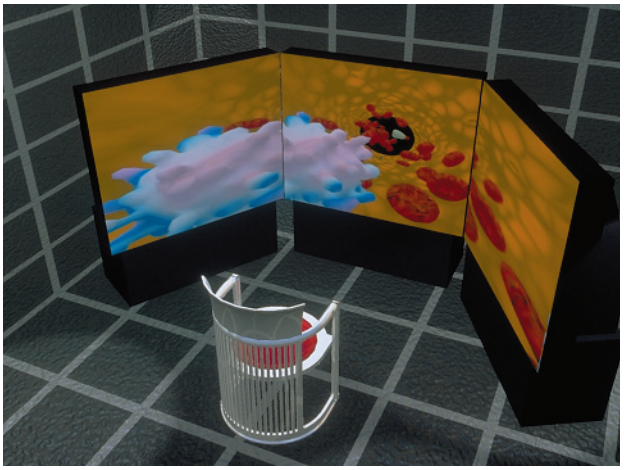
COLLABORATORS
Mitsuhiro Miyazaki, Ikuhiko Nishio, Motohiro Kobayashi, Takashi Hosoda, Yuko Tsukamura, and Ken Kubota

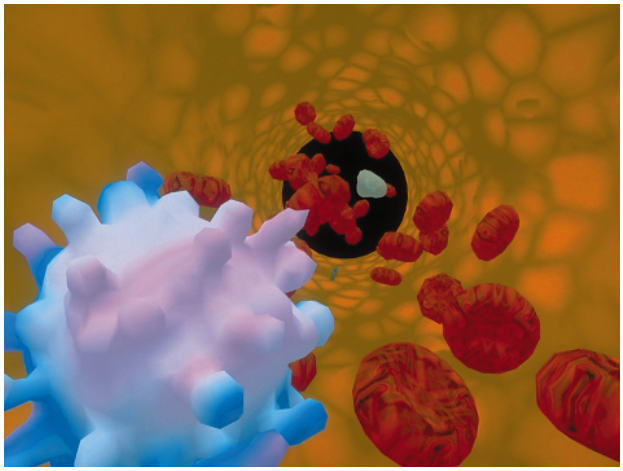
The Virtual Explorer project seeks to create highly interactive virtual environments for stimulating, immersive science learning experiences that are not possible with textbook-based approaches. The current system provides a realistic and content-rich environment for teaching basic immunology.

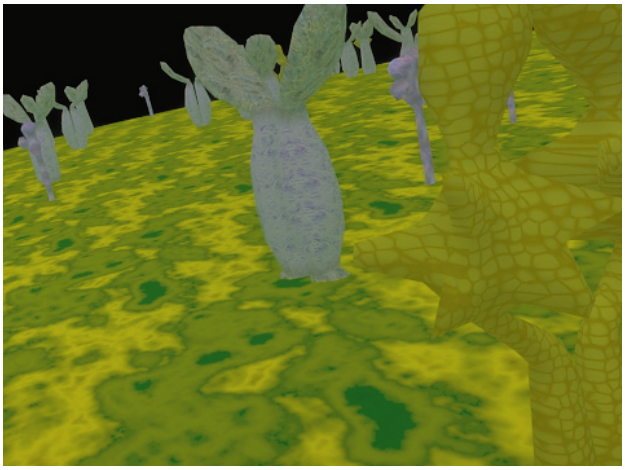
Students navigate through the bloodstream, the lymph system, and infected tissue of a patient, performing the assigned tasks and functions of the immune system from various first-person points of view, and enhancing their integrated understanding of its complex processes.

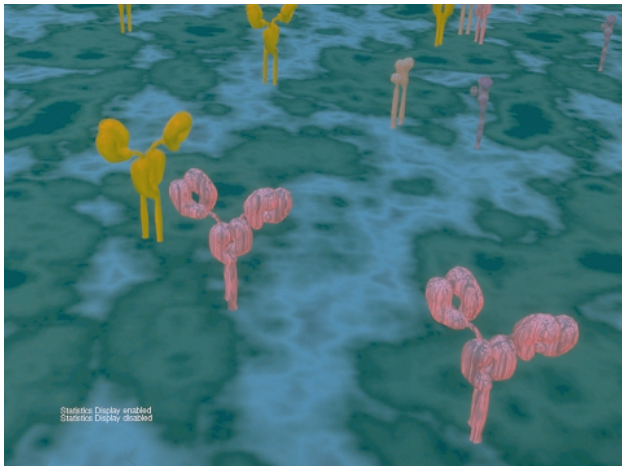
The virtual environment simulates the viewscreen of a nanobot that has been injected into a human body. It includes detailed, biologically accurate models of cells and proteins of the immune system and bloodstream, which are rendered in real-time during the simulation.

Eventually, the Virtual Explorer project will be extended to include additional fields of science education.









CONTACT
Kevin Dean
Senses Bureau
University of California, San Diego
9500 Gilman Drive, 0339
La Jolla, California 92093 USA
kld@chem.ucsd.edu
http://www-wilson.ucsd.edu/ve/

COLLABORATORS
Kevin Dean, Evan Finn, Jeremy Friesner, Bret Naylor, Sarah Wustner, Kent Wilson, and Scott Fisher

WonderSpace is a browser for visualizing a virtual world in cyberspace, where lifelike creatures act according to VRML 2.0 and a specification for skeleton animation. Through human-like avatars, WonderSpace realizes voice or sound communication in multi-user cyberspace. Technical features include compression/decompression of shape data and motion data, modified motions generated from a base motion, motion connecting, and synchronizing motion with sound.

At SIGGRAPH 97, WonderSpace technology provides three interactive experiences:

1. DayDream is the virtual-life world for voice chats via human-like avatars.

2. Wonder KARAOKE is a virtual KARAOKE world with dancing avatars.

3. Wonder ShrineOmikuji is a virtual Japanese shrine with interactive avatars that seek to attain "Omikuji," a Japanese technique for predicting the future.

CONTACT

Toshiya Naka, Yoshiyuki Mochizuki
Multimedia Development Center
Matsushita Electric Industrial Co., Ltd.
1006 Kadoma, Kadoma-shi
Osaka 571, JAPAN
naka@isl.mei.co.jp
Mochik@isl.mei.co.jp

COLLABORATORS

Shigeo Asahara (Team Director) and Michiharu Katsuda (Programmer)

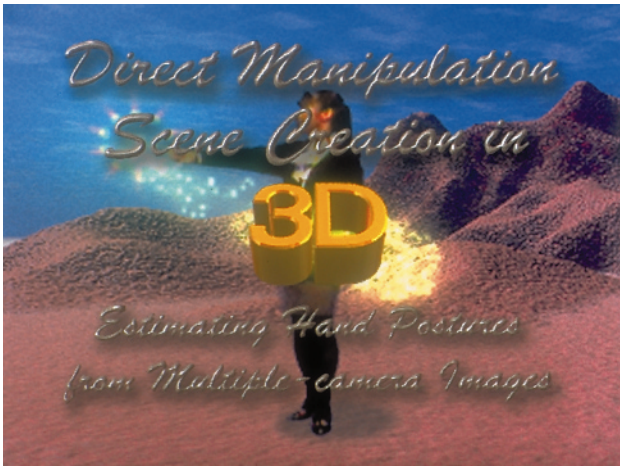
Direct Manipulation Scene Creation in 3D: Estimating Hand Postures from Multiple-Camera Images

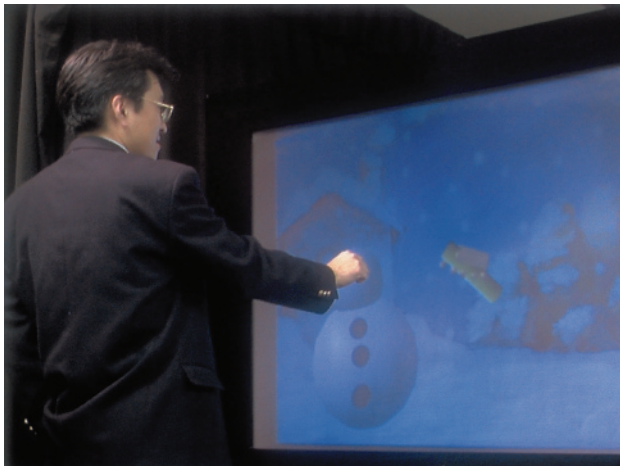
Akira Utsumi

In virtual reality systems, virtual objects and scenes have so far been created manually, or semi-automatically, by a variety of computer graphics utility software. This approach, however, is time consuming and demanding.

In this alternative approach, the system allows users to create different colors and shapes of virtual objects in 3D spaces by direct manipulation. It is based on a proprietary, multiple-camera-based hand posture estimation method, in which palm poses are estimated from multiple-camera images by a statistical approach regardless of finger bending. Then, hand gestures associated with commands for direct manipulation are recognized by verifying the finger bending.

With this system, participants create virtual 3D scenes by giving predefined commands with their own hands, to which no sensing devices are attached. Since the virtual scenes are displayed on a 3D display, participants feel as though the virtual scenes are real 3D spaces, even though they are not encumbered by technological equipment.





CONTACT
Akira Utsumi
ATR Media Integration & Communications Research Laboratories
2-2 Hikaridai. Seika-cho, Soraku-gun
Kyoto 619-02, JAPAN
utsumi@mic.atr.co.jp

COLLABORATORS
Jun Kurumisawa, Takahiro Otsuka, and Jun Ohya

In a studio atmosphere extending across time zones, students imagine and filter realities and cultures, and offer personal views on life potentials. They share art, visions, experiences, and adventures through creative efforts in animation, multimedia, Web site development, and telecommunications.

Works flowing from HORIZONS represent destinations and directions, expand understanding through new knowledge and contact, and reference or interpret explorations and discoveries of the past, present, and future.

Regional and international sites support experimentation in CG animation, interactive and object-oriented multimedia, QuickTime movies, dynamic Web site production, and Internet videoconferencing. Artists and mentors collaborate with young students in networked studio environments alive with concepts and conviviality, where narratives and realized works are communicated to remote partners via the Internet and a dedicated server.

Participating sites include:

- Duquesne University School of Education, Pittsburgh, Pennsylvania USA
- YBG Studio for Technology & The Arts, San Francisco, California USA
- New Orleans Center for Creative Arts, New Orleans, Louisiana, USA
- Local high schools, Los Angeles, California USA
- Israel Museum Youth Wing, Jerusalem, Israel
- K-bit Institute and CGT Kids World, Japan

CONTACT

Robert Dunn
Arc Vertuel, Inc.
School of Education
Duquesne University School of Education
111 The Oaks
Pittsburgh, Pennsylvania 15215 USA
rd1s+@andrew.cmu.edu
http://www.telecommunity.org

COLLABORATORS

Melanie Carr, Rachel Gerstein, Susan Hazan, Carrie Lee, Sim Graves, Bill Weinman, Nathan Fullerton, Sergio Ferdman, Alex Leltchouk, Gunhan Danisman, Andrew McCain, Keigo Yamamoto, Nobuo Yoshikawa and students from Pittsburgh, San Francisco, Los Angeles, Jerusalem, and Japan

This project presents two 3D imaging systems:

1. A stereo camera system that acquires a dense z-map for a scene. The prototype system demonstrates compositing of motion video and other real or even virtual segments, with full depth information and interaction between elements / actors in each segment. New algorithms considerably minimize occlusion and boundary overreach problems.

2. A real-time rangefinder that utilizes a dual-laser and single camera to calculate and display range information at video frame rates. A specially developed VLSI sensor with photodiodes integrated at the pixel level function as analog / digital micro-rangefinders, processing range data from an emitted laser for all pixels in parallel. The prototype demonstrates real-time range quantification of objects randomly selected by a user.

CONTACT

Atsushi Yokoyama
Hashimoto Signal Processing Lab
Sony Corporation
6-7-35 Kitashinagawa, Shinagawa-ku
Tokyo 141, JAPAN
ayoko@ius.ptg.sony.co.jp

COLLABORATORS

Jun Kurumisawa, Kazuyoshi Hayashi, Shinichi Yoshimura, Hideki Oyaizu, Takayuki Yoshigahara, and Yoko Miwa

In these two installations, participants enter two different rooms (which can be kilometers apart from each other) and virtually interact with each other in real time.

Point of Vue, Point of You
Images from two cameras, each one aimed into a separate space, are combined on two screens. By touching the screen, participants in each space select information from either of the two closed-circuit video cameras and, to a certain extent, create and organize their own images in real time and see them realized on the screen. In its constant displacements, the crowd in each space generates a group portrait and creates its own representation, which fills the space of each screen. The installation undermines the idea of belonging. Everybody's images is everybody else's. It is a visual mixture.

Body to Body
Participants' images are superimposed on images of others. Liberated of all technologies, they move freely to catch virtual objects that actually control their movements. As the participants' interaction evolves, the image of the others progressively vanishes from the screen, leaving viewers confronted only with their own images, as in a mirror.

CONTACT
Elsa Mazeau
89, passage Emile Boutrais
94120 Fontenay sous Bois, FRANCE

COLLABORATORS
LTCM laboratory (University Paris VIII)

Seiji Kobayshi

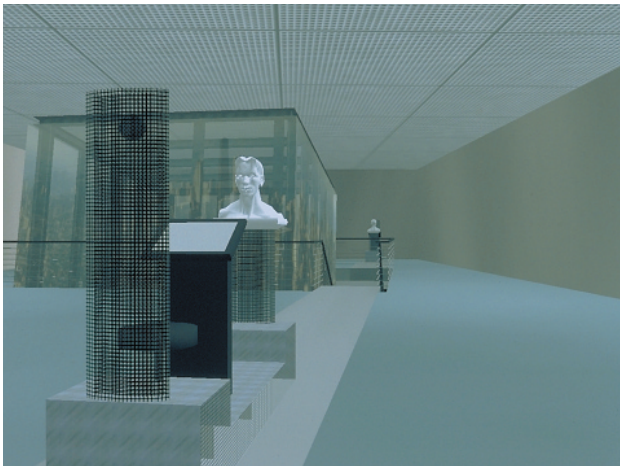
In this real-time human gesture recognition system, video images of a person are sent to a recognition module. The system does not require any sensors or cables to be attached to the subject's body. The key technology here is optical information processing. In the recognition module, video images taken by a CCD camera are presented to a holographic device that generates a vector representation of the gesture. The vector is then analyzed electronically to determine the gesture in real time.

CONTACT
Seiji Kobayashi
Advanced Development Laboratories
Sony Corproation
6-7-35 Kitashinagawa, Shinagawa-ku
Tokyo 141, JAPAN
seiji@devom.crl.sony.co.jp

COLLABORATORS
Yong Qiao, Ajay Chugh, Holoplex Corporation

Talking Head is a prototype product for a new generation of video conferencing. Video images projected on a bust give participants a true three-dimensional impression of their conversation partners, and implemented compensation algorithms generate eye-to-eye contact during the communication.

The effect is very interesting. At first, communication seems a little irritating, and astounding. But after a few moments, the user typically accepts the artificial “Talking Head” and feels comfortable with the communication. After some time, the user “forgets” about the fact that the communication partner is not real.

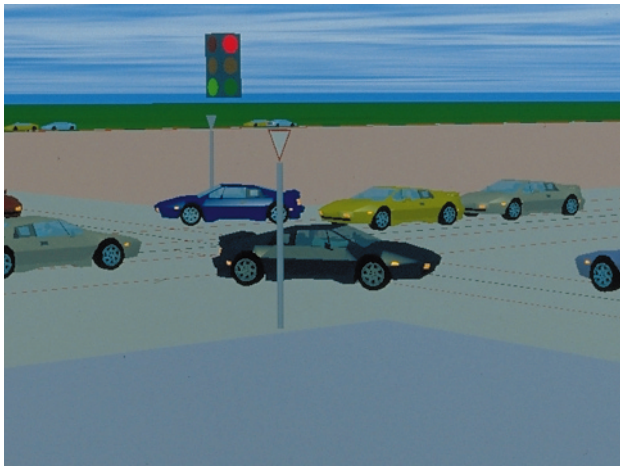


CONTACT

Gesellschaft fuer Mediales Gestalten Mbh
“The Virtual Company”
Kantstrasse 165
10623 Berlin, GERMANY
chris@well.com

Through virtual reality, Traffic Control offers a unique, interactive, highly entertaining, and completely new way of understanding traffic in urban environments. Users navigate in a very detailed model of Berlin, interactively choose their viewpoints (birds-eye, driver, bicycle, walking adult, little child), and interactively control traffic lights, signs, and vehicles.

A state-of-the-art simulation kernel shows highly realistic (chaotic) and complex traffic behavior in an environment of high-quality images generated by a Silicon Graphics Onyx2. Traffic Control is also suitable for real data input from street sensors.



CONTACT

Gesellschaft fuer Mediales Gestalten Mbh
"The Virtual Company"
Kantstrasse 165
10623 Berlin, GERMANY
chris@well.com

Magic Morphin Mirror: Face-Sensitive Distortion and Exaggeration

T. Darrell, H. Baker, F. Crow, G. Gordon, and J. Woodfill

From an early age, the image of one's face in a mirror evokes a quality of being connected and disconnected at the same time. One sees an "other," but knows it is one's self. This project explores the boundary between these qualities through a virtual mirror with face-specific image manipulation.

The system combines real-time special effects such as image morphing and texture synthesis with new advances in computer vision for face tracking and expression analysis. By distorting one or more aspects of a user's face in real-time, Magic Morphin Mirror creates a self-referential experience with an image that is clearly neither really oneself nor entirely synthetic nor autonomous.

Faces are central to human communication and yet machines have been largely blind to their presence. This project demonstrates that it is now possible to track and analyze faces in real time for interactive displays.

CONTACT
T. Darrell, H. Baker, F. Crow, G. Gordon, J. Woodfill
Interval Research Corporation
1801 Page Mill Road, Building C
Palo Alto, California 94304 USA
trevor@interval.com