ARSBOX

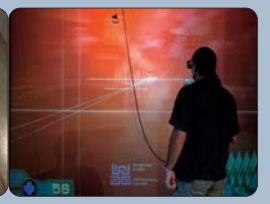
ARSBOX—CREATING IN VIRTUAL ENVIRONMENTS

The ARSBOX has been designed as a form of cross-media infrastructure making it possible to present, develop and manipulate a broad spectrum of media content. Immersive interactive 3-D worlds can be combined with videos and PowerPoint™ presentations, or, for example, linked with scientific workspaces like Mathematica™ in order to revise parameters of the displayed mathematical models in real time. Not only is the ARSBOX an innovative achievement in its own right; it enables innovation as well. The infrastructure's features open up new dimensions to enhance CAE (Computer Aided Engineering), design-on-the-fly, virtual prototyping and digital mockups.

In fall 2002, a jury of international experts selected the ARSBOX to be showcased in the Emerging Technologies exhibit at Siggraph, the world's largest computer graphics trade show held in San Antonio/Texas, USA.

VRizer

VRizer – GAME ENGINES ON THE ARSBOX

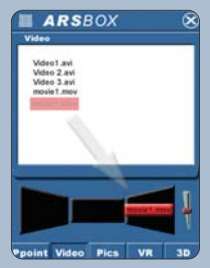


The use of game engines is currently the most widespread way to generate PC-based, interactive, real-time applications. Numerous games come with high-performance editors as standard equipment and thus give a broad spectrum of users the opportunity to realize their own conceptions in three-dimensional environments. The Ars Electronica Futurelab has gone one step further with the development of a special software framework and, in doing so, has closed the gap between applications based on game engines and the PC Cluster System ARSBOX *(futurelab.aec.at/arsbox)*. The software framework enables the user to make any OpenGL application compatible with any configuration of the ARSBOX in active and passive stereo mode. With the help of game editors, a user can create highly complex, effective and dramatic environments with a minimum of effort.

PALMIST

PALMIST—INTERACTION IN VIRTUAL SPACE

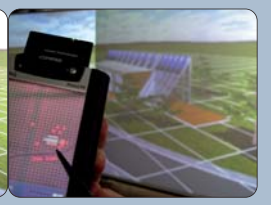
The PALMIST makes available all the basic functional features to control projection screens. By means of "drag & drop", any desired media context can be imported to the schematic depiction of any particular projection screen, and displayed in it. The user has complete control over his/her presentation environment at all times. Videos can be started, paused, stopped, and played forwards and backwards, and the same applies to PowerPoint™ slideshows, sounds or 2-D images. Different segments of media content can also be linked with or made to react to one another.



A simple example of this would be a switch in a 3-D application that, when activated, starts a video on another projection screen.
Navigation, control and manipulation in virtual space highlight the strengths of an "intelligent" interface. The objectives of the PALMIST are, to make available meta-information about the virtual world and, to enable the user to apply any parameters desired to that virtual world.

The ARSBOX makes it possible to do virtual prototyping in a simple, practical way. Changing the parameters of existing objects or creating new ones are both done on the PALMIST, and the results are visualized in real time. Not only can static parameters be changed; the PALMIST also allows the user to control the dynamics of the VR world—for instance, the speed of a conveyor belt, simulation parameters, etc.
By way of illustration, consider the process of landscape gardening whereby trees can be "planted" and scaled on the grounds surrounding a newly constructed building. With the ARSBOX, the architect and the landscape gardener can get together in a totally new type of design conference. Each sees exactly what the other does, so that they can collaboratively plan the arrangement of the trees in virtual space and experiment with the effects of light and shadow with trees of varying size. Another example is the mixture of colors to create a shade of auto body paint—different lighting situations can be combined on-the-fly with different paints and the results can be assessed on the spot.

ARSBOX VIRTUAL PROTOTYPING



Credits

Senior Executive Developer: Horst Hörtner

Key Researcher/Virtual Environment: Christopher Lindinger

Development: Florian Berger, Peter Freudling, Stefan Mittlböck-Jungwirth, Robert Praxmarer, Andreas Riedler, Andreas Jalsovec

The ARSBOX was realized in cooperation with the Department of Business Computing (Chair for Software Engineering, Prof. Gustav Pomberger) of the Johannes Kepler University, Linz

The system's interaction and control medium is a PALMIST—a pocket PC or a tablet PC equipped with a wireless LAN—running the FATE software framework developed by the Futurelab.

HIDDEN WORLDS BERLIN

MEDIA INSTALLATION AT SAP'S BERLIN REGIONAL HEADQUARTERS

The centerpiece of the medial mise en scène is *The Hidden World of Noise and Voice*, an installation by Golan Levin and Zachary Lieberman. The New York media artists have created software that depicts sounds and voices in virtual space. Everything that the installation's microphones pick up is interpreted by the system and translated into corresponding dynamic forms that subsequently populate the environment as virtual creatures. For example, a continuous tone, depending on its pitch, is represented as a thin snake or a fat worm slithering from the position of the microphone at which it originated out into three-dimensional space. A sonorous "blob", on the other hand, generates a compact shape that sluggishly moves forth from its source.

And this is how the previously empty space is transformed into a world full of formal variety, a domain of computer graphics whose diversity and dynamics suggest the species-richness of the oceans. The windows offering glimpses into this hidden world are rear-projection display units (Mitsubishi DLPs) that are capable of providing clear images in daylight conditions. Then, when night falls, the building's architecture is saturated by a series of large-scale projections. The architecture of the lobby and the ceilings of each upper level are visually dissolved by projections. This opens up a view through the exterior shell of the hidden world and makes it possible to follow the paths of the generated objects through the building from their point of origin to their vanishing point in the heavens above Berlin.

Credits

Idea and Concept: Gerfried Stocker, Horst Hörtner, Martin Honzik

Interactive Visuals: Golan Levin, Zachary Lieberman

Project Management: Martin Honzik

Software Design and Development: Wolfgang Ziegler, Peter Brandl, Roland Haring, Christian Naglhofer, Stefan Feldler, Christopher Lindinger, Florian Berger

Interface Design and Development: Stefan Feldler, Stefan Mittlböck-Jungwirth, Erwin Reitböck, Dietmar Offenhuber, Peter Freudling, Robert Abt

Virtual Designs and Sketches: Andreas Jalsovec, Peter Freudling, Reinhold Bidner, Helmut Höllerl, Stefan Schilcher, Martin Bruner, Nina Wenhart, Christine Pilsl

Coordination: Yvonne Hauser, Pascal Maresch

Special Thanks: Karsten Koch, Astrid Kasper, Hannes Fickenscher, Marc Braun, Robert Westphal, Goebl und Mattes

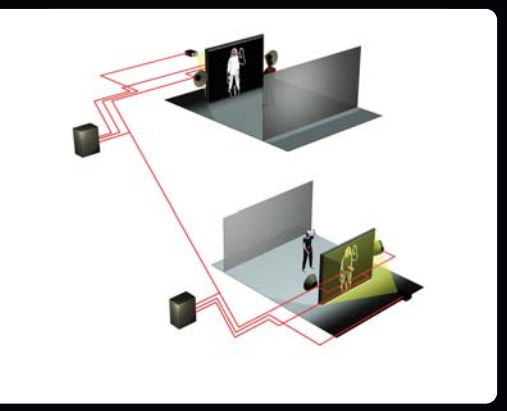
PULSE

Sensor-equipped surfaces installed immediately adjacent to the main entrance invite visitors to engage in direct physical contact with the building. The sensors set up there register the pulse of anyone who places his/her hand on the surface; after sundown, the beat is transmitted throughout the building. For a short time thereafter, the projections in the lobby and the levels above it pulse to the rhythm of the measured heartbeat. This interaction opportunity enables everyone to make their own very personal contribution to Berlin's cityscape by night.

INTERACTIVE ADVERTISING

Interactive advertising is a new way to call attention to commercial messages by means of interaction.

At SAP's Berlin regional headquarters, rear-projection display units (Mitsubishi DLPs) arranged facing the sidewalk along the facility's Rosenthalerstraße façade show commercial messages throughout the day. Subtle graphic attention-getters prompt passers-by to take notice of the content being displayed on these DLPs that deliver a sharp image under daylight conditions. Just by walking past, pedestrians leave behind traces on the display—ripples that resemble the waves made by the bow of a ship. Whenever someone remains stationary in front of the DLPs, his/her gestures are registered by cameras, interpreted in real time, and transformed into wave action on the screens. The result in this case is a series of concentric waves flowing out from a central point across the display. This enables passers-by—depending on the intensity of their gesticulations or movements in front of the DLPs—to produce scenarios ranging from the romantic ripples produced by a pebble tossed into a pond to the wild surf of an angry sea.



CO.IN.CIDE

TRACKS AND TRACES

residence.aec.at/coincide

Credits

Concept and idea: Heimo Ranzenbacher, Horst Hörtner, Robert Praxmarer, Ars Electronica Futurelab

Software: Robert Praxmarer

Stage: Stefan Mittlböck-Jungwirth, Martin Honzik, Christoph Scholz, Christoph Hofbauer

Web: Helmut Höllerl, Florian Landerl

A Liquid Music project for Graz 2003—Cultural Capital of Europe in conjunction with STADT_LAND_KUNST. Realized at the Ars Electronica Futurelab, Linz.
The programmatic context of co.in.cide is Liquid Music (www.liquid-music.org) a project that has been manifesting itself since 1998 primarily in the form of a small annual festival in the City of Judenburg.

THE INTERRELATIONSHIP OF TWO PLACES—THE THIRD PLACE

The third place is, to a certain extent, the power at work behind its concrete manifestations, a virtuality that is fed by reality/realities and that, in turn, feeds back on reality to realize itself. The place turns out to be a theoretical (topological) object. Art traditionally operates as it were from the state into which the theorization of things successively leads. The way in which images that make a strong impression on our conceptions of things come about says, as a rule, much more about their content than the pictures themselves. Art is directly addressed here: not as the producer of images (which it basically never was) but rather in its traditional role of focusing attention upon the non-visible aspects of what it shows, and from which what is visible draws its meaning. And this is the reason why the so often evoked school of seeing in art is also a school of political action. Not seeing what is visible but rather recognizing the forces that become visible is the basis of its aesthetic. *co.in.cide* formalizes the interrelationship of two "places" by means of a system of interaction that mediates between them—the "third place." Whenever the visualizations of visitors' bodies/ movements coincide with those of their telematic counterparts, they can open up a channel of verbal communication and establish eye contact. Only those who behave according to the conditions of the "third place" can reach that goal. When congruity is attained, the full image of the particular user's counterpart appears and replaces (assumes the place of) that user's own reflection. Saving and storing the images of the protagonists along with their voices concludes the process. The automatic upload of the file sets up an additional "place" on the Internet made up of visual and acoustic evidence (tracks + traces) of the interaction. The idea of the third place—the concept of decisive importance for *co.in.cide*—posits that the relationship that two places establish between themselves (or in which they are placed) creates for these places, even independently of the actual reference, binding conditions for the respective actions and activities carried out "on site."

LivingRoom is a multimedia installation that comes alive with the opportunity for interaction with new media ranging from playful experiences to educational project work.








LivingRoom

A PUBLIC SPACE INSTAL LATION

LivingRoom is a documentary, a game, a play, a single episode of a movie serial, animated feature, reality soap, comic strip ... and schoolwork.

Students can play out short stories on four stages set up at different locations throughout the school. These performances are transmitted to the school auditorium, where the various episodes displayed on four different screens merge into a single story and transform the school's physical premises into a narrative space. Real footage, cut-out animation sequences, live images and processed material from the Internet blend together to form partially random, partially scripted narratives. It is not only the screens on which the short stories are displayed that make this project into a living room, the point of *LivingRoom* is that the school is a place that is created by the activities that go on within it and not one of passive acceptance of predetermined routines. External influences also come into play—in this application via the Web. With a custom-designed video-processing interface, a user can recompile and rework existing episodes and, in doing so, show plot and narrative elements from a new perspective and tell alternative stories. Thus, narratives can be recorded totally spontaneously or planned in advance, and they can be realized individually or collaboratively. Virtual stage elements can be designed in different school classes or subjects and then be utilized live. Other possibilities include using *LivingRoom* for school theater performances and as an exhibition medium for school projects. Since *LivingRoom* has been conceived as a project that will accompany whole classes throughout their school years, it has intentionally been given a modular design whereby all components can be enhanced or replaced with upgraded versions. The hardware is standard equipment readily available in retail stores; the software can be expanded or replaced depending on what users want to accomplish and their respective skill levels.

Credits
Concept Team: Nina Wenhart, Dietmar Offenhuber, Helmut Höllerl, Christopher Lindinger, Carlos Rocha, Horst Hörtner, Stefan Mittlböck-Jungwirth, Christian Nagelhofer, Peter Brandl

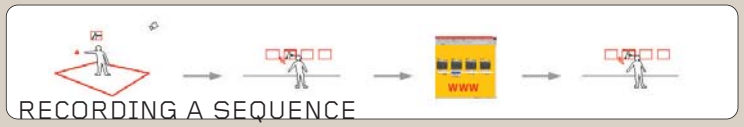
Software Development: Robert Abt, Carlos Rocha, Robert Praxmarer, Christian Nagelhofer, Peter Brandl

Hardware Development: Peter Freudling, Stefan Mittlböck-Jungwirth, Walter Steinacher, Erwin Reitböck, Ewald Elmecker, Martin Honzik, Christoph Scholz

Interface Development: Martin Bruner, Florian Landerl

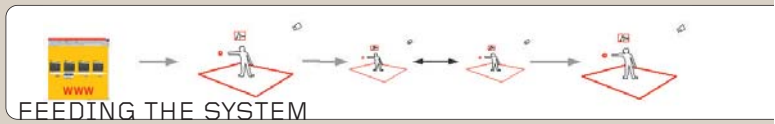
A project for Bundesschulzentrum Kirchdorf

INFRASTRUCTURE FOR CREATIVITY



RECORDING A SEQUENCE

- Record action
- Action sequence appears in the auditorium on the associated monitor
- Manipulate and create a sequence
- Programmed video sequence appears in the auditorium



FEEDING THE SYSTEM

- Information objects can be invoked on the stage
- Information objects can be sent from each stage to the Internet
- Recording Information objects can be used for the composition of the image

PROGRAMMING OF SEQUENCES

- A large number of video clips are stored in the data pool
- Through the web interface, video clips can be manipulated and new sequences can be arranged
- The newly programmed sequence appears in the auditorium

In the beginning, there was Humphrey—a mechatronic device that worked in conjunction with a pair of data glasses to simulate flight in a 3-D environment. This installation in the Ars Electronica Center has been a smash hit with visitors ever since the opening of the museum, which has replaced almost all of the exhibits on display there at least once over the past eight years. Humphrey, however, will continue to remain aloft in Ars Electronica's airspace, but his new design will greatly enhance and intensify the experience of flight. Continual improvements in processing capabilities make it possible to generate simulations that get closer and closer to perfection. Virtual reality systems use stereoscopic imagery to produce the illusion of a real, three-dimensional environment. By means of force feedback devices, even physical forces can be mechanically simulated in these virtual worlds.

The contracting muscles that produce flight also give viewers a direct impression of the forces at work upon the user.

HUMPHREY II

THE ILLUSION OF FLYING

Credits

Concept: Stefan Mittlböck-Jungwirth, Martin Honzik, Robert Abt, Horst Hörtner, Gerfried Stocker

Project Management: Stefan Mittlböck-Jungwirth

Mechatronics: Robert Abt, Stefan Feldler, Stefan Mittlböck-Jungwirth

Virtual Environment: Andreas Jalsovec, Michael Büttner, Peter Freudling, Martin Bruner, Werner Pötzelberger, Michael Weingärtner, Christopher Lindinger

Wearable Design: Fa. Form ² – Mario Zepetzauer, Stefan Degen

Architecture: Scott Ritter, Jakob Edlbacher

Cooperations: FESTO, Wintex, Form ², Rosenbauer

Documentation: Pascal Maresch

Special Thanks: Thomas Kienzl, Wöber Anton, Flugschule „Wings", Dietmar Offenhuber, Martin Sturm, Stefan Stipek, Stefan Steiner, Gerold Hofstadler, Rudolf Hanl, Thomas Teibler, D.O.R.I.S. – Thomas Ebert, Kurt Pfleger; Gerhard Riegler, Franz Nagelreiter

Humphrey has mutated into a prototype apparatus that uses a combination of virtual reality and force feedback technology to impart a feeling of weightlessness that is as realistic as possible.

By means of a system of cables, innovative air muscles transmit the physical forces at work and the feeling of movement directly to the pilot, who is able to navigate through these artificial worlds by moving his/her arms.

VIRTUAL REALITY FORCE FEEDBACK SYSTEM

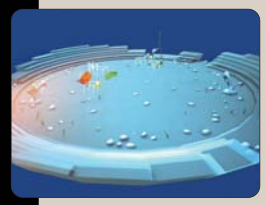
Ars Electronica Futurelab engineers utilized an empirical design process to create a feeling of weightlessness and centrifugal force experienced in flight. An aspect that makes a key contribution to this is the innovative mode of navigation, which enables the user to steer through an artificial environment by means of intuitive arm movements.

The essential elements are a data helmet, specially reinforced overalls resembling a pilot's jumpsuit, and the equipment responsible for producing the force simulation. In designing the pneumatic components, engineers also took the factor of visual impact into consideration since one of their prime objectives was to enable users and observers alike to understand how the apparatus functions. The contracting muscles that produce flight also give viewers a direct impression of the forces at work upon the user. For the process of immersion—that is, for the user to completely get into a virtual world— the most important component is the data helmet that stereographically visualizes an environment consisting of computer-generated data. In keeping with the state of the art, the helmet was designed to be as light as possible and reduced to its functional elements. Leading edge technology also went into the force-feedback-generated "physics" at work in these immersive worlds, as well as the new 3-D environments.

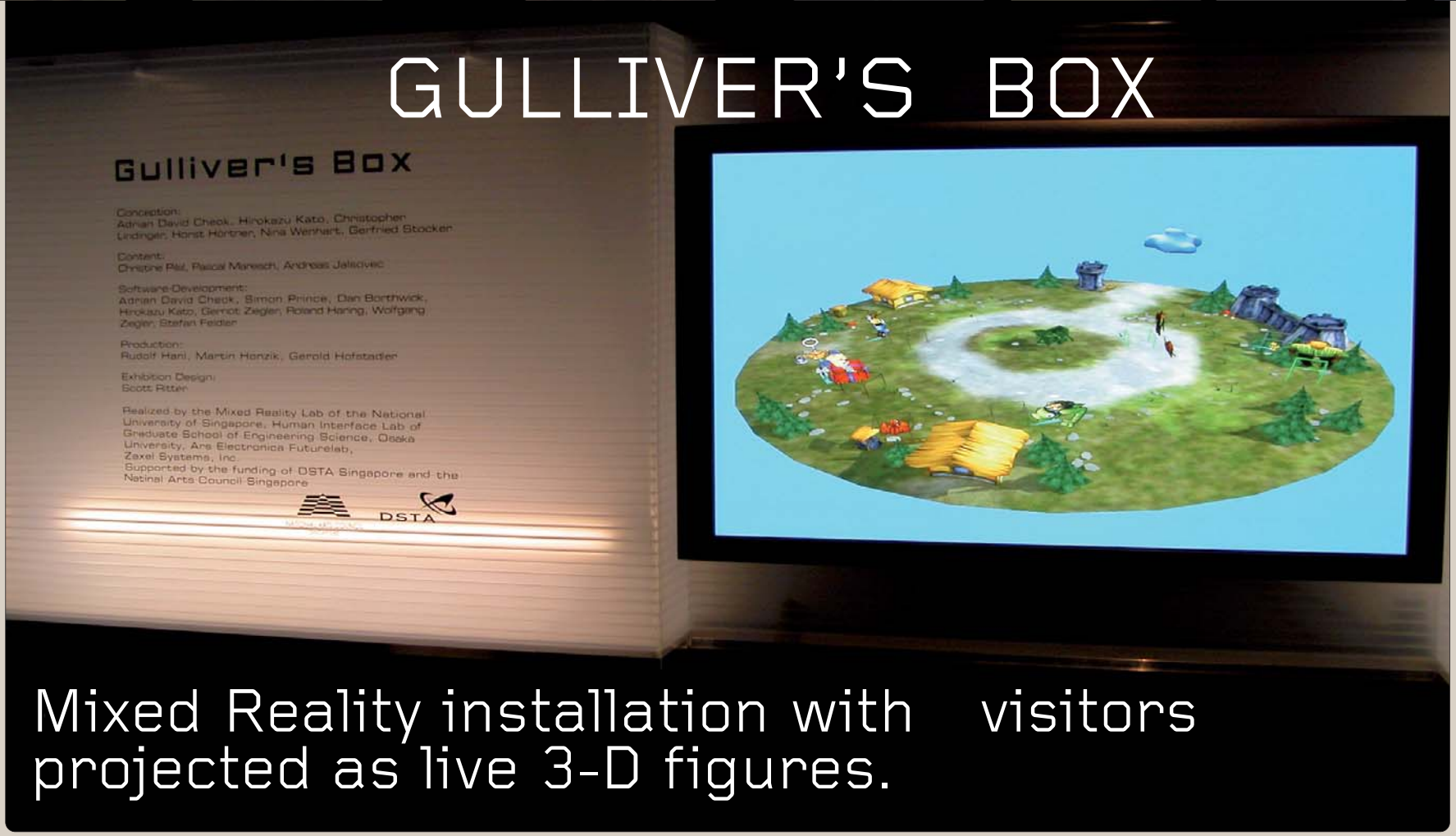








GULLIVER'S BOX



Mixed Reality installation with visitors projected as live 3-D figures.

Credits

Concept: Hirokazu Kato, Christopher Lindinger, Horst Hörtner, Nina Wenhart, Gerfried Stocker

Content: Li Yu, Pascal Maresch, Andreas Jalsovec, Christine Pilsl

Software Development: Dan Borthwick, Simon Prince, Adrian David Cheok, Hirokazu Kato, Gernot Ziegler, Roland Haring Wolfgang Ziegler, Robert Praxmarer, Stefan Feldler

Production: Rudolf Hanl, Martin Honzik, Gerold Hofstadler, Martin Sturm, Stefan Mittelböck-Jungwirth

Exhibition Design: Scott Ritter

Supported by the funding of DSTA Singapore and the National Ars Council Singapore.

Gulliver's Box is a result of the Ars Electronica Futurelab's collaboration with Prof. Adrian Cheok (National University of Singapore) and Prof. Hirokazu Kato (Osaka University). The developments that have been brought together in this installation represent the effort to pursue new approaches to dealing with Mixed Reality content. The challenge at the core of this project was to position an innovative medium somewhere between theater, film and installation.

The result is an infrastructure that offers artists new opportunities to convey audiovisual information, and one that ought to encourage creative people in every discipline to work with these new approaches. Seen from this perspective, the platform that has been created generates an experimental laboratory situation for a broad spectrum of forms of artistic expression. With it, performances by dancers, singers or actors can be recorded, transferred to avatars, and enhanced with any kind of computer animation. The application on display in the Ars Electronica Center also provides visitors with the opportunity to customize recordings of their own actions and subsequently to undertake a very special process of self-reflection.

This unique aspect arises from the perspective of the viewer —just like in the world of huge Brobdignagians and tiny Lilliputians in *Gulliver's Travels*, quantum dimensional leaps and the play of scale and relation are what shatter accustomed modes of perception. Ultimately, the various approaches that go into *Gulliver's Box* seem just as fantastic and horizon-expanding as the visions in Jonathan Swift's novel. The performances rendered by this medium and the recordings of the visitors themselves are an inviting chance for viewers to fundamentally change their points of view or to reconsider them for once. The possibility of observing and manipulating the mise-en-scène from any desired position external to the action goes beyond the God-mode of computer games and seems to be unique in a media context.

Interaction with characters – either those captured live or animated ones – used to be necessarily bound on monitors or projection screens, but Mixed Reality technology now gives rise to forms of artistic expression and reception in an intimate – albeit likewise projected – situation involving protagonists and viewers. In *Gulliver's Box*, the processes of creative design, display and perception are brought together in a single environment.

The conference table is the first product to emerge from a multi-phase research project whose objective is to develop prototype furniture for everyday use in the telematic office of the near future.

The Future Office Project pursues research on new settings for work and the integration of existing technologies into design scenarios that display both ergonomic functionality and aesthetic excellence.

FUTURE OF FICE PROJECT

INTELLIGENT SURFACES

The "table" is an instrument of both work and communication. The prototype as an integrated means of communication and action is the basis for a "conference room" that functions simultaneously as an interface for both groups of users—those actually present and virtual participants. The aim of this project is to create an integrated, flexible, intelligent environment for the entire spectrum of available communication options.

The central element of the working environment is the "table"—a multifunctional, convertible model for a team of up to six persons on-site. Additional participants at another location can be integrated via videoconferencing. Each team member has their own personal workspace. The shared virtual working area enables participants to organize, process and share documents and other files.

This project—which is intended as a design study—attempts to construct a bridge between projection techniques and state-of-the-art digitization processes on one hand and commercially available hardware and familiar software environments on the other.

TELEPRESENCE

Lack of presence on the part of virtual participants, their inability to establish eye contact with those on-site and inadequate opportunities for them to contribute to the discussion are characteristic of conventional teleconferencing and videoconferencing technology. The aim of the *Future Office Project* is to implement a variety of acoustic and visual means to enable all those taking part in a conference to perceive and experience the virtual presence of remote participants.

COLLABORATIVE WORKING

To ensure that a team is able to work together efficiently, media that support communications are of major significance.

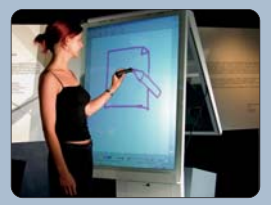
DIGITAL/ANALOG INTERFACE

The ability to work in a natural, intuitive way with traditional media like handwritten notes, books and other printed material will remain an important aspect of the working process. This calls for intelligent tools that enable users to convert "analog" documents into a form that can be digitally processed without tedious intermediate steps.







A MULTIFUNCTIONAL COMMUNICATIONS INSTRUMENT

CROSSPAD

The intelligent writing and drawing pad constitutes the mobile counterpart of the sensory surface integrated into the table.

C_PEN

With the C-Pen, text passages can be stored to memory without the use of a computer terminal and later be fed into the network for further processing.

IPAQ

With this handheld PC, the moderator of a conference can determine which content will be displayed on the respective projection surfaces and monitor screens.

MODERATOR DISPLAY

The conference moderator seated at the head of the table can, if need be, activate the flip-up screens integrated in the tabletop. The display consists of a flat screen for conventional computer applications and a holoscreen to enable remote participants to take part in meetings via videoconferencing. The screens can be controlled independently of one another and automatically assume a working position upon activation.

POOL

The center of the table consists of a working surface that makes it possible to use the mouse to "drag-and-drop" digital documents and objects from the user's own workplace into the large-format Pool. Objects in the Pool can be shifted by means of an eBeam marker directly onto the table's glass plate for processing. The conference moderator can also use the "Ipaq" to determine which content is displayed on the individual projection surfaces. A document camera is mounted above the Pool to allow analog documents positioned in the middle of the table to be digitized and made available to other workplaces in the network.

FUNCTIONAL DETAILS

VIDEOCONFERENCING/HOLOSCREEN

A holoscreen flips up out of the desktop. The screen's surface features a special coating that makes videoconferencing in daylight situations possible. The positioning of the image of remote conference participants within the round of those physically present creates a natural setting for interpersonal communication.

CONSOLE

Consoles for keyboards and wireless pointing devices are mounted beneath the desktop and can be pulled out when needed.

INTELLIGENT SURFACE

On a certain section of the desktop, handwritten notes and sketches made by pen on normal paper are automatically digitized. The data derived in this way can then be displayed on any screens on the desk or in the network and processed collaboratively.

MULTIPLE-PORT BANKS

Banks of ports to hook up the cables from a variety of peripheral devices are mounted at the head and foot of the table. They can be pulled out for convenient use and, afterwards, stowed out of sight under the desktop.

Credits

Concept: Gerfried Stocker, Scott Ritter
Project Management: Robert Abt
Keyresearcher Interactive Spaces: Dietmar Offenhuber
Keyresearcher Software Development: Florian Berger
Senior Executive Developer: Horst Hörtner, Christopher Lindinger
Keyresearcher Digital Surfaces: Helmut Höllerl
Content Management: Pascal Maresch
Keyresearcher Virtual Environments: Christopher Lindinger
Software Development: Robert Praxmarer, Robert Abt, Wolfgang Ziegler, Stefan Feldler
Development: Martin Brunner, Erwin Reitböck, Nikolaus Diemannsberger, Stefan Mittlböck-Jungwirth, Horst Hörtner
Screen Design: Erwin Reitböck
Furniture Development: Scott Ritter, Jakob Edlbacher

VR FLIPCHART

The VR Flip Chart can be used in conventional fashion with paper, as an electronic blackboard, and to run computer programs ranging from PowerPoint™ to stereoscopic VR applications.




The *VR Flip Chart* is the latest prototype for telematic working environments that the Ars Electronica Futurelab has designed within the framework of the *Future Office Project*. Besides a series of technical features to support conferences and seminars, the *VR Flip Chart* also incorporates a high-performance stereoscopic VR system (ARSBOX) with an integrated projection screen. This modular system can be used in conventional fashion with paper, as an electronic slate, and as hardware to run computer programs ranging from PowerPoint™ to VR applications. Control and selection of the media components are accomplished by means of a wireless handheld PC *(Palmist Project)*.

FEATURES

- Electronic paper, offering the possibility of online sharing with any computer-supported workplace
- Presentation screen for documents created with widely used applications like PowerPoint™, controlled via palmtop computer
- Online poster in public spaces with interaction support
- Window into an interactive 3-D world with polarization glasses and palmtop navigation
- Proven working methods can be retained. The user doesn't have to adapt to the medium.
- The *VR Flip Chart* is hardly any larger than a conventional flipchart. It can be custom configured to suit individual needs.