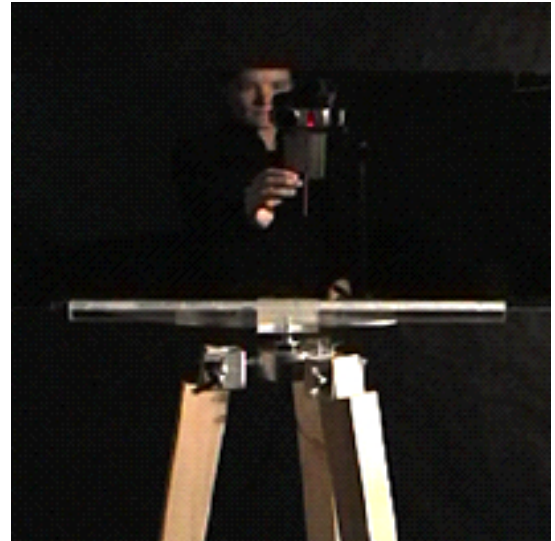# drawing spaces

experiments in presence and awareness of body and space in mixed realities

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Abstract

The interactive installation "Drawing Spaces" investigates strategies for creating a bodily sense of presence and awareness in networked space created through intersection of shared physical and virtual spaces. This paper presents two „Drawing Spaces" experiments: 1) a configuration where real-time generated virtual space mediates participants' interaction in a shared physical space (exhibited at CYNETArt 2000, Dresden), and 2) a networked configuration where separate physical spaces are connected into a networked Mixed Reality Space based on body movement and gesture (to be realised at University of Brighton in November 2001). In contrast to a „virtual reality" experience external to real space, Drawing Spaces attempts to employ the virtual as a means for heightening the participants' bodily awareness of real space and their physical presence.

Keywords: Mixed Reality, Interactive Environments, Human-Computer Interaction, Presence, Digital Storytelling, Media Art

Year the Work was created: 1998-2001

Introduction

The notion of virtual space as a new context of interaction and perception of the world can be followed back to the origins of virtual reality [Suth65] and interactive environments [Krueg83]. The different approaches range from the virtual reality immersion metaphor of „a world to be observed" [Suth65] [Cruz93], to explorations of telepresence as perception of remote people and spaces [SermTD], to shared communication spaces [GallRab80] [ArsEl92], to the current merging of real and virtual into different notions of mixed reality [MilKis94] [Mann97] [Ishii97] [Benf98] [BillKa99] [FleiStra00]. If the details of technological realisation are abstracted to different means of representation of computer-generated imagery and sound and to different means for the user to influence them in real-time, then all these approaches can be grouped under the general notion of interactive environments. From this point of view the two basic issues in exploring different concepts of interactive environments become: 1) what motivates the interaction of the participants with the environment, and the interaction between each other and 2) what is the relationship between real and virtual space i.e. how do participants perceive their physical presence and the presence of remote others.

In this paper we present the interactive installation „Drawing Spaces" as our approach to exploring concepts of interactive environments based on movement as a means for connecting the participants' perception of real and virtual space into a Mixed Reality situation.

Fig. 1. Screenshot from „Drawing Spaces"

Aims of Research

The interactive installation "Drawing Spaces" aims at exploring how bodily awareness of space and presence can be amplified through dynamic interactive environments. The basis of all experiments is creating a playful situation where movement and gesture in real space create a dynamic virtual space serving as a means of mediating interaction and communication between local or remote participants. By realising the experiments as installation in public space we explore the fusion of everyday behaviour with interaction in computer-mediated situations.

Basic Concept

Drawing Spaces starts with an "empty" virtual space – a black surface on the projection screen. As soon as the user enters the physical space of the installation the abstracted trace of his movement begins filling the empty space on the screen. Movement is the source and the only reason of the existence of the virtual space and of the perception of real space in this installation. Without movement no space exists.

As the visitors move within the space of the installation they draw spaces of movement. Fast movement creates large surfaces, while subtle movements result in fine lines. Moving closer or farther away from the camera changes the size of the body-brush that paints the screen. Body shape, size, distance, speed and rhythm of movement are parameters that translate participants actions into imaginary spaces on the projection screen.

Fig. 2. Abstracted forms of movement created by the user entering the installation

As depicted in Fig. 3. another crucial element in Drawing Spaces is the reflection of the real space in the resulting images on the screen . Through fast movement image surfaces can be created that incorporate parts of the real space which is normally filtered out as „it doesn't move". In this way movement is exposed as the means for „uncovering" the real space.

Fig. 3. Movement uncovers real space

Technical realisation and spatial setup

The basic principle of "Drawing Spaces" is realised by real-time image processing of the video stream of the participants' actions picked up by a camera . The individual phases of movement are extracted by the difference module that subtracts the consecutive frames in order to filter out still objects. The composition module transforms and overlays the resulting frames into a single image. As more and more of the transformed "difference-images" are superposed an abstracted trace of movement appears. This is displayed on the projection screen.

Fig. 4. Programme diagram

In this way the visitors' movement in space is captured by the computer, transformed, and drawn as traces of light on a projection screen. Still objects, or immobile visitors, dissolve – only movement is present. But the program is not independent from the spatial setting, and this is a deliberate decision. As the camera output is processed directly without compensation for uneven lighting conditions, the lighting in the installation space significantly determines the result of the programme i.e. the nature of the image space created through participants' movement. This adds to the richness of the interaction space of the installation.

Fig. 5. Basic setup for Drawing Spaces in shared physical space (CYNETart 2000)

Mediating interaction and presence

The set-up for CYNETART (Fig. 5. and 6.) focuses on investigating the role of a visual "virtual space" constructed through participants' action as a means for mediating haptic qualities of perception and interaction in real space. It is motivated by understanding the perception of a "given" reality as largely determined by the available means of interaction and communication with other people. The sense of presence in Drawing Spaces is conveyed through action rather than the representational means of 3D environment and avatars

[AvPan97]. Action enables presence, dissolving the reality of our physical extension as body around the active possibility of movement.
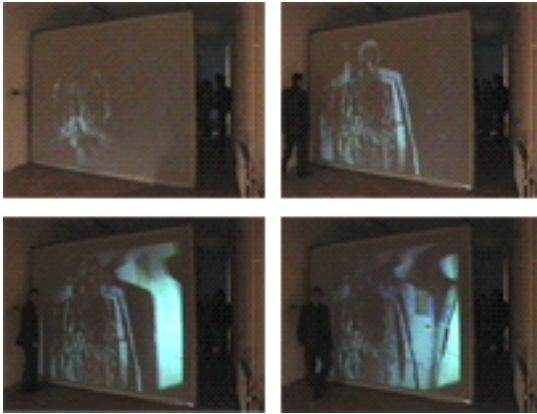

Fig. 6. Participant in the Drawing Space installation at CYNETart 2000

In technical terms, there is no virtual 3D scene, no viewpoint to be controlled, no objects to manipulate. There are no pre-programmed responses to users' actions. There is no goal, no purpose, or selection of possibilities as the basis of interaction. The visual forms on the screen do not intend to represent a "virtual world for our beholding" as in the classic approach of VR. They do not stand for a user's figurative embodiment (avatar) in a 3D computer scene nor do they offer a pre-made story to follow, modify or expand.

The image spaces that participants produce through their movement in real space communicate an abstraction of the relationship between their body - its size, physicality and motion - and movement. Their purpose is similar to a kind of a "magic mirror" confronting the user with the individuality of his/her movement in space: something that s/he cannot see and is only peripherally aware of in everyday life. The play-full situation, which is discovered, is based on recognising oneself within the frame, not as form, but through the individuality of one's movement and gesture.

This underlying „magic mirror" metaphor of the interaction concept can be compared to works such as Video-place (M. Krueger, 1974) [Krue83][ArsEl90], or Liquid Views/Rigid Waves (M. Fleischmann, W. Strauss, C. A. Bohn, 1993) [FleiStra97]. The notion of bodily sense of movement and gesture as the primary means for connecting and experiencing real and virtual space can be referenced to works such as Telematic Dreaming (P. Sermon, 1992) [Kozel94] or Murmuring Fields (M. Fleischmann, W. Strauss et. Al, 1998-2001), albeit they employ different technological means .
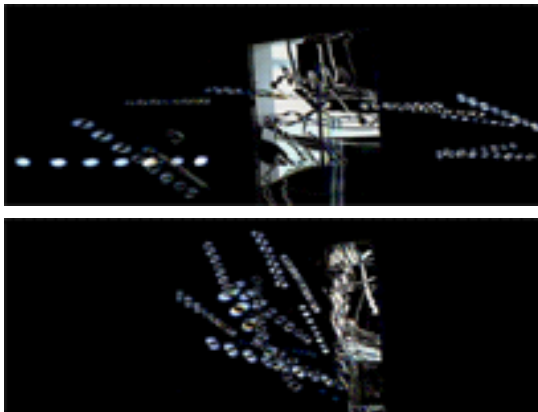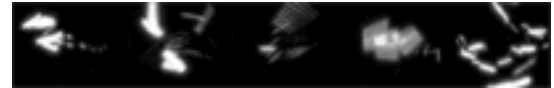

Fig 7. Body with light source

Fig 8. Shapes produced through interaction of two participants

Creating a networked Mixed Reality space

The next step in our experiments with Drawing Spaces is a networked configuration where separate physical spaces are connected into a networked Mixed Reality Space based on body movement and gesture (to be realised at University of Brighton in November 2001). We are investigating two scenarios for realising this: (1) merging live streams of the abstracted forms of movement of distant participants into a new image plane, (2) combining movement in physical space with a VRML based environment embedding live stream of abstracted forms of movement as means of presence and interaction of the participants (Fig. 8).

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