

VRML based Extended Galleries

This paper presents our work and research findings on developing the concept of extended galleries. It describes further development of the original "Home of the Brain" VR installation developed in 1992 as a metaphor for virtual space as a public forum.

An artistic concept of a multi-user space is introduced, focusing on the notion of virtual space as a stage setting and on behaviours and interactions of people in an extended gallery space. The notion of user representation is replaced by the notion of user enactment and avatar is treated as an extended body of communication. Several artistic interaction scenarios are presented accompanied by an instinctive and invisible interface environment.

A VRML based extended gallery demonstrator, "Murmuring Fields", is presented as an mixed-reality shared environment installation for several users and as a decentralised network architecture supporting large number of users across Internet.

The work has strong links to eRENA tasks 4.1 Spatial structuring techniques, 6.1 Navigation for the senses and 6.2 Linking between real and virtual places.

Authors Wolfgang Strauss (GMD), Monika Fleischmann (GMD), Jasminko Novak (GMD), Mette Ramsgaard Thomsen (GMD)

The World Generator - The Engine of Desire An Interactive Installation by Bill Seaman

The interactive installation *The World Generator - The Engine of Desire* establishes the basic structures for an eRENA, which is understood as an electronic arena within which multiple interaction can be carried out by multiple users. This text will analyse the artwork and defines its close associations to the idea and conception of eRENA. The modifications of the installations will be laid out as well as the transformation of the interactive installation into a teleconference installation. It will explore how the components real space and virtual space, performer and audience have changed with the different versions.

Author Annika Blunck (ZKM)

Enterable Paintings / Immersive Visual Aesthetics

The desire to enter the picture plane by various symbolic and perceptual strategies is gaining new impetus thanks to computer-generated 3D models with convincingly penetrable characteristics, and tracking devices which modulate digital worlds in keeping with spectator movements.

Michael Bielicky's Delvaux project takes the Belgian artist's fantasy world as the starting point for his enterable painting experiment. The quiescent eroticism of the Delvaux figures, poised amongst vestiges of bygone architectures, generates a singularly nostalgic, estranged space. In parallel, our radically different enterable painting space focuses on El Lissitzky's *Proun Room*, a twentieth century artistic milestone which marks the explosion of suprematist pictorial space into the 3D environment.

This paper is divided into three parts. A technical section describes the virtual studio being developed at the ZKM, presenting its components and comparing this configuration with other virtual studios. The second section reviews issues raised by computer-generated environments that appear central to new aesthetic forms, and the third section discusses our ongoing enterable painting experiments based on Delvaux and Lissitzky models.

Authors Andre Bernhardt (ZKM), Sally Jane Norman (ZKM)

Artistic Participation in eRENA

Descriptions of four proposals submitted to eRENA by three artists. These proposals form a basis for activities in eRENA years 2 and 3, especially in the “open” Work Package 7.

In the proposals links with and aesthetic expressions of the themes in work packages 4, 5 and 6 have also been considered and promoted. The proposals strongly connect to the production themes of work package 4, the crowd representation themes of work package 5 and the interaction, mixed reality and audience participation themes of work package 6.

Authors Multiple including ZKM, GMD and the artists

Mixed Reality Dance Performanc

This report contains a description of the work done in MIRALab, University of Geneva, and LIG, EPF Lausanne, concerning the simulation of virtual dancers and body gesture recognition for the interaction avatar-autonomous. It summarizes the different steps needed to create and animate bodies in a virtual environment.

AuthorsStéphane Carion, Pierre Beylot, Nadia Magnenat-Thalmann, (MIRALAB, Univ. of Geneva); Luc Emering, Soraia Raupp Musse, Daniel Thalmann (LIG, EPF Lausanne)

Constructing and Manipulating the Virtual: Gesture Transformation, Soundscaping and Dynamic Environments for Extended Artistic Performance

This Deliverable reports on two artistic performance projects *Lightwork* and *Mimoid*. Both are concerned with innovative approaches to the construction and manipulation of virtual environments in performance settings. *Lightwork* is an interactive improvisatory piece where the construction and navigation of virtual environments is performed in real-time within the performance. Performers interact with algorithms that generate virtual environment content and process electroacoustic music. *Mimoid* is a proposal for a mini-opera which draws upon, amongst other sources, Stanislaw Lem's novel *Solaris* following its concerns with life-death-rebirth, simulation, gender and boundaries between the biological-organic, the human and the technological, but situating these issues in relationship to, and exploring them through, virtual reality technology. Both works involve principled alternatives to the performance techniques demonstrated in Deliverable 2.1 and offer contrasting approaches to questions of interaction, embodiment, animation and virtual environment design. As such, together

with Deliverable 2.1, this work maps a range of performance possibilities for future electronic arenas.

The Deliverable is structured around two chapters with an introduction which, as well as giving an overview of the work done in the corresponding work Task, 2.3, discusses a number of departures which were taken from the existing project program to maximise the efficiency and informativeness of the research reported.

Authors John Bowers, Sten-Olof Hellström, and Kai-Mikael Jää-Aro (KTH); Jonas Söderberg, Bino, Pär Hansson and Lennart E Fahlén (SICS)

Extended Performances: Evaluation and Comparison

This document together with video material constitutes Deliverable 2.3 from the first year of the eRENA project. It is based on work on extended performances within eRENA at EPFL, University of Geneva and KTH and on input from other extended performance work at GMD and ZKM. The characteristics of these performances and experience from production and carrying them out in Geneva, Stockholm, Bonn and Karlsruhe is compared and a number of challenges for the development of electronic arenas as settings for extended performance are identified. An historical account of the history of stage aesthetics is also given and the question of just how radically new are contemporary electronically mediated performance practices is discussed.

Authors John Bowers (KTH), Sally Jane Norman (ZKM), Heike Staff (ZKM), Detlev Schwabe (ZKM), Lawrence Wallen (ZKM), Monika Fleischmann (GMD), Yngve Sundblad (KTH)

Demonstration and Evaluation of Inhabited Television

We introduce the concept of Inhabited TV – the public deployment of collaborative virtual environments, coupled with conventional broadcast TV, so that on-line audiences can participate in TV shows within shared virtual worlds.

We describe three early examples of Inhabited TV which between them demonstrate a range of different approaches to participation in on-line TV shows and which utilise a variety of underlying technologies.

These early experiences provide valuable insights into the key issues in Inhabited TV. These include: difficulties in on-line performers successfully engaging an audience of on-line inhabitants; the difference in pace between action within a CVE and that required for broadcast TV; the need for better control of virtual cameras; and making the use of awareness management techniques more intuitive.

We present the design of a gameshow called Out of this World that will be staged in September at ISEA'98 and that will attempt to address these issues.

Authors Steve Benford (Nott), Claire-Janine Brazier (Illuminations), Chris Brown (Nott), Michael Craven (Nott), Chris Greenhalgh (Nott), Jason Morphett (BT) and John Wyver (Illuminations)

Interaction Models and Mixed Reality Interfaces for Inhabited Television

This Document presents the findings to date for task 3.3 from work package 3 of eRENA (ESPRIT project 25379). It continues from deliverable 3.1 on a new area of research, i.e. *Inhabited Television*.

We begin with summarising the evolution of digital broadcast as well as justifying mixed reality's suitability to Inhabited TV, finally describing the current implementation – eTV.

Specifically, this deliverable report covers task 3.3 and the production of a mixed reality interface (i.e. eTV) onto Inhabited TV that combines a real world component - i.e. video, and a virtual environment with TV.

We would though, suggest that the reader is familiar with deliverable 3.1 [77] before reading this deliverable and views the accompanying video associated with it.

Author Jason Morphet

Spatial Structuring Techniques for Electronic Arenas: Dimensionality, Spatiality, Boundaries and Movement

This deliverable is concerned with how humans, located in a physical space, perceive, explore and understand a virtual space. It considers how the structure of the physical space, the structure of the virtual space and the relationship between the two can lead to different forms of experience and social interaction. It then proposes new techniques for structuring virtual spaces based on the twin approaches of bounded regions and awareness driven quality of service. These techniques are intended to enhance the design of a wide variety of electronic arenas from artistic, social and technical perspectives.

The deliverable is structured into four chapters. The first two of these review different art works and spatial technologies in order to understand the effects of different spatial structures on artistic and social experience. The second two chapters introduce the two techniques of bounded regions and awareness driven quality of service.

Authors Steve Benford (Nottingham), Jeffrey Shaw (ZKM), Wolfgang Broll (GMD), Chris Brown (Nottingham) and Chris Greenhalgh (Nottingham)

Artistic Concepts and Production in Extended Performance

The work presented in this report explores artistic concepts which consider multi-user virtual reality, tele-presence and augmented reality as appropriate means for developing a concept of extended performance combining VR media with performing and plastic arts. This investigation has been carried out via targeted workshops and competitions organised by GMD and ZKM, challenging persons from artistic and technical disciplines to build new visions of interactive concepts in performative shared and mixed reality environments. The events described in this paper are as follows :

- Virtual Stages Workshop, GMD (February 6-7, 1998)
- Cyberstar competition on new interactive concepts and shared visions, GMD (April-June, 1998)

- Seminar “Own bodies, other bodies, virtual bodies“, ZKM / IIM (International Institute of Puppetry), Charleville-Mezieres, France (June 6-7, 1998)
 - Workshop Real Gestures, “Virtual Environments“, ZKM/ IIM (August 4-16, 1998)
- Authors** GMD: Monika Fleischmann, Jasminko Novak, Wolfgang Strauss, Mette Ramsgaard Thomsen ZKM : Sally Jane Norman

A Framework for Supporting Crowds in Electronic Arenas

This deliverable, introduces a framework for supporting crowds within electronic arenas. This includes support for crowds of participants (i.e., human users), in terms of activating crowd member facilities and providing aggregate views of crowds to be seen at low awareness, as well as support for simulating crowds. It therefore integrates techniques that are being developed at Nottingham and EPFL respectively. The framework consists of four components. The *crowd formation* component is concerned with detecting the existence of crowds within electronic arenas, characterising them, triggering their formation and subsequently managing their membership. The *crowd member facilities* component introduces various effects of crowds on a participant’s awareness and interaction, including effects on navigation and access control. The *crowd simulation* component is capable of simulating crowds based upon a simple crowd behaviour model that may be parameterised with the number of crowd members, their goals, emotional status and levels of dominance. A key aspect of the framework is that locally rendering such a crowd simulation provide a low cost alternative to transmitting and rendering the activities of many individual participants when seen at a distance or at a low level of interest. Finally, the *system configuration* component exploits crowds in order to allocate network resources, manage consistency and perform system optimisations.

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Navigation and Devices

Task 6.1 is concerned with developing new interfaces and new metaphors for more physical interaction with virtual environments, involving the entire body and its physical properties.

The deliverable is divided into three parts:

- “A Characterization of Input Devices used in Interactive Installations” develops a taxonomy of how input devices and space have been used in interactive installations.
- “Navigation for the Senses” describes several devices for whole-body interaction developed or under development at GMD.

“Some Elementary Gestural Techniques for Real-Time Interaction in Artistic Performances” describes gesture-based interfaces for multimedia performances.

Authors John Bowers (KTH), Monika Fleischmann (GMD), Sten-Olof Hellström (KTH), Michael Hoch (ZKM), Kai-Mikael Jää-Aro (KTH), Thomas Kulesa (GMD), Jasminko Novak (GMD), Jeffrey Shaw (ZKM), Wolfgang Strauss (GMD)

Evaluating Out Of This World: An Experiment in Inhabited Television

This document forms Deliverable D7a.1 of the eRENA project of the i3 schema of the ESPRIT-IV research action of the European Communities. eRENA is concerned with the development of electronic arenas for culture, art, performance and entertainment in which the general citizen of the European Community might actively participate supported by advanced Information Technology (IT). Within this general context, the current deliverable reports on the project's first experiment in 'Inhabited Television' whereby Virtual Reality (VR) technology is deployed to enable the citizen to participate within broadcast TV.

The document describes how, through an actual public demonstration, we were able to realise a popular format TV show within a multi-user virtual environment by paying special attention to the design of simple yet powerful interfaces for participants and viewers, together with novel camera control and event management software support for the production team. We have also subjected our work to extensive evaluation from a number of perspectives, both social scientific and technical. The results of these evaluations and their implications for work in the project and for more general research topics are described.

In particular, it is emphasised how this deliverable is the product of international, cross-partner and cross-profession collaborations in the project and how the work within it has been able to lever new integration pathways within the project.

Authors Steve Benford, John Bowers, Mike Craven, Chris Greenhalgh, Jason Morphett, Tim Regan, Graham Walker, John Wyver (BT, KTH, Illuminations, Nottingham), edited by John Bowers

Pushing Mixed Reality Boundaries

We report on task 7b.1, the eRENA workshop on pushing mixed reality boundaries. We introduce the concept of a mixed reality boundary that distinguishes our approach to mixed reality from other approaches such as augmented reality and augmented virtuality. We then review the history of boundaries in theatre in order to raise new requirements for mixed reality boundaries.

We extend the concept of mixed reality boundaries in two ways. First, we define the generic boundary properties of permeability, situation, dynamics, symmetry and representation that allow boundaries to be configured for different purposes. Second, we describe how multiple mixed reality boundaries can be used to join together many physical and virtual spaces into an integrated environment called a tessellated mixed reality.

We describe a practical experience of using a mixed reality boundary to create a performance. This culminated in a public demonstration of a rain curtain, a novel mixed reality boundary whose interesting properties include a lack of solidity, thereby allowing performers, props and audience to pass through it.

We evaluate this experience from artistic, technical and social science perspectives. We consider the implications of this work for the design of mixed reality technology in general. This involves exploring how dry versions of the rain curtain might be realised and speculating on how they might be used to create new kinds interface to virtual environments.

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