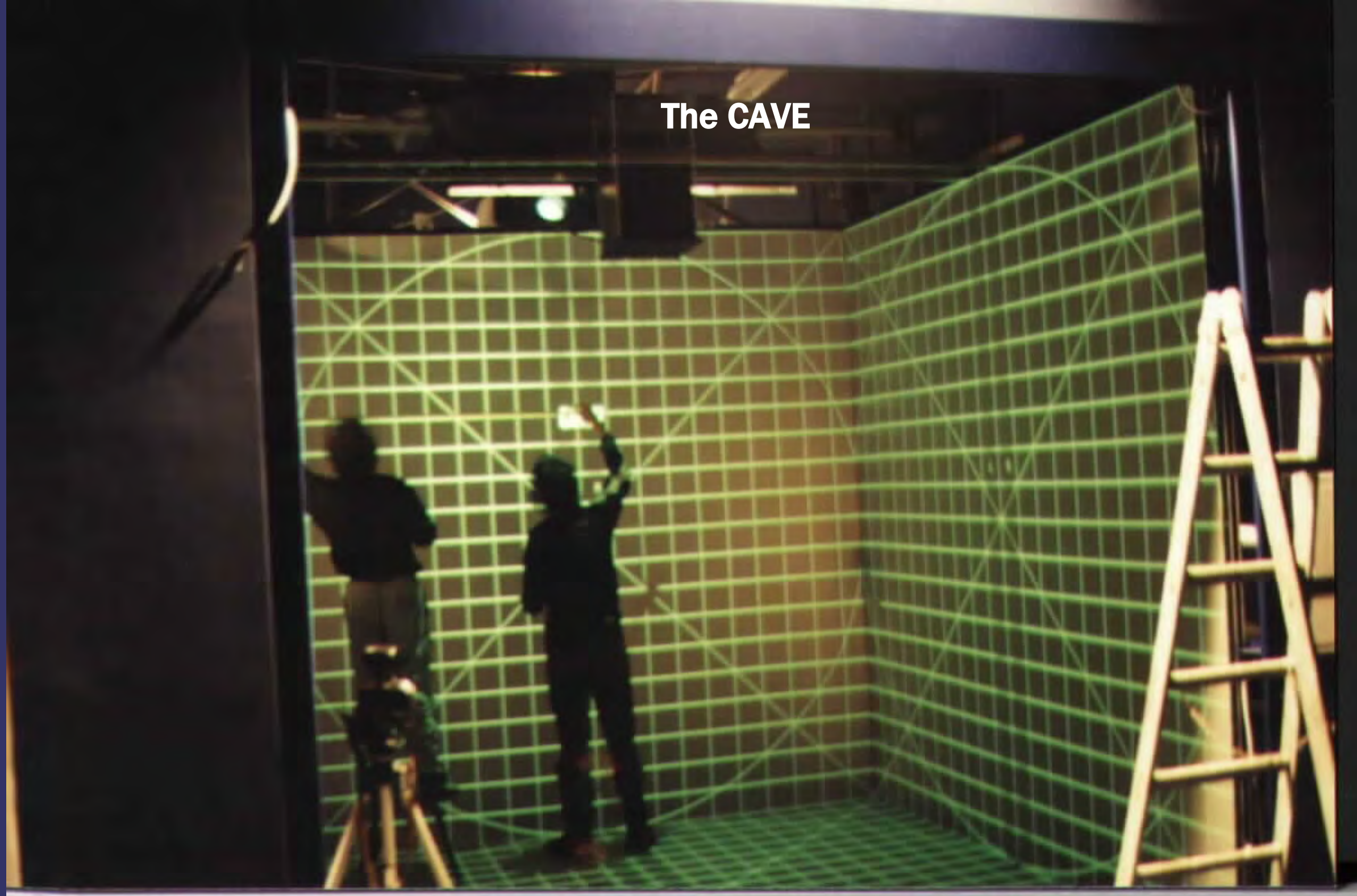The **M**ULTI**M**EGA **B**OOK *in the CAVE* [MMB]

"The shift from the printed book to the electronic text & digital skin" (1906-1907)

Interactive Storytelling in Narrative Media

Franz Fischnaller - Research IMERA - Maison Mediteranenne des Sciences de l'Homme - Aix-en-Provence

The CAVE

F. Fischnaller | F.A.B.R.I.CATORS | The MULTIMEGA BOOK in the CAVE (1906-1907)

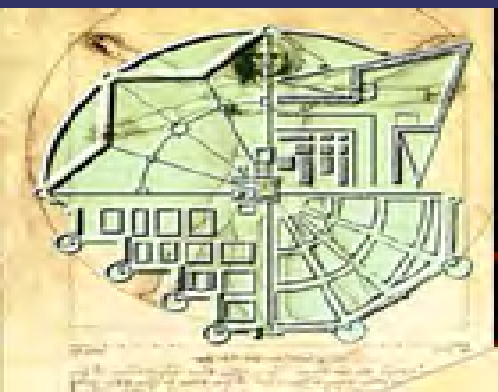**Franz Fischnaller** - Research IMERA - Maison Mediteranenne des Sciences de l'Homme - Aix-en-Provence

Real time, navigable and interactive life-size rendered city environment
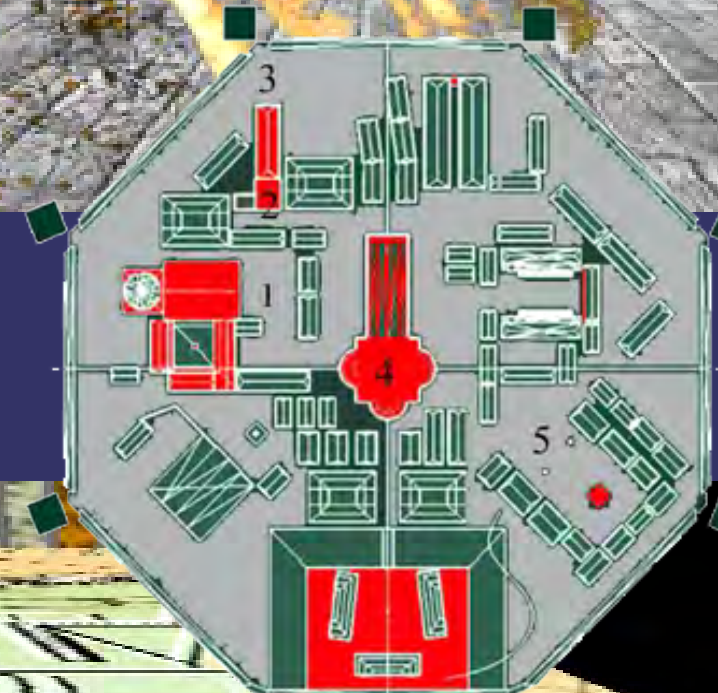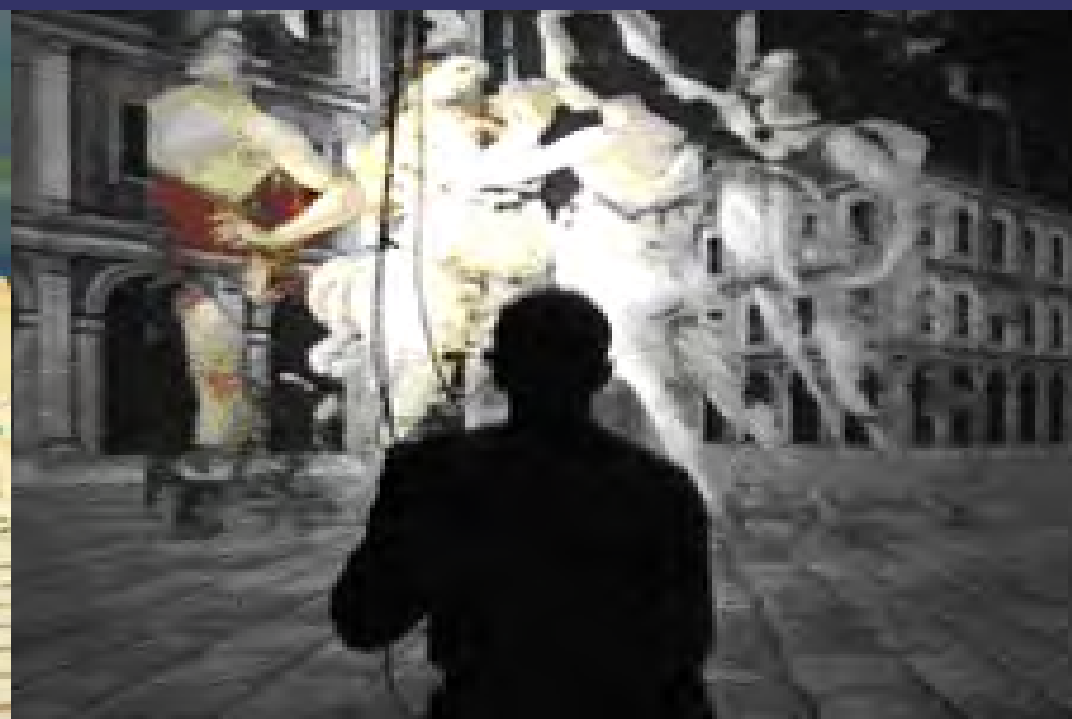
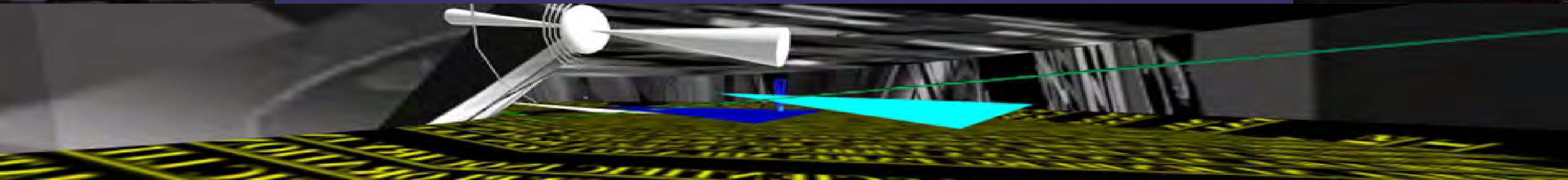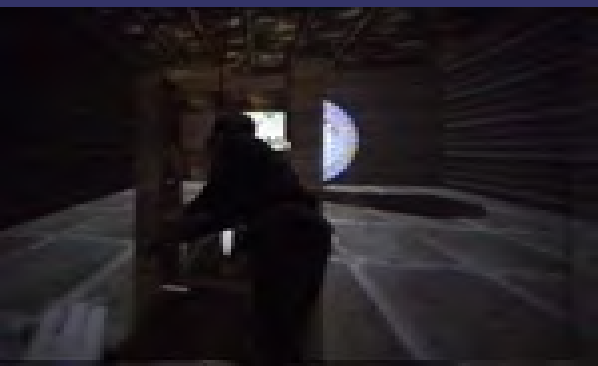Immersive Interactive Environments
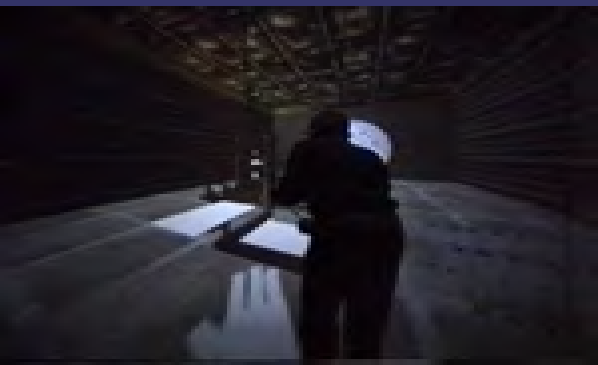
… interact with *Gutenberg's printing press*… travel through a *cyber tunnel* leading into the *CD City*, a cyber city that visualizes a digital and networked system of a 21st century electronic urban vision…
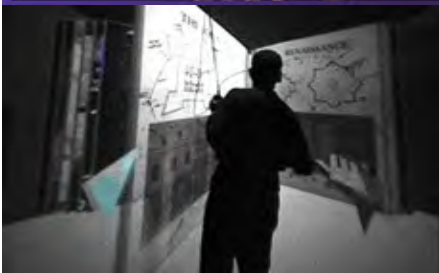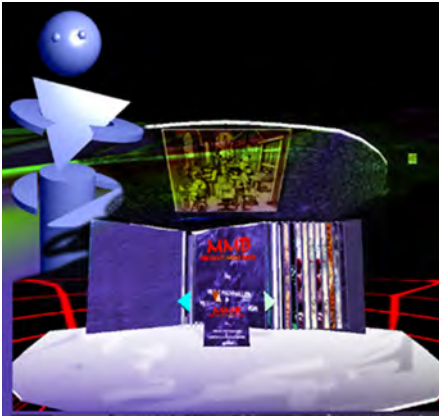
NEM=MENT

The
interactive Guide in MMB

Franz Fischnaller - Researcher INRIA - Maison Méditerranéenne des Sciences de l'Homme - Aix-
en-Provence

Date	1996 -1997 (1, 2, 3,4 Phases) 1998 -1999 (5, 6 Phases) 2001 (Upgrading) 2006 (Upgrading) 2008-09 (Upgrading, Enriching, Improving)
Project Name	# THE MULTIMEGA BOOK IN THE CAVE® [MMB] "THE SHIFT FROM THE PRINTED BOOK TO THE ELECTRONIC TEXT & DIGITAL SKIN"
Topic/Key Words	Italian Renaissance Art, medieval and renaissance architecture, urban environments, art, legendary masterpieces, communication (15th-century), Electronic communication (21stcentury), immersive presence, interactive technology, Cave visualization system, immersive virtual reality, 3D Stereoscopic visualization, Fully immersive stereoscopic interactive storytelling, avatars, network high speed carrier, interactive sound, digital heritage.
Project Phases/ Stages	MMB in the Cave (The shift from the printed book to the electronic text & digital skin") was conceived as a six -phase project
Achievements/Accomplishments	See description bellow
Project Current Stage	All phases are completed
Role/Responsibilities (FF)	Author, Designer, Project Production Manager
Credits/Collaboration/Partners	Electronic Visualization Lab (EVL), the University of Illinois at Chicago, USA; University degli studi of Milan, Italy; Ars Electronica Future Lab within the Research & Residence, Program of the Museum of the Future, AEC, Linz, Austria F.A.B.R.I.CATORS, Milan, Italy, Robotics srl, Italy; L'EMMECI srl, Italy ZKM Medienmuseum, Karlsruhe, Germany
Awards/Artist in Residence	1997 Recipient, Foreign Title Award, Theater and Exhibition Section, Multimedia Grand Prix'97, Japan. 1997. Permanent exhibit in the CAVE Ars Electronica Center, Museum of the Future, Linz/Austria
Funding/Grants/Support	1996. Recipient of an Interactive Art Commission and Residency Research Prize from the ZKM | Medienmuseum, Zentrum für Kunst and Design, Karlsruhe, Germany 1996 Recipient of a second Interactive Art Commission and Residency Research Prize from the ZKM | Medienmuseum, Zentrum für Kunst and Design, Karlsruhe, Germany. The Award was granted to develop the first digital prototype (simulation and digital animated film) of the MMB and the realization of one physical augmented Mega-Page for the MMB. 1997 Recipient of a technical Research, Development Grant Support from the Electronic Visualization Laboratory (EVL) at the University of Illinois at Chicago, UIC; (Project: MMB VR: Multimega Book in the Cave/ Virtual Reality Version)The grant and support was provided to develop part of the production and development of the full immersive Virtual Reality Application in collaboration with the specialized and interdisciplinary team and the facilities of the Lab of EVL. The development included the implementation of the application and designed to run in the CAVE™ (CAVE AUTOMATIC VIRTUAL ENVIRONMENT) Virtual Reality Theater, a multi-person, room-sized, virtual-reality system, first designed in EVL.

	THE MULTIMEGA BOOK IN THE CAVE® [MMB]
	"THE SHIFT FROM THE PRINTED BOOK TO THE ELECTRONIC TEXT & DIGITAL SKIN" (CONTINUE)
Funding/Grants/Support (continue)	1997 Recipient of an Interactive Art Commission and an in-house Residency Research Prize from the Ars Electronic Center, the Museum of the Future (ARS), Linz Austria. (MMB VR: Multimega Book in the Cave/ Virtual Reality Version). The Award was granted to develop the final phases of development of the MMB-VR and the implementation into the ARS the CAVE™ (CAVE AUTOMATIC VIRTUAL ENVIRONMENT) Virtual Reality Theater, a multi-person, room-sized, virtual-reality system which was set up with the support and collaboration of EVL/UIC. The work was accomplished in collaboration with the team of EVL and Ars Electronic Center. Concluded the final phase of development, MMB VR: Multimega Book in the Cave first interactive immersive public presentation of took place few at the ARS Electronic Festival 97, "Flesh Factor," AEC Museum of the Future, Austria. After the Festival, the project became a permanent exhibit in the CAVE of Ars Electronica Center. 1998 Recipient of an Interactive Art Commission Research Prize from the Palazzo delle Esposizioni (the largest interdisciplinary exhibition area in the center of Rome), Rome, Italy (Project: *NEM and the Renaissance City*: NRC, Audiovisual interactive work). The Award was granted to develop the final phases of development of the NRC project. The commissioned work was after display in the exhibit: "La Coscienza Luccicante... dalla video arte all'arte interattiva"; at the Palazzo delle Esposizioni. Curator of the exhibit: Maria Grazia Tolomeo and Paolo Sega Zerra Zanetti; Scientist Commitee: Derrick de Kerckhove, Sally Berger, Silvia Bordini, Gerfried Stocker and Maurizio Calvesi
Acknowledgments	Silicon Graphics, EVL Electronic Visualization Lab (EVL), the University of Illinois at Chicago, USA; ZKM Medienmuseum, Karlsruhe, Germany.
Bibliography	See: FF. Publications-5a and 5b
Exhibit/Exposure	See: FF. Exhibit / Exposure
Conference/Lecture	See: FF. Conferences / Lectures
Web / Links	
Images	
Video on YouTube	http://www.youtube.com/watch?v=XEx_06EW84M&feature=em-upload_owner
Description	See Bellow

6

Introduction:
The Multi Mega Book in the CAVE™ (MMB) *"The shift from the printed book to the electronic text & digital skin*

MMB is a 3x4 meter fully immersive, real-time rendered interactive 3D virtual book.

In the MMB visitors can virtually enter into the book, explore, navigate, and navigate within alternate immersive environments and narrative storytelling. Focusing on the shift from the printed book to the electronic text/digital skin, each page of the MMB makes accessible through interactive means a unique aspect of the diverse history of human communication. the MMB allows the interactive visitor free exploration of various dimensions of both centuries. The user creatively interacts with two revolutionary moments of human history and experiences in media, technology, science, architecture, and art from the Renaissance (15th-century printed communication) to the Electronic Age (21st-century electronic communication) NEM=MEN is the interactive guide and avatar of the MMB. NEM is an "info-point" in the Renaissance environment and a "network agent" and/or a "high speed carrier" in the CD-City of the MMB.

MMB was primarily designed to run I the CAVE, The CAVE (Computer Augmented Virtual Environment) is a VR full-immersive interactive installation with high-resolution stereoscopic images. It is a multi-person, room-sized, virtual-reality system. at the Electronic Visualization Laboratory (EVL) of the University of Illinois at Chicago, but it is also capable to run on a number of different VR platforms, including the Immersa-Desk and simpler graphics workstations.

MMB is the winner of the Foreign Title Award at Multimedia Grand Prix, is a permanent exhibit in the Ars Electronica Center, at the Museum of the Future Linz/Austria, and has been shown widely to international audiences at such shows as SIGGRAPH, United States; ARS Electronic Festival, Austria; ISEA, United States; Art Futura, Spain; Salon B.it, Italy; MediARTech, Italy; Virtuality and Interactivity II, Italy; Imagina, France; Mediaterra, Greece; and Palazzo dell'Esposizione, Italy.

The project has been shown/screened widely to international audiences, conferences, exhibits and events in Europe, USA, Asia, etc. The first interactive immersive public presentation of the project took place at the ARS Electronic Festival 97, "Flesh Factor," AEC Museum of the Future, Austria. After the Festival, the project became a permanent exhibit in the CAVE of Ars Electronica Center. The same year it has won the Grand Prix'97, Foreign Title Award Theatre and Exhibition Section Multimedia, Japan.

The original structure of the MMB is an interactive electronic book sculpture comprising 24 mega pages. The MultiMega Book in the CAVE™, a VR application, is one of the mega pages. The realization of the entire project will be accomplished when all of the 24 mega pages are completed. Simultaneously, it should be understood that each mega page constitutes a whole project in itself.

MMB was conceived as a six-phase development. The outcome of each phase of the MMB project was conceived to run as a standalone application.

Visualization Display System and Platforms

The first version of the MMB application was primarily designed to run in the CAVE™ (CAVE AUTOMATIC VIRTUAL ENVIRONMENT) Virtual Reality Theatre, a multi-person, room-sized, virtual-reality system, first designed in the Electronic Visualization Laboratory (EVL) at the University of Illinois at Chicago, UIC [21].
Following the implementation of the several phases the application was improved and further adapted to different visualization display systems and platforms, for both fixed installation and movable solutions, including the
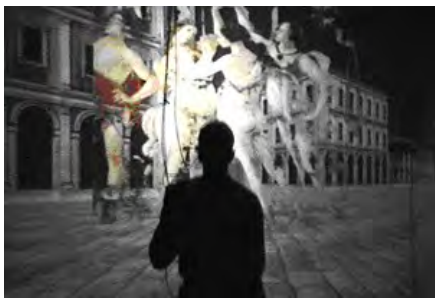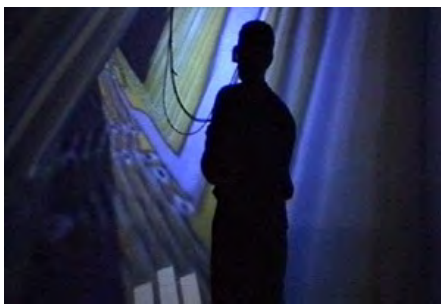
Immersa-Desk (IDesk), C-wall and AGAVE™ display system (Access Grid Augmented Virtual Environment) and others large scale display system for data visualization i.e 9x3 Mt .

The Cave

The CAVE™ is a room, measuring 3x4m, with four screen walls. High-resolution stereoscopic images are rear-projected onto these walls and the floor, with lightweight LCD stereo glasses to mediate the stereoscopic imagery. Attached to the glasses is a location sensor so that as the viewer moves within the confines of the CAVE™, the correct perspective and stereo projection of the environment are updated and the user may walk around or through virtual objects [22]. The users interact with the environment using "the wand," a simple tracked-input device containing a joystick and 3 buttons. It is used to navigate the virtual world and to manipulate virtual objects within that world [23]. Four projectors, one for each screen, are connected to separate or split graphics pipes of one or more high-end workstations. The CAVE™ system has a resolution of approximately 2,000 linear pixels constructed from 1024x768 pixel stereoscopic images displayed on each screen using Electrohome Marquis 8000 projectors. A Silicon Graphics Onyx with three Reality Engines is used to create the imagery that is projected onto the three walls and the floor. The CAVE™ theatre area sits in a 3x4 m, light-tight room,

Application in Virtual Art

The MMB application is a large-scale environment. Each component of the environment covers a large virtual space, using hundreds of megabytes for models, texture- maps, and audio clips to link multiple scenes. The final, complete environment, or world, contains 150 modeled objects, 120 recorded sounds, and many additional textures and other files, for a total of 250 gigabytes of data. The virtual environments of the MultiMega Book in the CAVE® are visualized by multiple narrative scenes. For this application, two major virtual-reality environments were created: one intended to correspond to the Renaissance and the other intended to correspond to the Electronic Age.

Navigation and interaction

The navigation and the interaction with the MMB in the CAVE® is often surprising, designed to draw the user from the Renaissance to the Information Age. Exploring different modes of communication and demonstrating the differences between each era's combinations of mathematics, innovation, art, and cutting edge technology in communications, the MMB is a metaphor for means of communication through time and space integrated into one unique environment. The user creatively interacts with two revolutionary moments of human history and experiences in media, technology, science, architecture, and art from the Renaissance (15th-century printed communication) to the Electronic Age (21st-century electronic communication)The shift between the Renaissance and the Electronic Age integrated into one unique environment. One of the navigable scenes is the "FF's ideal city", articulated by works of architecture such as the Cupola di Brunelesschi, the Laurenziana, Santa Maria delle Grazie, Santa Maria del Fiore, Uffizi, Piazza Innocenti, Palazzo Pitti, and and works of art by artists such as Michelangelo, Alberti, Botticelli, Leonardo da Vinci, and Bruneleschi. In our real, physical world, these buildings and pieces are found variously in Rome, Florence, and Milan. In the [MMB], all of these works are found in one unique city environment rich in symmetry, color, and depth. The user may investigate, in close detail, Leonardo's masterpiece, *The Last Supper*. Usually limited to viewing the original real painting from a distance of six meters, the MMB visitor can use the application to observe it from very close and see it from a 360 degree viewpoint Similarly, the user can also visit and interact in a functional way with Gutenberg printing press. Additionally, the [MMB] visitor is able to travel through a cyber-tunnel leading the way into the CD-City, a cyberspace that interprets the movement of 21stcentury digital and networked information.

NEM: The Avatar and Guide in the MMB

The MultiMega Book in the CAVE® is a large and complex world, composed of interactive buildings, streets, paths, squares, and diverse renaissance like

angles. The interactive visitor could become lost in this urban environment, as in any other real or imaginary city. Therefore, the author, Franz Fischnaller, designed NEM as an interactive guide to the MMB. NEM, a term which is the English word "men" spelled in reverse, is a guide structured according to the primary geometric forms of the triangle, cube, and sphere. NEM appears in the Renaissance city first as an "info-point" column and morphs on the collision into the invisible setup of the proximity triggers into a geometrical character
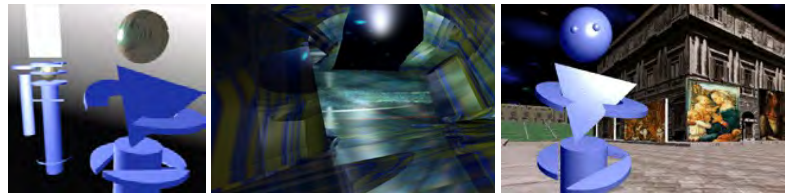
The visitor approaches NEM and it opens up into a "humanoid" figure, establishing an interactive relationship with the forms which will guide him through the virtual environment. In the CD City, NEM is a "network agent". No longer guiding the visitor from place to place but acting as a node for sending and receiving information, are the changes in NEM's shape and behavior related to the epoch.

In the Renaissance environment, both guide and visitor must move their bodies in order to reach the original source of the information. In the CD City where the information is mainly digitalized, NEM exists as a "high speed carrier", bringing information to the user who is not required to travel to its physical source. However, as the digital interchange flows around the CD City, the visitor is encouraged to travel, and to interact with, any of several NEM network agents.

The first experiment of a virtual interactive character animated with an electromagnetic system (recorder motion-tracked animation), NEM was successfully accomplished in the CAVE™ of the University of Illinois at Chicago's EVL. The CAVE® uses a tracking system to gather tracking information corresponding to the position of the user's head and hand in order for the computer to calculate the perspective from a user-centered point of view.

Tracking is done with electromagnetic systems such as Ascension's Flock of Birds, and sensors are attached to the stereo glasses and to the 3-D mouse. This same system is used to record motion-tracked animation. The first experiments with this system were performed in development of the MMB application.

User interaction in the CAVE
I enter the CAVE®, put bon the glasses, and pick up the wand. The 3D architectonic structure of the MultiMega Book in the CAVE™ rises up in front of me, occupying my entire field of vision. I am free to manipulate the MMB. I zoom it in and out, walk around it, see it from the back, from the front, and make it as smaller than or as large as I wish. The touch screen features two arrows (left and right) placed in front of the MMB and hanging in space; clicking on one of the arrows, I can move the pages. Meanwhile, images and objects, flying from the far emptiness slip into the book.

When one opens Page 7 entitled: "The shift from the printed book to the electronic text & digital skin", the book collapses into a 3D environment with a stone gray floor emerging beneath your feet; fully immersing the viewer in a life-sized renaissance city: Fischnaller's Ideal City, a virtual, real time, navigable and interactive life-size rendered city environment..

I get to the Page dedicated to the shift between printed and electronic text. I touch it, and the Page collapses into a completely different 3-D environment. I am inside a city, surrounding me on every side. The ambience of the buildings, streets, squares, arches, corners, sculptures, objects, and paintings reveal this environment to be of the Renaissance. Pieces by artists of the caliber of Michelangelo, Alberti, Botticelli, Leonardo da Vinci, Bruneleschi become protagonists in this imaginary city which contains such buildings as: Santa Maria delle Grazie, Santa Maria del Fiore, Uffizzi, Piazza Innocenti, Palazzo Pitti, the Laurenziana.
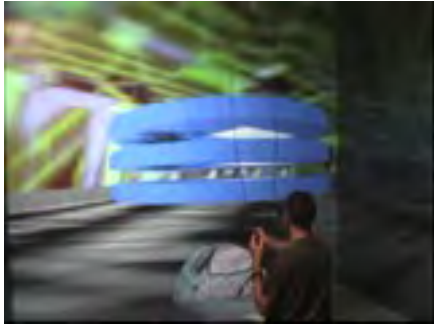
Software

The technical implementation of the MMB calls for the design and development of "XPn", an authoring system for immersive art exhibitions and framework for creating large-scale, interactive virtual-reality applications. Technical innovation Several characteristics of this application presented diverse creative technical challenges, which in turn revealed innovative aspects and salient feature relative to content management, the development of juxtaposed virtual environments, networking interactive techniques, avatar design, architecture, and virtual effects. The implementation of MultiMega Book has given rise to a range of technological challenges. Ygdrasil, the software utilized for developing the project, has been upgraded and enhanced to address these issues.

Hardware and Software - Background-History

The first version, implemented on SGI and Linux platforms was written with the custom Software "XPn" Authoring System for Immersive Art Exhibitions; this was based on Performer and the CAVE™ libraries, a sound library, and C++. The system and the application was further developed and built in Ygdrasil software; Ygdrasil requires EVL's CAVELib™ and the CAVERNsoft™ (after Quanta) networking library, which is still currently a commercial product originally distributed by VRCO and CAVERNsoft and now by Mechdyne. During the first LSI project phases, the development and implementation of MMB required the use of "XPn," an authoring system for immersive art exhibitions, developed by Dave Pape (PhD, EVL, The University of Illinois at Chicago). The XPn is known as the Ygdrasil system and provides a framework for creating large-scale, interactive virtual-reality applications. The XPn system was used to implement the Multi Mega Book in the CAVE and "Mythologies" applications, which have been shown to large audiences. The implementation of the MMB has given rise to a range of technological challenges, which in turn have revealed innovative aspects and salient features relevant to: development of juxtaposed virtual environments, networking interactive techniques, avatar design, architecture, virtual effects and content management [25]. The structure of the MMB required the development of additional software features to satisfy content and to enhance high-quality levels of interactivity. To enable this a series of special features and enhancements have been added to the software Ygdrasil, including software tools that aid the rapid and intuitive development of interactive virtual environments for artists and other non-technical users. Although originally developed for art applications, the general system is being used in building a wide range of virtual worlds [26].