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# **Forms of Interaction in Mixed Reality Media Performance**

## **A study of the artistic event DESERT RAIN**

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# Abstract

This thesis describes and analyses the production, presentation / release and audience's reception of the interactive mixed reality performance *Desert Rain*. It focuses on forms of interaction and participation in relation to the field of Human-Computer Interaction (HCI). The complex mix of multiple relationships, as well as interaction with devices and artefacts in the performance brings to the forefront several similarities between theatre and HCI: the notion and role of the “audience” (theatre) and “user” (HCI), the “boundary code” (theatre) and “interface” (HCI).

In classical drama events are organised in order to constitute a “whole”, by which Aristotle means a beginning, middle and end. The events should have internal coherence and follow one logic sequence from beginning to conclusion. *Desert Rain* is based on classical dramatic elements: introduction (revealing context), climax (searching for a solution of a task), and finally discovery or change from ignorance to knowledge. The complex set of social interactions and communication is a challenging design problem: interaction with devices, interaction between performer and participant, and communication between participants. Multiple relationships with other people are established and artefacts (props) are exchanged, which make sense as a story unfolds. Each prop is a key and indicates a dramatic turn. Furthermore they indicate a change of level and way of participation. At the end of the performance participants / members of the audience have the necessary information to understand the overall concept. All these elements are minutely designed / directed by the artists.

The conclusion is that dramatic structures, as used in traditional theatre productions are as useful in novel forms of interactive environments when various forms of interaction, multiple-relationships and communication are addressed. Direct engagement can be created through hands and feet on activities where users could add new functions to props and interfaces, thus influencing the outcome of the event.



# Sammanfattning

Denna avhandling beskriver och analyserar hur den interaktiva föreställningen *Desert Rain* har skapats och framförts, ett verk som blandar realitet och virtualitet. Avhandlingen handlar främst om hur olika former av interaktion och publikdeltagande kan ta sig i uttryck i denna typ av verk och relaterar detta till begrepp inom människa-datorinteraktion (MDI). Det komplexa samspelet mellan människa och maskin, dvs interaktion med teknisk apparatur och mellan människor på olika nivåer i föreställningen uppvisar en rad paralleller med MDI: Den ena är begreppet "publik" (teater) och "användare" (MDI), samt deras förändrade roll. Den andra är gränsbegreppet, dvs å ena sidan den s.k. "gränskoden" inom teater ("gränsen" mellan scen och salong) å den andra sidan begreppet gränssnitt (MDI).

I den klassiska teaten är händelserna organiserade på ett sådant sätt att de utgör "ett helt", vilket enligt Aristoteles innebär en början, en mitt och ett slut. Händelserna ska inbördes stämma överens utifrån ett förutbestämt mönster och följa en logisk linje från början till slut. *Desert Rain* är konstruerad utifrån dessa klassiska grundelement: introduktion (klargörande av sammanhang, anslag), klimax (sökande efter ett svar på uppgiften, gåtan etc), och slutligen upplösning, dvs då allt uppenbaras och alla bitar faller på plats. Den komplexa sammansättningen av social interaktion och kommunikation är en utmaning ur designsynpunkt: interaktion med artefakter, interaktion mellan deltagare och skådespelare, samt kommunikation mellan de olika deltagarna. Samverkan mellan människor skapas och föremål av olika slag utväxlas, vilka får sin förklaring allteftersom den pågående "historien" utvecklas. Varje artefakt är en "nyckel" och indikerar en förändring i "dramat". I slutet av föreställningen har deltagarna / publiken den information som krävs för att kunna dra nödvändiga slutsatser och därmed förstå den övergripande idén. Alla dessa element är noggrant planerade och formgivna av de konstnärliga gestaltarna.

Slutsatsen är att de former och strukturer som används inom teater även kan användas inom interaktiva miljöer sådana som speciellt omfattar komplexa samspel mellan människor och med artefakter. Möjlighet att "lägga till" egna funktioner till artefakter ger deltagare/ användare en känsla av delaktighet i nya interaktionsformer.



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# 1 General Introduction

## Aims and objectives

This thesis describes and analyses the production, presentation / release and the audience's reception of the collaborative mixed reality performance *Desert Rain*. It focuses on forms of interaction and participation in relation to the field of Human-Computer Interaction (HCI). The complex mix of multiple relationships, as well as interaction with devices and artefacts in the performance brings to the forefront several similarities between theatre and HCI: the notion and role of the “audience” (theatre) and “user” (HCI), “boundary code” (theatre) and “interface” (HCI). The notions of “audience” and “user” differ from each other concerning intentions and goals. A public visiting a sports event for instance would probably want to get entertained not to fulfil a certain purpose. From an artist's point of view a main intention may be to mediate an experience or a message of some sort whereas applicability and usability are major goals from an HCI perspective. Despite these differences artistic as well as system and industrial designers deal with the same problem: human experiences. (HCI is here seen as denoting the collected knowledge of interaction between humans and computers from a number of perspectives). Performance theories and practices deal by tradition with the issue of orchestrating audience experience, engagement and reactions. This knowledge could contribute to the HCI perspective.

This field studies have been conducted at several occasions spread over one to three weeks long periods spread over a period of twenty months. The practical production of the performance is described as well as the practical accomplishment of audience participation and interaction. An analysis is based on field studies throughout the whole production process, from an early test version to the final set up and is informed by performance theories and practices as well as ethnomethodology.

One overall research question is how audience participation in performance art - work can be accomplished. Another main question is how the HCI perspective can be complemented and benefit from performance practices in interactive design. The interactive media performance *Desert Rain* may serve as a model to demonstrate how performance practices could be employed onto the design of audience experience and participation in artwork as well as in other forms of interactive environments.

## **Performance and installation art with audience interaction**

Performance art is influenced by a number of traditional and novel art forms such as art installations and performing arts (stage performance, dramatic art), by social phenomena and popular culture like for instance computer games, happenings, music and film. The *Desert Rain* performance is a mix of installation, performance and interactive game. The development of these art forms is parallel with the elaboration of the role of the audience. As will be described the audience in *Desert Rain* has been given a substantial participatory and performative role.

During the sixties and seventies conventions concerning the role of the audience were questioned along with the performance space within the fields of performing arts. Actor and play moved out from the traditional auditorium into factories and streets. Doing so the so-called “fourth wall” convention was broken, that is, the invisible wall between stage and audience was transgressed. The performance theorist and director Richard Schechner describes how spectators were engaged in a play during the early seventies sitting “on the bed during scenes that were played there” (Schechner 1994:81), which illustrates the “breakdown” of the traditional distinction between spectator and performer. Schechner points out how quickly the audience learned the conventions of the production and how special techniques helped the audience to learn the conventions. “Upon entering the theatre, spectators were greeted by performers who acted as hosts, explaining the ground rules” ...and ...“in a loud voice addressed to everyone”... at the beginning of a special

scene “to sit around the table” (ibid: 82). Directors and artists like Grotowski and Peter Brook explored and extended the performance space as well as exploring the role of actor and audience by moving them around through different spaces during a performance and further by Robert Wilson and Robert Lepage who elaborated interaction between actors and real-time images.

Installations are generally constructed as spaces, or “tableaux”, as opposed to separate paintings hanging on a wall. During the early sixties Edward Keinholz built a number of these tableaux filling a vast museum space, separate rooms where the spectator / visitor could enter and walk around to experience a whole concept or “narrative”. Artists like Bill Viola use video projections or computer generated images to fill up a space; Christo and Jeanne Claude work with environment and sites wrapping up bridges and buildings in plastic. Jeffrey Shaw uses different forms of visual environments in 3D with which the audience can interact through different manipulative and sensor devices. Interaction and interactivity became the key words of the nineties indicating an activation of the role of the audience.

Laurie Anderson is one of the key figures in performance art mixing a whole range of media, technology and disciplines including music, text, video, film, dance, sculpture and painting. Her main goal has been to make contact with the audience from the start in the late 70s rather than audiences to new levels of awareness, as did the Dadaist and Futurist during the twenties. “Anderson understands how media work, both technically and perceptually, on the senses, and she questions the artist’s role in colluding with the aesthetics of a ‘cold, speedy, techno world’.” (Goldberg 2000:15) She claims that despite all computers and digital equipment that fills her studio she can do without them. “I think amazingly beautiful and dangerous art can be made with a pencil. And it’s the dangerous part that matters. Avant-garde questions the mainstream. It’s about originality, controversy, taboos.” (ibid:23) In her work *Stories from the Nerve Bible* (1992) Anderson brought together politics, art, religion, and war with reference to the Gulf War quoting Marinetti “War is the highest form of modern art” (ibid:159), a statement given new significance in the *Desert Rain* performance. Images on posters and flyers, written and spoken vocabulary (like “target” or “hit” for instance) within the *Desert Rain* performance make references to war situations. The use of an interactive game format refers to the fact that pilots were trained in simulators before sent to the Gulf thus illustrating the virtual properties in the modern “surgical” war. Networked computer games are appreciated for their social implications and the possibility for “clans”, groupings of game aficionados, to play over vast distances, but they are also used by the US Marines to teach teamwork and tactics. A “hit”,

shown as a dot on a display, might signify “a thousand” or “a hundred thousand” people as indicated on a small box secretly put in participants’ jackets before leaving the performance.

Other personal contacts with projects, institutes and people that have influenced my thinking on performance arts come via SMARTlab, led by Prof. Lizbeth Goodman at the London Institute. Ongoing projects within the frames of SMARTlab is for instance Code Zebra, a major international research project that has selected SMARTlab as its UK base. The project is led by Sara Diamond, director of the New Media Centre at Banff, Canada – a practice based investigation into the working practices shared by artists and scientists. ‘Current curious.com’ is a multimedia performance company created by artistic directors Leslie Hill and Helen Paris, a nationally and internationally commissioned performance artist of solo and collaborative work. They also work as Associate Artists and Researchers at SMARTlab across a number of research and online activities. Helen Paris was also involved at a preparatory stage of *Desert Rain*. The European project Radical is a collaboration between SMARTlab and Ecole Supérieure de l’Image (ESI), that aims to develop a digital seedbed for creative arts practice and publications providing guides to good practice in the fields of creativity for the IST (Information Society Technologies) programme.

The Australian artist Stelarc among others explores the extension of the body. Stelarc focuses on zombies and cyborgs and what it means to be a human being in pieces like *Robotic Art*, *Body Extensions*, and *Exoskeleton*. Exoskeleton is a six-legged, pneumatically powered walking machine constructed for the body. The locomotor, with either ripple or tripod gait, moves forwards, backwards, sideways and turns on the spot. It can also squat and lift by splaying or contracting its legs. The body is positioned on a turn-table, enabling it to rotate about its axis. It has an exoskeleton on its upper body and arms. It is human-like in form but with additional functions. The body’s arms guide the choreography of the locomotor’s movements and thus compose the cacophony of pneumatic and mechanical and sensor modulated sounds.

The Swedish performance artists Bogdan Szyber and Carina Reich have performed and “staged” their pieces at various indoor and outdoor spaces. Once performers were hanging for hours high above ground tied with rope to a water tower in the woods. In *Drowning Piece* the audience watches a woman that slowly moves around, beneath surface, in a gigantic glass tube filled with water during a painfully amount of time. Death metal meets toe dancing in the performance *Unrealestate* staged at the Royal Opera in Stockholm.

## Interface Design and “Conversation”

Research and perspectives concerning interface design, or interfacing, are dealt with by a number of notable researchers within HCI. Just a few are mentioned below due to either personal dealings or to the context they provide for *Desert Rain*.

Early interface design is built on a one-to-one relationship between a human and a computer, where a person does something and a computer responds. This simplistic notion of “conversation” led interface designers “to develop a model of interaction that treats human and computer as two distinct parties whose ‘conversation’ is mediated by the screen. But as advances in linguistics have demonstrated, there is more to conversation than tit-for-tat” (Laurel 1993:3). Brennan and Clark employs the notion of “common ground” based on the assumption that co-ordination of content is based on shared information or common ground and that all “collective actions are built on common ground and its accumulation” (ibid:3).

Equally Erving Goffman claims the two-part paradigm as inadequate when people are involved in multiple relationships with other people. He suggests a model for conversation analysis that is more suitable for complex systems so-called “footing” where “participants over the course of their speaking constantly change their footing, these changes being persistent feature of natural talk” and further that “A change in footing implies a change in the alignment we take up to ourselves and the others present as expressed in the way we manage the production or reception of an utterance. A change in our footing is another way of talking about a change in our frame of events” (Goffman 1981:128).

Bowers, Pycock and O’Brien apply a similar understanding of conversation onto an analysis of human interaction in collaborative environments. They present an analysis of “social interaction in an internationally distributed, real-time, multi-party meeting held within a collaborative virtual environments (CVE)” (Bowers & al. 1996). They examine how “ordinary conversational mechanisms are exploited or transformed in such environments” (ibid.). Through employing empirical techniques derived from Conversation Analysis reveal problems with so-called turn taking in conversation and participation involving multiple-relationships. Their work emphasise social interaction as a principal issue in the overall design of virtual worlds. In previous work Bowers and Rodden have argued that the interface or interfaces may be “a resource for social action and interaction” (Bowers & Rodden 1993).

## **The interactive performance *Desert Rain*, theme for this study**

The mix of media and use of technical devices puts *Desert Rain* in a unique position concerning level and variety of audience participation. The performance involves participants in a complex set of multi-party conversations and social interaction in real life and in a virtual social environment, and interaction with technical devices as well as with artefacts.

The installation is divided into four separate rooms through which the audience / participant / player moves or “travels” in a specific order and involving members of the audience to various degrees. It is organised as a visit, or journey, as a narrative and drama limited in time and space with a beginning, middle and end. Each space has a different message and concept that is linked to an overall concept (the Gulf War) and each revealing and adding a piece to the “story” or puzzle. An individual’s degree of participation is influenced by interaction with performers and interaction with other participants as well as by what kind of props or technical devices are used. The role of the audience shifts along the journey from being a regular theatre visitor listening to a performer giving information about the piece to being active participants and players, or gamers, actually taking over the role of performer themselves. Before leaving the performance space the audience reverts to being regular theatre visitor until they get involved once again through a small gift or token that is left in a pocket in a jacket.

*Desert Rain* has been favourably received by public and press throughout Europe. It can be suggested that one reason is the fruitful collaboration between artists and computer scientists, which has led to the accomplishment of a complex interdisciplinary yet comprehensive and integrated set-up. Another reason is the reciprocity of benefit, that is, technical concepts were artistically interesting as well as the artistic use and exploration of the collaborative virtual environment, CVE, was interesting from a computer scientist’s point of view. Yet another reason is the research and development time, in all two and a half years, which enabled the parties concerned to elaborate several versions through discussions with users / the audience finding out what problems there might be and then be able to adjust and attend to these problems. Initially the project was made possible through Artlab, a process-oriented research and development programme in Nottingham that gives artists R&D time, which in turn make it possible to elaborate an artistic project thoroughly. Later money, equipment and manpower were put into the performance by the European project eRENA.



The eRENA (Electronic Arenas for Culture, Performance, Art and Entertainment) project aimed at developing “electronic arenas”, or “inhabited information spaces”, “that allow citizens to experience new forms of art, entertainment, performance and culture” focusing specifically on the reconfiguration of “traditional relationships between performers and audience and creating new kinds of stage that extend narrative possibilities” (eRENA 1999:4). Partners in the eRENA project, financed within the ESPRIT programme, were the universities of Nottingham and Geneva, EPFL Lausanne, GMD Bonn, British Telecom Research Labs, Illumination Ltd, ZKM Karlsruhe (leading institution in development and exhibition of novel forms of art, led by professor Jeffrey Shaw) and KTH (coordinator through professor Yngve Sundblad). *Desert Rain* is a performance by the London based performance group Blast Theory developed in cooperation with computer scientists from Nottingham University and ZKM, and studied by scientists at KTH (John Bowers and myself). As a member of the KTH team I conducted field research on *Desert Rain* focusing on the practical production a performance art – work and forms of interaction in that collaborative environment.

## Theory and Method

The concept of an “electronic arena” as explained within eRENA is “*An electronic arena deploys mixed reality technologies to create environments for potentially large-scale real-time participation in media-rich cultural events*” (Bowers 1999:2). The *Desert Rain* performance comprehends all the five key-terms (mixed-reality, large-scale participation, real-time, media-richness, and cultural events).

I studied the practical production of the first prototype of *Desert Rain* in January 1999, the completed version later that year and a number of performances in Germany, England, Sweden and Netherlands between 1999 and 2001. The artistic designers, the performance group Blast Theory, spent approximately five weeks at ZKM's Center for Art and Media Technology on two occasions testing various solutions of a navigational device, exploring a permeable mixed-reality water screen, designing and re-designing the 3D world graphics and testing the sound in a one-user prototype, and later the six-user version, together with technicians, computer scientists, programmers and members of the audience. My studies were carried out between January 1999 and September 2000. In addition an interview was conducted in November 2001 in Rotterdam. The field research is influenced by ethnomethodology, “an interpretative approach to sociology which focuses upon everyday life as a skilled accomplishment, and upon methods which people use for producing it” (Fairclough 1995:21).

Throughout the whole production process I took notes of the observations made on site. Besides that I took part in meetings and had informal talks with artists, technicians and personnel at ZKM. The studies of the final production focus on the audience reception of the piece and how participation and collaboration between participants and performers were actually accomplished. From behind a water screen I could observe how participants succeeded in managing a navigation-al device, a footpad, and their reactions to a performer emerging through the screen. It was also possible to observe how, when and if people communicated with each other even if the wording was hard to distinguish. Through watching a set of computer screens on a hidden computer space I studied how participants managed to navigate through a virtual space and listened to helpers / performers that would talk to people over headphones if they needed assistance. Neither inter-views nor questionnaires were distributed to members of the audience since we agree with the artists that verbalisation is filtered through consciousness thus breaking the “magic” of the experience.

The main source of influence informing the studies is performance theories and practices. A theoretical framework is suggested consisting of performance and reception theory (Schechner, Barker, Martin & Sauter) in order to analyse and interpret how audience experience and participation in a large-scale collaborative environment may be organised and designed. The analysis of the interactive game element in the performance is informed by theories on play and games represented by Huizinga and Caillois.

## **Research problems**

The thesis describes how the practical production of an art – work is accomplished and analyses the following research problems:

- How participation in novel forms of interactive media art can be reached
- How “audience” and “user”, “boundary” and “interface” are related in novel forms of media art
- How the field of HCI could be complemented and benefit by using performance practices in the design of audience participation and experience.

## **Thesis Overview**

Chapter two presents a theoretical framework consisting of Aristotle’s Poetics providing basic ideas of form and structure and in drama, performance theories and

reception theories (Schechner, Barker, Martin & Sauter) and theories on play and games (Huizinga, Caillois). These theories are used to analyse forms of interaction in collaborative environments like *Desert Rain*.

Chapter three provides a background picture of the *Desert Rain* performance, including studies of the practical production of it.

Chapter four aims at defining the role of the audience, level of engagement and interaction at each stage of the performance. Conventions used in theatre, play and games are explored as well as how these conventions are used to organise and orchestrate audience experience and participation. Brenda Laurel uses theatre as foundation to point out how thinking about dramatic action may be applied to computers.

The final discussion in chapter five suggests implications for the HCI perspective. The notion of “user” and “interface” are discussed as well as how users may attribute new functions and meaning to props and devices in the performance. How does the role of the “audience” / “user” shift throughout the performance? How is the audience engaged and through what means? What are the properties of the “interface” in *Desert Rain*?

## **Summary of results**

One overall question is how the HCI perspective could be complemented and benefit from performance practices in interaction and collaboration design. The studies of *Desert Rain* reveal some valuable points to HCI concerning “user” and “interface”, interaction and collaboration. Collaboration in interactive environments that involve people in multiple-relationships and real-time conversation need specific form and structure in order to be engaging and to sustain engagement and collaboration. The visit in *Desert Rain* is clearly defined concerning time, task and space and yet the whole event allows participants to add new meaning to Artefacts (props) as well as create new “stories”.

In classical drama events are organised in order to constitute a “whole”, by which Aristotle in *Poetics* (McLeish 1998) means a beginning, middle and end. The events should have internal coherence and follow one logic sequence from beginning to conclusion. *Desert Rain* is based on classical dramatic elements: introduction (revealing context), climax (searching for a solution of a task), and finally discovery or change from ignorance to knowledge. The complex set of social interactions

and communication is a challenging design problem: interaction with devices, interaction between performer and participant, and communication between participants. Multiple relationships with other people are established and props (artefacts) are exchanged, which make sense as a story unfolds. Artists have designed interaction and encounters, the unfolding story and the use of props minutely. Each prop is a key and indicates a dramatic turn. Furthermore they indicate a change of level and way of participation. At the end of the performance participants / members of the audience have the necessary information to understand the overall concept.

Exploration of the virtual world and the physical installation is constrained by limitations in time and space. Despite these constraints participants are allowed free scope to add new meaning to actions and props and give them new functions by transforming their usage.

The role of the audience / “user” as well as the role of the performers / helpers shift throughout the performance. The audience changes from being spectators, to players and participants and back to being spectators again whereas performers shift to helpers and spectators. These shifts are made possible through the use of “threshold objects” that mark a shift in action and participation along the trajectory. A “threshold object” may be a jacket, a word or a card, anything that implies a change of action.

An interactive performance that specifically addresses interaction, participation and collaboration problematises notions like “user” and “interface”. An “interface” may be political, social, organisational, and emotional as well as technical according to Bowers, Rodden, Bannon and Kuutti. Within the theatrical frame there is an invisible boundary between public and stage, the “fourth wall”, maintaining the imaginary world on stage. The fourth wall resembles the notion of the interface as being a boundary between two entities. In the *Desert Rain* case a prop can be part of the interface as well as just to being an object. In order to facilitate social encounters the design of the event needs a balance between restrictions and possibilities, which is elaborated further in the text.

Conclusions drawn from the studies reveal how various forms of interaction, collaboration and participation, may be designed and orchestrated using drama as foundation. Participants in a mixed reality environment can accomplish a set of complicated and interrelated tasks if each element is introduced successively and structured as levels of learning. Interaction with devices is facilitated when intro-

duced in an engaging context. A game activity based on conventions, guidelines and rules recognisable to the general public may facilitate the use of technical devices. If participants get involved and made part of a “drama” or “narrative”, barriers between participant / user and system can be overcome.

## 2 Perspectives and approaches from performance and game theory influencing the research

Interactive media performances as well as various kinds of collaborative environments involve the audience in multiple relationships and hands-on activities. The combination of performance, installation and game and mix of entertainment, problem solving and teamwork in *Desert Rain* put high demands on members of the audience, artistic designers and technicians respectively. Dramatic art has a long tradition of orchestrating human relationships. Drama is intrinsically interactive involving at least two partners, a spectator and a performer, in a communicative act. The way dramatists and actors work when staging a drama may provide ways of thinking valuable to designers of CVEs.

Notions I have been sensitive to are “audience” and “user”, “interface”, and “boundary”. This chapter gives a short background to performance theories and theories on games and play. Notions like borders, transitions and threshold markers are explored as well as categories and properties of games and play.

In the early nineties Brenda Laurel proposed the idea of using the notion of theatre and drama to get a deeper understanding of human-computer activity. “Dramatic arts have a tradition of several thousand years in thought, study, and experimentation with human experience with a variety of modes of interaction” (Laurel 1993:xi)...and that Aristotle’s poetics “defines forms and structure in drama and

narrative literature and provides an understanding of how structural elements can be combined to create organic wholes” (ibid:xix). Laurel employs Aristotle’s ideas as presented in *Poetics* about form and structure for representations in which humans and computers can participate.

### **Audience research / reception theory**

Most investigations on theatre audiences make use of sociological techniques and experiences to gain insight into cultural attitudes of the general public. The initiative often comes from city councils or governmental authorities and the purpose is normally utilitarian. Audience research in general put emphasis in describing the features of existing or potential theatre audiences (Martin, Sauter 1995). The visitor could be described from several perspectives: demographic, attitudes towards different kinds of cultural activities, habits, preferences and so forth. “[S]ubsequent surveys made it obvious that the social structure and social habits of theatre audiences hardly changes just because a theatre offers baby sitters, .....or guided tours back stage. Theatre going is predominantly a social activity and social habits are difficult to alter from the outside” (ibid:28).

Earlier audience researcher made use of questionnaires, but never joined the public in the auditorium in order to find out what they actually experienced during a performance. Reception theory on the other hand “deals with the spectator’s intellectual and emotional experiences in the theatre” (ibid:29). There is a distinction between a macro-aspect and a micro-aspect within reception research, or as Henri Schoenmakers puts it “a sociological and a psychological aspect respectively” (ibid:29). The macro-aspect deals with the real spectator’s experience as opposed to an ideal spectator. Here the researcher focuses on finding answers to who is experiencing what during a performance whereas the micro-aspect deals with the psychological aspect, that is what kinds of emotional reactions and thought occur while the spectator is watching a performance.

Emotions that have attracted reception researchers the most are identification, sympathy and empathy. These emotions are vital in the creation of a common fictional world, the theatrical common ground, a world that is created in an interactive process involving a spectator and a performer. Many of the questions concerning identification are still to be answered though. “So far, we cannot even confirm if Aristotle was right after all, in assuming a cathartic purification of the spectator’s feelings” (Martin & Sauter 1995:33).

## **Levels of communication and creating a “fictional” world**

One of the basic elements in drama is creating and participating in a fictional world. “To make this imaginary world of drama meaningful and purposeful, it must have aspects of the real world in it. The central, real-world component of dramatic situations is human relationships” (O’Toole & Haseman 1988:3)

We watch the making of the fictional world as much as the fictional world itself. Theatre is to be understood as an act of communication between its presentational side and its perceptible side. Martin and Sauter describe how a performance is perceived and interpreted by its audience. The sensory level describes how people become aware of each other with their senses, which is important for the establishment of any contact between stage and auditorium. If the sensory level fails, the spectator will most likely lose his or her interest in the scenic action. The artistic level comprehends the performer’s artistic ability and includes all the means, which can be used to create a role. How is the spectator involved on this level? Aristotle claims the delight of watching people imitating people is something deeply human because there is a deep pleasure given to people through representation. The artistic level of theatrical communication concerns the style of aesthetic expressions and the norms, from which these expressions are produced and evaluated. It describes how the mimesis is executed and to what degree it is appreciated. The purpose is to create a fictional world. The fictional level is important in terms of creating the fiction. A theatrical situation implies of necessity a performer and a spectator in order to create this representational or fictional world. “[W]hen people come to the theatre, they not only accept a world of fantasy, but they actively engage in constructing it. The basis for this step from physical to the imaginary world is the...theatrical agreement between performer and spectator. According to this agreement, and only then, the performer invites the spectator to interpret the scenic reality as something that it is meant to represent. The spectator, aware of the representative character of the scenic actions, accepts the invitation and builds his or her fantasies” (Martin & Sauter 1995:82).

“The concept of communicative actions concerns the interaction between at least two subjects, capable of speaking and acting, who are engaged (by ways of verbal and non-verbal means) in an interpersonal relationship. The agents seek a consensus regarding their situation to co-ordinate their plans of action in mutual understanding” (Habermas in Martin & Sauter 1995:87).

A central term for Habermas is consensus, which stands for the purpose of com-



municative actions. A predominant means of achieving consensus is language, but as far as theatre is concerned non-verbal communication should be included as well. The performer on stage seeks consensus with the spectators to establish the fictional world.

### **Borders, boundary codes, transitions and threshold markers**

Traditionally the audience has had the role of sustaining the theatrical illusion by not participating or interrupting a play, whereas today the condition may be the opposite. There is an invisible “fourth wall”, or screen, between public and stage, a border that should not be transgressed in order not to break the fiction. “Theatre as art is hinged on an essential boundary, namely the division between actor and spectator. This boundary is used to separate two realities: reality of performance artefact, with its aesthetically contrived space and time, and reality of so-called everyday activity, where space and time obey other sets of codes” (Norman 1999:11). And according to Goffman “[A] line is ordinarily maintained between a staging area where performance proper occurs and an audience region where watchers are located. The central understanding is that audience has neither the right nor the obligation to participate directly in the dramatic action occurring on the stage, although it may express appreciation throughout in a manner that can be treated as not occurring by the beings which the stage performers present onstage” (Goffman 1971:125).

In theatrical contexts the fourth wall convention is the denomination of the symbolic wall between audience and stage. “What has been called ‘the symbolic distance’ must be assured. A membrane must be maintained that will control the flow of externally relevant sentiments into the interaction” (Goffman 1997:133). Sally Jane Norman describes the role and use of boundaries and codes throughout the history of theatre. “Theatre possesses a rich repertory of codes which govern symmetry and dissymmetry between viewing and acting participants in a shared virtual world (namely, the aesthetic construct that is the theatre experience), along with derivative codes that govern the degrees of overlap, permeability and interaction between these two categories of participants” ((Norman 1999:11). “Doors and curtains are two physical boundary mechanisms frequently used to engender performance space. Alternatively, in the absence of such physical devices, the ‘virtual reality of theatre’ may emanate or radiate from the actor” (ibid:13). The stage / audience code has been broken by the different roles assigned to actor and audience. This transformation has been assisted by changes made in the proxemic relations between stage and auditorium, performers and audience. Directors like

Brook and Grotowski for instance have experimented with breaking down the usual actor / audience zones.

In narrative theory the term “marker” indicates a transition from one state to another, to differentiate one narrative voice from the other. In a movie, for instance, black and white footage might be used to indicate a flash back. Janet Murray claims that “computers are liminal objects, located on the threshold between external reality and our own mind” (Murray 1997:99). She uses the term liminal, an anthropological term taken from the Latin word for “threshold”. It is used to describe a mythological experience where for instance a story takes place between the world of ordinary state and the sacred world. In this case the term threshold objects, or markers, are used to indicate some sort of change in the narrative or happening. All narrative art forms have developed conventions to sustain the border between the actual world and the fantasy world. One way to sustain this is to prohibit participation. In theatre it is maintained by the fourth-wall convention and when this invisible wall is torn down and participation allowed it has to be carefully structured. Murray elaborates on this, “part of the early work in any medium is the exploration of the border between the representational world and the actual world” and “we need time to get used to any increase in representational power. During this time one of our main activities, as creators and audience...involves testing for the boundaries of the liminal world” (ibid: 103). Murray asks what the digital equivalent to the theatre’s fourth wall might be claiming that there is a need to define boundary conventions of the virtual environment. Structuring participation as a visit is one way to facilitate participation. The agreement between participants and the “visit” is based upon acknowledgement of the rules that are valid within the frames of the performance. Otherwise the participants might want to explore the rest of the space crossing the boundaries of the imaginary world and the real. A visit, as well as an event or a performance, has “an entrance and an exit that mark the beginning and end of the story” (ibid: 106). A visit or a journey metaphor can be used to structure a story.

All narrative art forms have developed conventions to sustain this. One of the most important ways in which this has been done is to prohibit audience participation. An actor’s invitation to enter the circle of enchantment, created by the stage, might be perceived as a violation of the compact between playwright, actor and audience. Breaking the fourth-wall convention that prohibits actors from acknowledging the spectators and instead encouraging audience participation creates new roles for and raises new demands on actors, performers and audience. Interactive media art, installations, and performances demand and expect a participating and engaged

audience. There has been a shift from the passive spectator to the active participant or “interactor” (Murray 1997).

## **Play and Games**

Play, according to performance theorist Richard Schechner, is a “free activity” where one makes one’s own rules. In Freudian terms play expresses the pleasure principle, the private fantasy world” (Schechner 1994:13). Play is an activity in which the participant (-s) set their own rules, whereas a game generally has acknowledged rules, and “art may be considered a specific co-ordination of play and ritual” (Schechner 1994:95). He continues by asking what “play” actually is, its characteristics, functions and structure referring to Johan Huizinga (*Homo Ludens* 1938) who in turn argues that play is a “free activity”, which stands outside ordinary life. It is an activity that in a sense is not serious, but at the same time it absorbs the players completely. “It proceeds within its own proper boundaries of time and space according to fixed rules and in an orderly manner” (ibid.). Caillois whose book *Man, Play and Games* (1958) is an extension of Huizinga’s theories, presents “a topology of play on the basis of which the characteristic games of a culture can be classified and its basic patterns better understood” (Caillois 1958:vii). Caillois says that “play must be defined as a free and voluntary activity, a source of joy and amusement. A game which one would be forced to play would at once cease being play” (Caillois 1961:6). Play according to Caillois is “essentially a separate occupation” (ibid:6) isolated from ordinary life and is generally taking place within precise limits of time, place and rules. There is a place for play such as the space for hopscotch, the arena etc. And it takes place within a certain limit of time. The duration of a game is often fixed in advance and starts and ends at a given signal. “[t]he game’s domain is therefore a restricted, closed, protected universe: a pure space” (ibid:7). A typical free play activity according to Schechner would be children’s play and games (these play and games have rules too, but they might change from play to play and day to day) whereas Huizinga’s definition concerns all activities that are outside ordinary life (children’s play and games as well as sports, computer gaming, theatre etc). And as being apart from ordinary life it is “free”.

Another important element is the rules that govern play, “rules that must be accepted as such and that govern the correct playing of the game. If the cheat violates the rules, he at least pretends to respect them. He does not discuss them: he takes advantage of the other player’s loyalty to the rules... the game is ruined by the nihilist who denounces the rules as absurd and conventional, who refuses to play because the game is meaningless” (ibid:7)

## **Games and Rules**

“No scepticism is possible where the rules of a game are concerned, for the principle underlying them is an unshakeable truth” (Paul Válerý in Caillois 1962:6).

As soon as the rules are transgressed the whole play-world collapses. The game is over. The spell is broken and sets “real” life going again. The player who trespasses against the rules or ignores them is a “spoil-sport”. The spoil-sport is not the same as the false player, the cheat; for the latter pretends to be playing the game and so doing still acknowledges the magic circle. Huizinga claims society is more lenient to the cheat than to the spoil-sport. This is because the spoilsport shatters the play-world itself. He robs play of its illusion. “In the world of high seriousness, the cheat and the hypocrite have always had an easier time than the spoil-sports, even called innovators, prophets, rebels or nonconformists. It sometimes happens that the spoil-sports in their turn make their own communities with rules of their own. The outlaws, the revolutionary or member of a secret society are all equals and a certain element of play is prominent in all their doings” (Huizinga 1976:54).

“The player who trespasses against the rules or ignores them is a spoil-sport. The spoil-sport is not the same as the false player or the cheat; for the latter pretends to be playing the game and, on the face of it, still acknowledges the magic circle. It is curious to note how much more lenient society is to the cheat than to the spoil-sport. This is because the spoilsport shatters the play-world itself. ..He robs play of its illusion” (Richard Schechner and Mady Schuman 1976:54).

In an article on trust Garfinkel shows the moral background of common activities through breaching and upsetting routines (Coulon 1995). Garfinkel shows that before playing a game we have to accept the common rules. If I cheat and breach the rules I also breach the trust. “The scandal is not so much in the breaching of the rules of the game as in the breaching of trust, which is the fundamental condition, usually hidden, of the game with its accepted rules” (ibid:43).

## Categories and Properties of Games

Roger Caillois sees the structure and values of society reflected in the way that combinations of certain elements in games gain popularity over others at various times in history. He identifies four categories of games: vertigo, simulation, struggle or competition, and chance. Vertigo implies the exploration of emotional sensations that accompany loss of control over one's actions. Caillois sees the combination of vertigo and simulation as "in principle and by nature in rebellion against every type of code, rule and organisation, whereas games of struggle and competition call for calculation and regulation and are conservative of the social structure" (Barker 1989:88). The properties of game and play activities are constituted by the need to prove one's superiority, make a record, solve riddles, inspiring fear etc.

Another important element is the longing for ecstasy, and desire for voluptuous panic as important motive powers behind our need to play games.

Each of Caillois's four categories of games: vertigo, simulation, struggle or competition, and chance is characterised by different properties.

### *1. Vertigo games that inspire fear, longing for ecstasy, and desire for voluptuous panic.*

Vertigo, and vertigo games, is / are "the negation of controlled effort" (Caillois 1961:72). These games "explore the emotional sensations that accompany loss of control of one's actions" (Barker 1982:86). Roller coasters, bungee jump, or less conspicuous activities like swings in a playground, may invoke the feeling of vertigo. Among other things "the horror movie exploits our appetite for 'voluptuous panic', the intention being to take the audience to the point of almost screaming out in imagined terror" (Barker 1986:86).

Within the frames of modern Western society there is little space for giving full expression for that longing except for drug use sought transcendently in all societies, in carnivals or in horror movies according to Barker.

### *2. Games of competition or struggle, that aims at proving one's superiority or making a record*

Vertigo games are the opposite of control and competitive games, which are characterised by the striving for power and "self-control; respect for rules; the desire to test one-self under conditions of equality; an obligation agreed to in advance, to circumscribe the conflict within set limits, etc." (Caillois 1961:71). But as Barker points out the conformity to rules and laws also creates a temptation to circumvent them, making room for "spoilsports", cheaters and breaching of trust.

### 3. Solving riddles, mysteries or puzzle

Examples are computer games like *Myst* and *Riven*, children's play and games involving rhymes and word play as well as the classic example of the Sphinx posing riddles to Oedipus or the more contemporary ones, the riddles by Gollum to Bilbo.

### 4. *Simulation games*

These are games of make-believe, disguise and mimic like dressing person up as a knight or a cowboy for instance. Live Action Role Playing Games, LARPs, is one example when adults dress up as like wizards or orchers performing the fantasy world of Tolkien, or role-playing in net based games like MUDs.

## **Summary**

The theories described here are mainly on the tendency and means to make the "fourth wall" between performers and audience disappear, on borders and boundary transitions also in other forms of interaction, including play and games, and on categorisation of games.

The theories will in the following chapters be used in the analysis of observation of performers and audience of the *Desert Rain* performance.

### 3 The Desert Rain Performance – a Field Study

#### Introduction

The *Desert Rain* performance is collaboration between the performance group Blast Theory, and the eRENA partners University of Nottingham, ZKM, and KTH. It is practically accomplished by the Communications Research Group (CRG), at the University of Nottingham, ZKM and Blast Theory.

The intention with the project for Nottingham's part was "to construct a new kind of collaborative environment, supporting new forms of awareness and communication between inhabitants of distributed spaces by the use of MASSIVE 2 (a VR system), and by the use of a live video image of the physical space transmitted across the network and then displayed in the virtual space so that it appears as an extension of the virtual environment" Moreover CRG, led by professor Steve Benford, wanted to explore the use of a permeable boundary between the real and the virtual world. Another approach was to "consider the rain curtain as just one example of a more general class of non-solid, semi-transparent mixed reality boundaries, some of which might be realised using dry materials" (Benford 1999).

Blast Theory introduced the technology of the rain curtain to the eRENA project. While experimenting with water projections in 1997, they met with researchers from Nottingham who were researching various mixed reality boundary technologies. The idea of using the rain curtain as a permeable boundary in a collaborative

virtual environment was born, together with the first tentative performance ideas. In two longer working periods in 1999 at ZKM's media theatre all aspects of the piece were developed, tested and evaluated in internal and public demonstrations (Benford 1999).

*Desert Rain* is one of eRENA's final demonstrators that fully embodies its mixed reality research objectives. The main features of this electronic arena are:

- a new relationship between performers and audience which can be experienced by the interacting audience members within a collaborative environment
- a new form of staging that extends narrative possibilities by using virtual reality technologies combined with real theatre elements and video
- a new, physically permeable mixed reality boundary technology by means of a rain curtain - a curtain of water spray onto which images could be projected

The successful premiere of *Desert Rain* took place in Nottingham on October 18<sup>th</sup>, 1999. A critic of the Sunday Times describes the event as follows: "Only six audience members attend each performance. They are led to a darkened waiting room, where each "player" is given a magnetic swipe card and watches a series of instructions unfold on a TV screen. They are to find a target - whose name is written on the back of a swipe card. Then, one at a time, they are led from the waiting room and zipped into a fabric cubicle, where they negotiate a virtual desert projected on to a wall of fine water spray as they struggle to reach the name on their card. Once through, the game ends and they are led forward through the water and over a huge sand dune to a hotel room. Here, there's a television set through which they swipe their card. If they find their target, the real person that name represents appears on the screen and talks about their experience of the war. There's a soldier, a journalist, a tourist, a peace worker, a television viewer and an actor who played a part in the Gulf war drama *The One That Got Away*. (...) As the audience leave, they pass a description of the shooting down of an Iranian airliner by a US ship. Their bags are returned and inside they find a bag of sand containing 100,000 grains. If you have trouble understanding casualties, the bag is meant to say, this is what 100,000 looks like.(...) It's a powerful piece and it excites curious emotions in the viewers"<sup>1</sup>.

The final result - *Desert Rain* - was premiered during the Now ninety9 festival in Nottingham from October 18<sup>th</sup> to 22<sup>nd</sup> 1999. The event was then shown at the

<sup>1</sup>Stephen Armstrong: "Want to replay the Gulf war as a video game? Sunday Times, 31 October 1999



ZKM Karlsruhe in November. During 2000 it toured to London in May, Bristol in June, Glasgow in July, and was presented in Stockholm for ten days in September.

### The performance group Blast Theory

Blast Theory<sup>2</sup>, is a group of four inter-disciplinary artists based in London. Since 1991 the group has created theatre performances, installations, videos and new media works and they are considered as one of the most innovative performance groups in European theatre.

A common thread running through all their work is the fusion of video, computers and live elements, often with some kind of interaction with the audience/visitor. For example, Stampede in 1994 used a system of pressure sensitive mats during a promenade performance to allow both audience and performers to trigger audio and video events. An ongoing focus on the siting and thus framing of their work has lead the group to use unusual spaces such a film studios, shopping centres and a bank for the presentation of their work. This approach has extended to making work specifically for night-clubs and a 45 second film which toured European cinemas in 1997.

The group has been recognised as being at the forefront of interdisciplinary practice within the UK and beyond. Their work has been shown at the Institute of Contemporary Art, at the South Bank Centre and at venues throughout Britain. In 1997 the group spent 9 months in residence at the Kunstlerhaus Bethanien in Berlin and since then Blast Theory has shown work in Amman, Utrecht, Hannover, Hildesheim among others.

In addition to their experience with new media performance, Blast Theory also introduced the technology of the rain curtain to the project. They had first begun experimenting with the rain curtain in 1997 while on a research placement funded by the Arts Council of England. During this time they met with researchers from Nottingham who were developing the mixed reality boundary approach described above and the idea of using the rain curtain as a boundary material was first borne.

### *1997 - Kidnap Cinema Blipvert*

45 second advert, in which a free phone line was set up to check out interest in

<sup>2</sup>Blast Theory are: Matt Adams; Ju Row Farr; Nic Tandavaniitj; Jamie Iddon.

Email: [blasttheory@easynet.co.uk](mailto:blasttheory@easynet.co.uk).

being Kidnapped. It travelled around cinemas in Britain and mainland Europe and was seen by over 600,000 people.

#### *Nov-Dec 1997 Kidnap Installation*

85 People interviewed by Blast Theory about to what extent Kidnap infiltrates peoples lives - culturally, politically, fictionally etc. There is a sequence of rooms, which you enter one at a time only if you agree to be interviewed. One room is a corridor, the next shuts behind you until a time- release button lets you out, then you wait in a waiting room before you are interviewed. The last room is a lounge where you can watch your interview or anyone else. 2 performers.

#### *1999 – 2002 current work*

TRUCOLD is a video work shot on the streets of Karlsruhe and London. The work comes out of Blast Theory's interest in physical displacement, amnesia and time travel; last

manifested in 10 Backwards in 1999. TRUCOLD focuses on the city at night, the gaps between what is real and what is fictional, and the power of the viewer to fictionalise their surroundings. Presenting the urban expanses as unknown, unknowable, and out of reach, TRUCOLD places the viewer alone and distanced from their surroundings.

#### **Data collection, empirical work**

The studies of the *Desert Rain* activities were carried out over a period of twenty months.

- An introductory meeting with Blast Theory at Toynbee Studios in London January 8 1999
- A two-week workshop from January 12 until 28 1999 at ZKM a one-user prototype was tested. Video recording and hand notes.
- ZKM from August 14 to 21 1999, study of the production of the six-user version and one day of test with users / audience. Video recordings and hand notes.
- One week in Nottingham between October 11 and October 18 (opening) 1999 within the frames of the theatre festival Now ninety9 festival. Study of work process until the opening.
- A full week of performances at ZKM November 10 –14 1999. Two hours of interviews with French students were video recorded with the help of media students at a media college close to ZKM.
- A week at Riverside Studios in London from May 12 to May 21 2000. Hand notes.

- On week in Stockholm between August 30 and September 14 2000. Performance space at EKC-Hallen, KTH campus.
- Three days in Amsterdam between November 1 and November 4 2001 within the frames of Rotterdam Cultural City 2001 where a three-hour interview with Blast Theory were recorded.

The first studies were carried out during a two-week workshop at ZKM in January 1999 at ZKM. The objectives for the workshop was to assess the potential and limitations of a rain curtain for creating a mixed reality boundary and build a one-user prototype including a full day of public demonstration followed by an evening discussion. In August 1999 a study of the production of the six-user version and one day of test with users / audience was carried out at ZKM and one week in Nottingham October 1999. At a later stage, when the artwork was completed, the research studies focus on how audience participation is practically accomplished. These studies include a full week of performances at ZKM in November 1999, a week at Riverside Studios in London in May 2000 and a week in Stockholm, September 2000. Finally interviews were conducted with members of Blast Theory in Netherlands in November 2001. The studies consist mainly of observations, notes made by hand on location, and video-recordings. Members of Blast Theory advised against making interviews with the audience since an interview could have an injurious effect on their experience of the event. Together with the performers I stood behind the rain curtain where participants could be observed without seeing the observer. The performers could thus judge whether someone needed help whereas my mission was to observe how participants managed the navigational device and how collaboration was established and maintained. Conversation between participants was difficult to catch due to the sound of the falling water. Exclamations and shouts were easily perceived whereas low-voiced conversation did not come through. It was possible though to determine whether a participant got a grip over and became part of the happening, or of some reason chose not to participate and to accomplish the “journey” by them selves.

## **The history of Desert Rain**

### **1997**

The process of developing *Desert Rain* begun with an initial research and development phase of two weeks in 1997 under the working title of Virtual Rain. The project was a part of Artlab - a process orientated research and development programme - and took place at the Powerhouse in Nottingham, England.

During this time the properties of video projecting into water spray had been explored, using multiple projection (including the use of slide projection), projection from different directions, water being dispersed from a hand sprayer and from a small specially fabricated greenhouse spraying system, live presence within, through and around the water/projection (including live videoing and simultaneous projection), the use of computer generated image and text onto the water curtain and sound, both generated live and pre-recorded.

On the last day an informal presentation took place to an invited audience. Blast Theory and Steve Benford (University of Nottingham) met and started afterwards their collaboration.

### January 1999

In January 1999 a team of computer scientists, performers and social scientists spent a two-week period at the ZKM experimenting with the rain curtain, including a public demonstration on 27th January. The results of the workshop is accounted for under the heading “The practical production of Interactive Media Art”. The goal of the workshop “was to explore the use of a novel mixed reality boundary, a rain curtain, in the creation of a performance. At the same time, we have tried to show how the rain curtain represents a particular class of mixed reality boundary and have suggested how ‘dry’ boundaries with similar properties might be created and used in more everyday settings. This workshop has been one informative part of the process of developing a full public performance that will involve multiple participants interacting with performers” (Benford 1999)

### August 1999

Blast Theory together with computer scientists from Nottingham and ZKM technical staff<sup>3</sup> in ZKM’s media theatre shared a four weeks working period in order to develop the final form of the *Desert Rain* performance. The main goal was to extend the number of users to six participants.

The design of the whole environment had to be installed and tested in the media theatre. The technology of the rain curtain had to be proved. The same with the surf /foot- pads in terms of size, of working in a wet environment, and of usability. The best position of projectors and cameras had to be found out. And finally, the whole collaborative environment with computer graphics and sound had to be set up and integrated with all other electronic means.

<sup>3</sup>Boriana Koleva and Ian Taylor from Nottingham and Torsten Ziegler and Jan Gerigk from ZKM.

On the last day, an audience were invited to experience the whole performance which was yet not completely ready and had still improvised parts. Various smaller technical problems occurred which were to be fixed until the premiere in November. All participants completed a questionnaire of Blast Theory. This material led to further changes in computer graphics and sound and especially to changes concerning all information visitors get before stepping into the collaborative virtual world.

## **The Practical Production of Interactive Media Art – Desert Rain**

Between January 12 and January 28 1999 a team of computer scientists from the university of Nottingham, the London based performance group Blast Theory and social scientists from KTH and from King's college London, spent time together in a workshop experimenting with a mixed reality boundary to support performance at ZKM, Center for Art and Media, in Karlsruhe. The main objectives of the workshop were to assess potentials and limitations of a rain curtain as a material for creating a mixed reality boundary as well as creating performances that establish new relationships between audience and performers. The last day of the workshop culminated in a public demonstration where the audience was invited to test a one-user prototype. The demonstration was followed by an evening panel discussion and feedback session. During a period of seven days in August 1999 a six-user version was constructed. The last day of Blast Theory's visit at ZKM visitors at the museum were invited to test the final version. The text below accounts for the practical production of the one-user prototype of the *Desert Rain* performance, as well as for feedback and comments from the audience. The text is a revised version of articles written by John Bowers and me and published within the framework of eRENA (Bowers & Rinman 1999). It gives detailed account of actual work practices and problems met, not the least of practical technical nature, in the ethnomethodological tradition of "an interpretative approach to sociology which focuses upon everyday life as a skilled accomplishment, and upon methods which people use for producing it" (Fairclough 1995:21). Several of the conclusions on how to design and technically implement computer graphics and interaction and navigation devices are highly relevant for the Human-Computer-Interaction field.

### **Organising the work**

The perspective taken in our investigations is that the production of media artworks should be seen as a species of work. As such, participants to such productions are presented with work-organisational problems and issues. Who should do this (part of) the work? By when? In collaboration with whom? The artworks we

discuss are complex in various ways, mixing a variety of technologies and requiring the concerted participation of several different workers with different skills. How is their labour to be divided? And, if it is divided in some way, how is this to be managed so that the different participants can coordinate their work and “assemble the different pieces” in an appropriate and timely manner? These are some of the topics we address in this section by highlighting the methods of work-organisation deployed in the various projects we have studied.

### **Many people involved in the work**

It is important to emphasise the variety and number of working participants in each of the projects investigated here. Blast Theory’s workshop at the ZKM involved the four (differently skilled) members of Blast Theory themselves but also the daily participation of commonly two computer scientists from the University of Nottingham and the occasional but notable participation of the technician who had developed the footpad interface to be used, the chief of the ZKM’s Medientheatre, and two technicians from the theatre. Various representatives from eRENA institutions visited the workshop and found themselves lending a hand and, from time to time, eRENA researchers at ZKM would help, especially with liaising with other local workers when the need arose. Meanwhile, back “home” in London, Blast Theory’s office was maintained by their administrator.

In addition to the sheer numbers and variety of people involved in the work of producing these events, it is important to emphasise the essential role of local help. The studied project were realised in some sense “away from home”. Blast Theory were working at the ZKM, not at their native Toynbee Studios in London.

### **Different forms of work-organisation**

The project involved multiple participants working on a particular piece in a time-constrained fashion. Blast Theory had nearly three weeks on site at the ZKM with public workshop times announced in advance.

Complex projects are commonly managed through the delegation of their various components by the artists to a large number of researchers and technologists, who then assume responsibility for the construction of what the work requires.

The organisation of the work within the Blast Theory ZKM workshop was accomplished through familiar means but they were somewhat different in nature and emphasis. The time of the workshop was concerted dedicated time for the

members of Blast Theory: they were not distracted by multiple other tasks of a personal, administrative or artistic nature. They could devote themselves to a component of *Desert Rain* and collaborating with the researchers and technologists on it. Commonly, all four members of Blast Theory were co-present, and once necessary equipment and other resources were assembled, they could work alongside their closest co-workers in the Medientheatre with little interruption. This permitted an ad hoc, locally planned, taking-problems-together-as-they-come style of work organisation. The co-presence of co-workers enabled them to raise issues there and then with each other, devise solutions and re-plan the work “from within” as it were. Regular, daily meetings were held between Blast Theory and collaborators from Nottingham and ZKM to review progress and plan the day. While, naturally, who was to do what was decided at these meetings, the emphasis appeared to be more on consensual collaboration than delegation and management. Blast Theory is independent of any particular institutional ties. They are not governed by organisational reporting arrangements and are free to enter into mutually agreed temporary alliances, like the current one with University of Nottingham researchers and the eRENA project, to realise a work of such activities clearly planned and announced by one of the show’s producers.

### Creating a Place and Time for Work

The project was realised at venues that were occupied for a fixed period of time, within which public performances or demonstrations were to be given. A location therefore has to be made into a working environment, if possible a working environment that is clearly dedicated to the specific project at hand. A temporary workplace has to be established and a working ecology produced that is adequate for enabling focused work on the project in question without excessive disruption from others who might “drift through” or “call by”. Creating a place for work is a significant affair and, the group dedicated notable time and effort to this matter.

### Making the ZKM’s Medientheatre an environment for the work of Blast Theory

On arrival at the ZKM’s Medientheatre, the members of Blast Theory, who had not visited before, were noticeably impressed by the sight of the theatre. Its sheer size (an approximate floor area of 20 m by 14m, and 12 m high) and sleek modern design make a strong contrast with the somewhat aged Victorian buildings that comprise the Toynbee Studios in London, which Blast Theory share with several other artists and community groups. That this huge space is at their disposal for over two weeks was initially found to be a somewhat daunting affair. However, ZKM personnel had taken a number of steps to help Blast Theory inhabit this



space and make it their temporary working environment. Blast Theory were pleased to find that all their equipment, unloaded from the van and left outside the theatre late the night before, had already been moved inside the theatre by somebody. The chief of the theatre immediately proceeded to show the visitors around, introducing them to the theatre's technology: an eight channel Dolby sound system, control panels for house-lights and sound at the entrance of the theatre, and the control rooms for light and sound, and the film and video projectors upstairs.

Blast Theory's equipment had been placed at the opposite corner of the theatre to the entrance: a couple of wooden boxes containing material for the rain curtain, a brand new PC (indeed, delivered to the Toynbee Studios the afternoon before departure), a laptop computer, a graphic tablet, books and such like. Two tables were brought in by the chief technician and his assistant and placed by one of the long side-walls of the theatre. Another two tables were placed at the back of the room, on the short side, opposite to the control rooms and entrances. Later on the projector to back-project onto the rain curtain was put on one of these tables.



A workplace



While unpacking and installing the PC, one of Blast Theory decides that the best place to work would be on the short side of the theatre facing the rain curtain with the entrances to the theatre to the rear. Here it was thought that personnel would have a better overview of the rain curtain and be out of the way of anyone walking from the front to the rear of the curtain. Accordingly, the tables are moved.

Before the day had finished, the theatre had been transformed into a working environment. Tables bearing the computers for running the VR system, for supporting 3D design of the virtual environments and for running software interpreting sensor data from the footpad were located at a distance from the rain curtain but oriented so that people working at those computers could gain a good view. These were aligned to suggest a crescent shape alongside the theatre's own sound mixer desk. That is, computing and audio technology directly associated with the realisation of *Desert Rain* could be controlled by persons located near each other and mutually aligned with respect to each other and the rain curtain. To the other side of the theatre, and noticeably separate, another table held Blast Theory's laptop and was the centre for 2D graphical design work, sound editing and discussions of the ideas and concepts at play in *Desert Rain*. At this table were to be found the books and other materials to which Blast Theory from time to time referred and wished to alluded to in some way in *Desert Rain*. It was also around this table that the group held a number of their meetings. In short, the Medientheatre had become a differentiated environment containing dedicated locales for different kinds of activity with the appropriate resources ready-to-hand in expectable places. The Medientheatre was further "domesticated" through the continual playing of music CDs to accompany the work. From being a silent empty almost overwhelming space, the Medientheatre became a place of work that was characteristically Blast Theory's and their colleagues'.

While the theatre was made inhabitable as a working environment through its artful structuring in this fashion, Blast Theory's work was not immune from interruption. From time to time, various officials from the ZKM would come by. That the Medientheatre was only "on loan" was vividly conveyed when a group of French cultural officials, accompanied by their ZKM host, visited while Blast Theory were hard at work to the accompaniment of loud rap music: "ferme la musique, nous ne pouvons pas entendre que dits Sally" (said in abrupt tones without pre-checking whether French would be understood, "shut down the music, we can't hear what Sally is saying"). Another ZKM official would regularly come to the theatre with small groups of visitors, point out the facilities to his guests, but not introduce himself or greet the theatre's occupants. Clearly, the ZKM could not restructure all

of their activities around Blast Theory's residency. During the final day of the workshop, enquiries were made about whether a number of items of equipment, which had been loaned, could be reclaimed in preparation for the next evening's concert performance. Indeed, before all of the equipment associated with *Desert Rain* could be packed away, the Medientheatre had already been filled with rows of seats and a stage where the basin to the rain curtain had been.

### Plumbing – The Rain Curtain as a Mixed Reality Boundary

To achieve the desired effects for the rain curtain several problems needed to be addressed. Many of these stem from the fact that the curtain itself is part of a water supply system that has to be carefully controlled. Water from the curtain needs to pass into an appropriately designed "basin" and water on its way to the curtain has to be drawn from a tank, itself filled from a public water supply. Each of these receptacles needed careful consideration in their selection or design, and often required someone to oversee them and the flows between them.

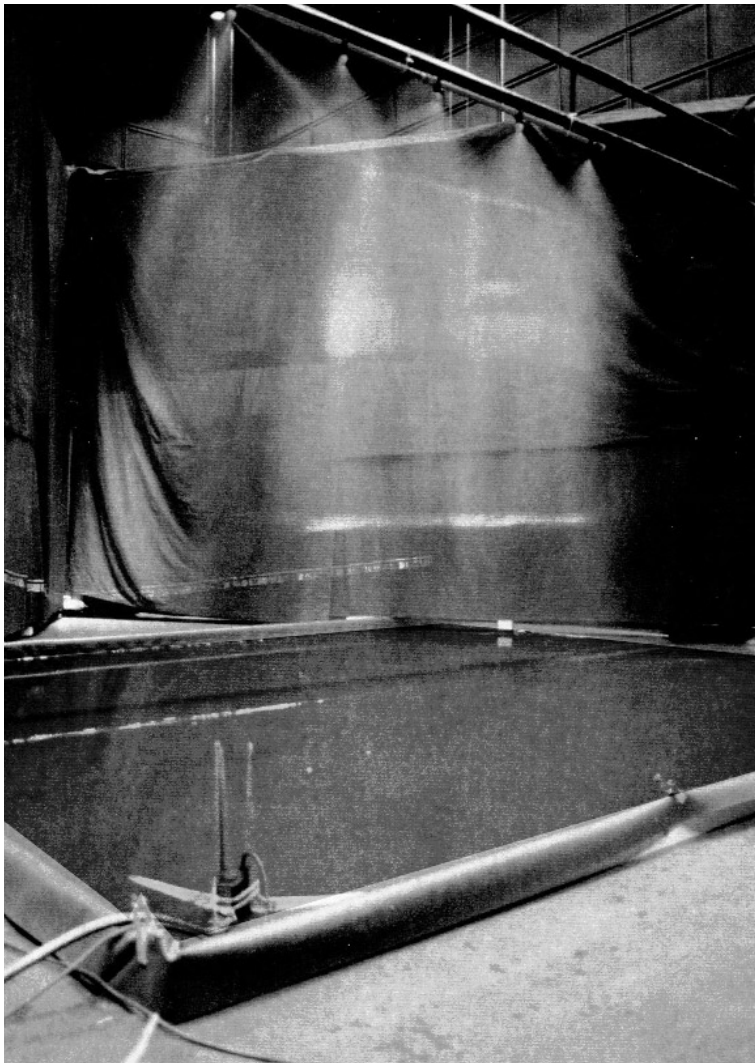
A rectangular basin, a wooden frame, was made of battens and planks, approximately 4.90 m by 4.50 m across and one decimetre high. This wooden construction had no bottom surface itself. This was first provided by a light, thin grey waterproof mat bought in London a couple of days before the workshop. However, after the curtain's first trial, it was found that this mat had leaked and had to be replaced with a black rubber mat sourced from ZKM. This substitute worked better its blackness also giving an impression of an endless void instead of the floor surface that was clearly and distractingly seen through the rain curtain initially.

To enable the rain curtain to be worked with for long enough before the basin required emptying or the supply tank required refilling (either by pumping water back from the basin to the tank or sourcing fresh water), a tank of approximately 1000 litres was required. This mass of water could be safely used without overflowing the basin and would enable several days of intermittent usage of the curtain itself. An open plastic container, brought by the ZKM's manager of the Medientheatre, was used as a water tank and placed out of sight in a closed area outside the theatre. Filling the tank demanded some consideration. For the first trials, it took more than an hour before a satisfactory method was found to make the water flow at a steady pace from the lavatory in the dressing room outside the theatre into the tank. Filling the tank then took two to three hours.

Recycling the water from the basin to the supply tank was not done continuously

as this would require the sustained operation of a pump that would give off distracting noise. To drain the basin and refill the tank took about 30 minutes, rather less time than filling the tank afresh. After a week of usage, though, it was all too evident that the water needed replacement. Many litres had been lost due to evaporation and occasional spillage. Algae and other “foreign bodies” had begun to noticeably grow! Indeed, some visitors to the workshop had complained about the smell.

It should be clear from this discussion, therefore, that careful consideration of the water flow system was necessary to make the rain curtain viable in hydrological terms, let alone serve as a mixed reality boundary.



Water curtain  
and pool

To create the rain curtain itself, the production team (Blast Theory and the researchers from Nottingham and the ZKM – henceforward referred to as “the team”) had ordered a sprinkler system from Holland, normally used in greenhouses. A steel pipe with nozzles was attached to a bar hanging from the ceiling. Although the team had experimented with projecting virtual worlds onto a water curtain before, they were working with this particular sprinkler system for the first time in the workshop. The system had been very carefully researched and selected, including making a personal visit to Holland. However, several fine details of its operation needed to be resolved in an improvised fashion unaided by memory or documentation. For example, it was not clear what orientation the taps should be placed in to let the water through. At the risk of mistaking “open” for “closed” and creating a disastrous flood, the team agreed: “Let’s find it out the hard way”. The taps were set, the projector was switched on, the water system worked in a controlled way, and a fairly sharp test image appeared on the moving surface. Although the correct usage of the taps had been guessed at, this did not stop mistakes on other occasions, in particular, mistaking one tap for another in darkened conditions. “The theatre’s floor has never been so clean,” remarked one visitor.

Over a period of several days, even though the initial results were satisfactory, the team made several variations on the rain curtain to see if its properties could be improved. For example, the number and spacing of nozzles was experimented with. A set up with many nozzles closely spaced gives a bigger projection space than one with fewer nozzles further apart as the areas unfilled with spray between adjacent nozzles are smaller. However, such an arrangement requires higher water pressure and the team were already concerned that they were fortunate in using a very powerful pump provided by the ZKM, which they couldn’t count on at other venues. Additionally, it was discovered that the top area of the curtain, above where the water has fallen into droplets, is not satisfactory for projection anyway. Accordingly, although five nozzles were commonly used in testing the curtain at the ZKM, a four-nozzle system is currently preferred for future use. Finally, while the team are generally satisfied with the curtain as a projection surface, they nevertheless plan another visit to the nozzle specialist in Holland to discuss potential improvements and to share experience.

Some of the most dramatic experiments conducted with the rain curtain involved trying to improve it as a projection surface. The team wondered whether a whiter surface would heighten the ability to discriminate among graphical objects. It turned out that one of the ZKM employees had a friend in Berlin, who worked with art video production, and it was recalled that in one of his videos milk had

been used in order to hold a bright image. A couple of days later, contact with the Berliner had been made. The milk had been used and left in a basin for several days, but it neither turned sour nor nasty-smelling. After some calculations it was decided that five litres of (long-lasting, low-fat) milk was to be used for the curtain. The milky water passed through the pipes, and became visible less in the curtain than as patterns in the bottom of the basin. The difference in image quality was hardly noticeable, besides making the curtain a bit dimmer perhaps. After two hours of hard work with a vacuum cleaner and a mop, the basin was dry and the water tank emptied. When the water system was tried out the next morning, a couple of the nozzles did not work, probably blocked by the fat in what had been sold to the team as low fat milk. To get rid of the blockage, to disinfect and to prevent the smell of rotting dairy produce, chlorine bleach was put in the water tank. It also eliminated all further signs of algae.

### The Footpad

The team, for the purposes of the workshop, reused a footpad interaction device, which had been developed in association with the ZKM for other purposes. Adapting the device to the team's project raised a number of problems. On arrival the footpad, at that time known as the "surfboard", appeared in bright pink hues with numerous stickers attached with logos and slogans from surf equipment manufacturers - a design aesthetic and suggested use context which could scarcely be more different to the foreboding desert setting the team wished to explore! Before being shown in its new context to the public the board was repainted black. The board also had a triangular shape perhaps suggestive of the front half of a real surfboard. It was mounted with three sensors, one at each corner of the board. In its original operation, this distribution of the three sensors should enable good responsiveness to patterns of movement reminiscent of those involved in surfing: the single sensor at the front tip yielding forwards movement, the others making for lateral shifts.

However, the team wished to physically locate this interaction device at the narrow apex of wooden framed triangular enclosure. To fit the device in this location, it had to be fully reversed. Although it now fitted snugly in place, the orientation of the sensors, of course, was in turn reversed with the left and right pair now at the front and the single sensor, formerly at the tip of a "surfboard" now at the rear. This led to extensive difficulties in reprogramming the software, which interpreted sensor data (so that, e.g., forwards movement was not mistaken for reverse movement) and for some users (a surfing posture now being anomalously interpreted).



The device required calibration so that its responsiveness would be intuitively related to the movements and postural changes that the user would make. However, clearly, the sensor data in such a device are effected by the weight of the user in question. As, naturally, the team were not expecting all visitors to weigh the same, how to handle a potentially great variation in responsiveness was a taxing problem. The inventor of the footpad suggested calibrating the device in several different “weight-bands” and switching between different settings for different users. Not only was there not enough time in the workshop to do this, the team were sceptical about the acceptability of this in actual use.



The footpad

A final example of the contingencies, which had to be dealt with making the interaction device work is worth noting here. The device used three tennis balls to provide physical resistance to the movements of users. It turned out that in its life as a

“surfboard”, the device had experienced much wear and tear on these. Within the workshop, the tennis balls further lost their elasticity. Not only did this make the board less mobile, it may have contributed to the failure of one of the sensors, which then required replacement-a matter, which was itself delayed as the ZKM’s supplier did not deliver another sensor in a timely fashion.

In summary, the adaptation of the interaction device required considerable effort. While this was irksome for the workshop, it had the advantage of drawing attention to important criteria for good device design for environments where a mixed reality boundary is to be worked with. For example, the device must not only work effectively in enabling appropriate interaction with a virtual world, it must also physically fit a real-world environment and mesh with the capabilities of flesh and blood users.

### Virtual World Design in Practice

For the team, it was essential that the virtual worlds projected onto the curtain could be clearly recognised. The motel environment where all participants would start their exploration should be legible as such. The desert that lies outside of the motel room door should be legible as a desert. And so forth. However, designing such worlds presented several difficulties.

For example, no 3D modelling package offers a rendering window where the effects of projection onto a rain curtain are simulated. Changes to designs required not inconsiderable imagination in the face of only partially useful feedback from a conventional rendering window, when it was inconvenient to launch the rain curtain itself. This made the practice of rapid experimentation and quickly implemented changes that would normally be familiar in graphical design often somewhat problematic.

The properties of the rain curtain necessitated adaptation to other aspects of design practice. For example, high colour contrasts are required in graphical design for the perception of differences on the curtain. Patterns and other textures have to be very carefully designed to be legible at all. This is especially important if one wished to convey depth, as colour contrasts and texture gradients often give the viewer useful perceptual depth cues.

In the case of the motel room, a radical graphical design strategy was adopted to give the viewer the impression of the “boxiness” of such environments. With the exception of one textured wall and a moving image on a virtual TV set, the room’s

surfaces were rendered through white “wire frames”—that is, the edges of the surfaces were suggested by thin white lines against a black background. This had the effect of not only high contrast but also clear perspective depth cues as lines converge. Interestingly, then, what is rather a crude rendition of a room when it appears on screen becomes intriguing and potentially engaging on the rain curtain. The motel room, then, exemplifies very well the challenges that exist in graphical design for a mixed reality boundary like the rain curtain – challenges that needed to be met by extensive ad hoc experimentation by the team.

The bunker presented fewer graphical design challenges of such a unique sort. The architectural structure of a bunker lends itself well to a rendition composed of polygons with large faces. High contrasts in shading also worked well in suggesting a three dimensional structure. Most participants visiting the workshop could see this as a clearly legible building even if it was not positively identified as a bunker. This, together with the motel room, give us some clues about how to develop graphical design practices which may work well for mixed reality boundaries like the rain curtain. Forms, which either are (bunker) or can be made to be (motel room) angular, composed of large, flat surfaces and relatively uniform in their colour can project adequately well in the face of loss of fine detail on the rain curtain. Forms, which in conventional graphical design practice are rendered through multiple small surfaces or the extensive use of textures may be problematic. This is borne out by difficulties there were in conveying the other forms in the virtual environment: the desert and the semi-transparent fence.

As one team member put it: “if there’s one property that a desert has, it is that it is undulating”. Suggesting a rolling terrain on the rain curtain, then, is of essential importance for the team. This proved to be especially difficult and, at the time of writing, no fully satisfactory solution has been adopted. There are complex dilemmas here. A smooth terrain with much curvature is highly “expensive” in polygon-count and resource intensive to render. Complex worlds that yield a low frame rate seem to be especially objectionable for users viewing a rain curtain projection. Furthermore, as one of the effects of the rain curtain can be to lose subtle detail in geometrical shapes, a terrain was experimented with consisting of large triangular faces and substantial colour contrast between them. However, the colours did not “mix” on the rain curtain as intended and the large shapes did not combine to suggest an undulating desert landscape. For most of the rest of the workshop, a relatively flat terrain (except for a slight downwards slope towards the entrance to the bunker) was preferred. It is, though, highly questionable whether this suggested a desert to any of the participants who visited during the workshop. Effectively suggesting a desert terrain, then, remains an outstanding problem.



Another outstanding problem of virtual world design is the semi-transparent fence between the motel and the bunker. While on screen in the 3D modelling package that the team were using, this does indeed appear as a semi-transparent fence, it seems more opaque on the rain curtain. The team's intention was to portray a permeable boundary (if possible itself resembling a rain curtain) within a virtual environment that was in turn projected onto a permeable surface. Attractive though this self-referentiality might seem, in the timescale of the workshop, it was impossible to satisfactorily realise. Indeed, the relative opacity of the fence seemed to make some users turn back and return towards the motel room even though it was quite possible to move through the fence.

### **Mixed Reality Boundaries**

It should be clear from our discussion of the work conducted during the two weeks of the workshop that the fascinating properties of the rain curtain come at a price. New graphical design practices have to be improvised. Interaction devices have to be carefully selected and adapted. A whole water transportation system needs to be attended to. While the boundary that is the rain curtain mixes "realities", just as clearly, did the team and those working with them have to mix radically heterogeneous forms of technology, from the computational to the hydrological. Each of these elements needed to be in place for the boundary to work as specifically a mixed reality boundary rather than a load of falling, dimly illuminated water. In short, the mixed reality boundary needed much real world work in its creation and maintenance. To properly appraise the viability of such technologies, we need to document and draw attention to this work so as to sensitise others who may follow such an experimental path in what to expect and to provide a "practical baseline" for the future. If the rain curtain becomes progressively easier to work with, if new graphical design practices can emerge, if interaction devices which seem appropriately matched to the rain curtain can be developed, then we can determine whether – as a technological innovation – the rain curtain and the ideas it expresses are on the way to a stable form that could be adopted by others or are remaining problematic. Only if we document the work to make the rain curtain work now will we be able to evaluate its viability in and for the future. This concludes our initial evaluation of the Pushing Mixed Reality Boundaries workshop. This evaluation has focused on a range of issues from the artistic, technical and social science perspectives. The following section briefly outlines how this work will be carried forward towards the design of a full-scale public performance.

### **Entering the work**

The rain curtain provoked extremely varied response from the public, with

nevertheless a unanimous initial reaction of hushed surprise and intimidation upon entering the theatre. The actual configuration of the rain curtain in the Medientheater, with the high wooden frame shrouded in black cloth, accessed from the far side with reference to the theatre entrance, endowed the installation with mysterious qualities. The line-up of computers at the rear of the house, manned by a silent team of programmer/operators, added to this disturbing atmosphere. Visitors were escorted into the theatre individually or in twos or threes, and tended to await their turn in apprehensive silence. To a certain extent, then, they were “conditioned” before going into the actual installation and experiencing the virtual rain curtain. Immediately after penetrating into the enclosure via the manoeuvrable flap of black cloth, they were hit by the unearthly sound of finely dispersed falling water, and by a moderate but perceptible change in temperature (between visits, the rear theatre door was regularly opened and closed to control the level of the external water tank; this rear door connects directly with the exterior of the building, and January temperatures were low). Obscurity surrounding the projection equipment on the other side of the water curtain, and the fact that the dazzling projection beam prevented clear vision of the space beyond the curtain, gave the space a disconcerting sense of openness and boundlessness: people felt as though they were entering an “outside” world because the installation limits were unfathomable.

### Technological shortcomings versus critical aesthetics: the art of exploiting “bugs”

Opinions concerning the navigational experience proposed through the rain curtain projections, and attitudes regarding the above-identified technological shortcomings, diverged quite strongly in ways that largely reflected preoccupations and demands which, in turn, can be characterised as a function of the visitors’ backgrounds. We were fortunate in being able to host observers from the theatre world (including certain ZKM theorists and, in particular; the theatre and stage design students from the Hochschule für Gestaltung, housed under the ZKM roof), as well as observers more versed in visual than in performance media.

Overall, these two groups manifest two distinct kinds of reactions to the proposed aesthetics: visitors fluent in computer-based, interactive visual media experienced a higher degree of frustration with the paucity of the graphics and the slowness and cumbersomeness of the navigation system. In some cases, this frustration overrode and dispelled the initial fascination with the rain curtain configuration, and the visitors left with a negative impression. In contrast to this attitude, persons attuned to performance and theatre aesthetics tended to be less irritated by the technological

shortcomings of the system, and to consider the low frame rate and laborious navigation as constituting an integral part of the aesthetic project. Even though there was widespread frustration with the footpad interface amongst both these groups, persons drawn by the strange temporal qualities of the water curtain, and by the singular “pace” emanated by this constantly moving projection surface, tended to be more tolerant and even appreciative of the slow graphics. For the latter persons, the graphics pace was gauged to serve a work essentially engaged in media criticism – including self-reflexive criticism of the media used to convey the work itself. Hence, display techniques running counter to seamless graphics, to video and computer game speeds, and to smooth TV news-type editing (e.g. precisely the Desert Storm “montage” of mediated events the Virtual Rain piece seeks to denounce), were in this case considered as an appropriate, meaningful artistic choice.

### The six-user version

This concludes the description of the mixed reality boundaries workshop. This initial experience has raised a range of issues to be considered in developing a full scale, multiple-participant performance. The accomplishment of the six-user version got ready in August 1999 although the final version was presented in Nottingham in October. By August the graphics had been extensively elaborated, the sand dunes refined, music sampled and so forth. Members of the audience were invited to test the devices, footpads and headphones, as well as the legibility of the graphics. A number of unexpected problems were distinguished. Karlsruhe is situated near the French border and is thus frequently visited by the French. French and Germans participants had problems communicating with each other in the cubicles, as had the helper on the headphones due to language problems. Blast Theory attended to the problem by writing down certain words such as “left” and “right” in German as well as some words in French. Despite difficulties with pronunciation participants and performers manage to communicate and give some helpful advice as well as getting help to translate to participants less apt in language. The artists’ adaptability to every change and ability to answer to participants’ various needs will be further described in chapter five and six. The next chapter, chapter four provides an overview of the completed version of *Desert Rain* performance.

## Desert Rain – The Performance

### Basic Settings

The *Desert Rain* performance lasts 30-40 minutes and 6 participants can experience it. The staged event consists of seven elements, six spaces and a couple of physical objects. The overall concept concerns modern warfare, represented by the Gulf-wars.

- 1) Entrance: The audience is picked up the theatre entrance.
- 2) The antechamber: the first station on the “journey” where the ground rules about the piece and a plastic card containing the targets’ name are supplied.
- 3) The cubicles: a 3D world is projected on a water screen, through which the participant navigates, while standing on a footpad.
- 4) The sand tunnel: a 2 metre long tunnel fenced off by high walls containing sand through which the participants walks, ending up in a hotel room.
- 5) The hotel room: the swipe-card is used to turn on a TV-set showing a number of video clips.
- 6) Nine sentences all connected to the Gulf-war are pasted on the wall near the exit.
- 7) And finally a little sandbox is left in the participant’s pocket

### Order of events

#### *Entrance and Antechamber*

A performer dressed in a green parka with a fur-rimmed hood collected the public (six at a time) at the entrance outside the theatre. They were brought into an antechamber where they each sat down on a chair and then they were given some basic information about the piece by the performer who used a torch as the only source of light: The information is basically as follows: 1. how to communicate with other participants in the virtual environment, 2. how to use the footpad in order to navigate through the world 3. how to identify the other avatars in the 3D world and 4. how to find and hit the target. Finally they have to find the exit and the other participants and, then get out together. In short, each visitor is given a plastic card with the target’s name on it (the target is the person that has to be found). The visitors have twenty minutes to complete their task in the virtual world.

They are then asked to take their jackets off, put them in the box under the chair and to put the raincoats on. The limited number of people creates an intimate atmosphere, unusual in traditional theatrical contexts. This change of clothes has a symbolic and ceremonial touch: it is like changing skin from one’s ordinary life, to

become part of the performance or ritual and then being introduced to the secret conditions. The room with its slight cave-like resemblance and the distribution of cards / missions recalls the interior of an aircraft in a war movie. It is silent and the participants may ask questions if they don't understand. In that moment the water is turned on. The swishing sound is very powerful and is accentuated by the humid breeze that hits the faces of the participants when they leave the antechamber one by one, together with the performer. The next halt increases the feeling of walking further and further into a cave.

### *Cubicles (and mixed realities)*

This part in particular is a Collaborative Virtual Environment (CVE). Behind a fenced-off area, six computers are placed, showing each participant's exact position in the 3D world. A performer / technician can "move" the participants without them knowing it, if someone becomes hopelessly stuck somewhere. The technology includes collaborative possibilities in the visual area and in audio.

The next space is hidden behind a green fabric wall of the same waterproof material used in tents, with six crescent-shaped zippers instead of doors and handles on the front. The inside of each cubicle is u-shaped and the visitor is placed with the back towards the "door", the thin, green fabric walls separating the visitors from one another. The open space in front of the visitor is the fourth wall, a water screen where images are projected. The visitor is then instructed to step up on a footpad placed in a low, water filled basin and to put on a head-set (including a microphone) and to wait for someone to tell them to start. The black rubber mat in the basin mirrors the images and the moving water gives an illusion of profound, almost vertiginous depths. Finally the performer who loses the zipper behind them carefully locks them all in.

When all are in position and the headsets have been donned, they are instructed to start to move around and the play begins. To navigate through the virtual world, the visitor leans forwards, backwards, or left - right. The first image presented on the moving water screen is a motel room with a chair, a double bed, a lamp, and a TV- set with a show running. The visitor has to find the door and get out of the motel room into, or out to, a desert landscape surrounded by Arizona-like mountains. The strong, almost blinding light from the projector lamp might be taken for the hot, merciless desert sun. Once outside there are big, blocky arrows pointing to a sign "Exit here".

When passing through the yellow rectangular sign, the image shifts into a new landscape that, in a second or two, turns from bright daylight to darker. A short distance away, several inscriptions are visible, written in white on the black sky. The names of the different targets are written in white and when the visitor gets closer a voice says, "My name is Sam" or whatever the name of the target is. Just underneath the name is a picture of the target or person. The visitor is supposed to walk right through that picture.

The visitors are then supposed to look for the exit together. Eventually an agreement is made among the participants on who is going to search for the exit. The long tunnels have different colours in order to facilitate the description. A sign at the exit informs whether the rest of the group has found their targets or not. As soon the visitors are close enough to one another, they can communicate through the microphone. They can also communicate with each other in the "Live Link", a room with six numbered boxes, one for each visitor. When entering one of the boxes a live video image of the inhabitant of the box is seen and the two can communicate.

If that is done correctly, the image on the water screen switches to a white spinning object with the following inscription: "Wait here". A huge shadow is seen blocking the projector light. It grows smaller and the shadow gets a real face and a performer eventually walks through the water screen. The furred hood on the green parkas gives a halo effect when a light placed in the ceiling illuminates the water on the fur. The performer asks for the card with the target's name and replaces it with a new swipe card.

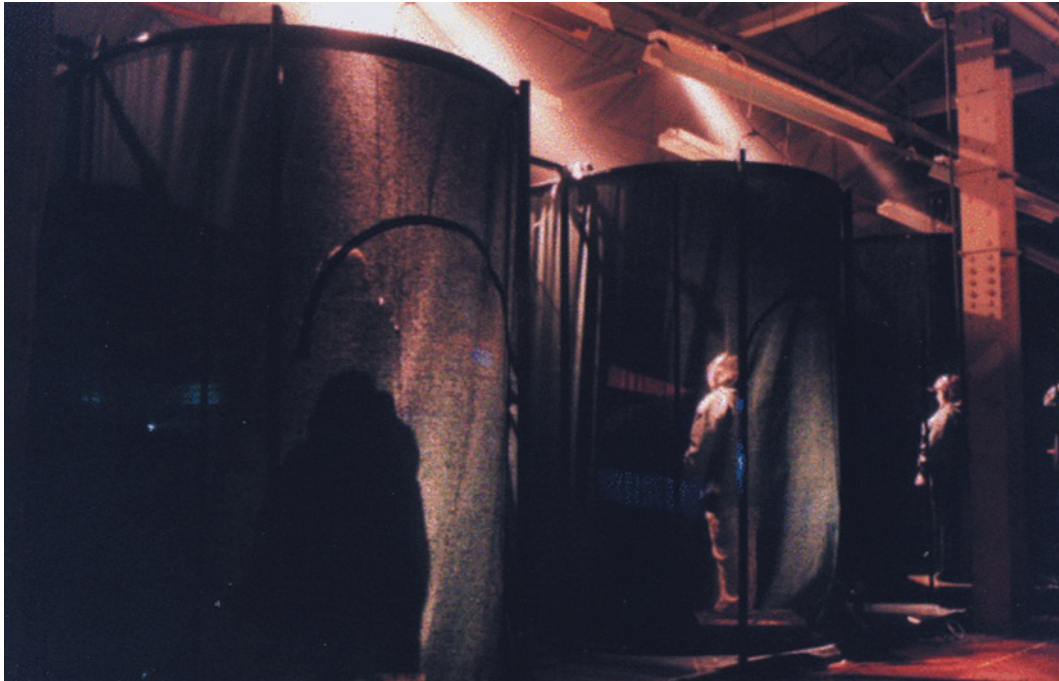
After twenty minutes the water is switched off and the sound-scape changes. The visitors are told to take their headsets off, and to step down from the surf board. A black rubber doormat that has been placed in the water leads from the foot-pad to the other side of the basin to prevent the visitor from slipping and falling into the water. At the other side of the basin, they are asked to take their raincoats off. They are then shown into the next halt, a sand tunnel.

### *Sand tunnel*

A two metre, hilly tunnel of sand framed by high wooden walls leads to the end station, a hotel room. The sand is prepared after each run through by the performers and is completely smooth and untouched, as if no one has walked there before. The performers are gone and the visitors are left alone in the tunnel. The silence accentuates the sound of the sand under the soles.



The cubicles



The hidden computer space





A participant

Computer graphics -motel room







A target



The "live link"

Performer walking through the rain curtain





The sand tunnel



The hotel room

### *Hotel Room*

The room consists of four walls with huge photographs of a hotel room. It is blown up in life-size. The same as in the starting point in the virtual world? To the right of the tunnel is a TV with a perspex screen and beside it a swipe card reader. The participants who succeeded in finding their targets in the virtual world were given a swipe card instead of the "target card". Each one of the six swipe-cards corresponds to a video clip that starts when pulling the card through the card reader. The videos consist of three minute long interviews with all six "targets" (five men and one woman), each one affected by the Gulf War in one way or the other. The same hotel room, the same lamp and TV-set, as in the photos on the walls in the constructed hotel room in the installation, constitute the background of the screened interviews.

The six persons in videos:

- Shona Campbell served in the Army for three years and is now a captain in the Territorial Army. At the time of the Gulf War she was suffering from colic and was confined to bed.
- Richard Kilgour is a peace worker who helped establish a peace camp on the Iraqi-Saudi Arabian border in December 1990.
- Glenn Fitzpatrick drove an Armoured Personnel Carrier in the Gulf War, collecting Iraqi casualties. He is currently studying Fine Art.
- Eamonn Matthews was one of the only journalists in Baghdad on the night the air war started. After a week he returned to Britain and resumed his post as deputy editor of Newsnight.
- Sam Halfpenny played Legs in "The one that got away", an LWT film of the Bravo Two Zero mission told from Chris Ryan's point of view.
- Tony Taras is an actor who was on holiday in Egypt at the time of Iraq's invasion of Kuwait.

The text below is pasted up on the wall outside the hotel room. It is the last space containing any visible information about the *Desert Rain* and in close connection to the exit:

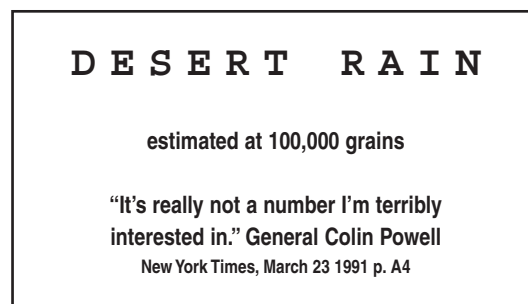
- In 1988 the USS Vincennes was dispatched to the Persian Gulf to help Iraq, under Saddam Hussein, in its war against Iran.
- The warship was equipped with AEGIS, the most sophisticated weapon control system yet developed.

- It uses 16 main frame computers and 12 minicomputers to control up to 122 ship-to-air missiles and two 6 tonne, 6 barrelled automatic machine guns capable of firing 3,000 rounds per minute.
- On July 3rd the Vincennes shot down Iranian Airbus Flight 655 killing all 290 on board (more than died in the Lockerbie bombing). While widely reported in the third world the incident received little coverage in the Western media.
- The crew of the Vincennes had undergone 9 months of simulated scenarios prior to leaving for the Gulf, all of which were predicted on hostile encounters.
- During the crucial minutes in which the airbus was flagged as a hostile F14, the crew ignored indicators that cast doubt onto the AEGIS interpretation of events.
- Because the AEGIS automatically analyses incoming data there was no way to directly evaluate the radar blips.
- The commander of the nearby USS Sides “wandered about in disbelief” as the Vincennes prepared to fire but did not intervene with the vessel equipped with AEGIS.
- On return to the US captain William Rogers - commander of the Vincennes – received the Legion on Merit award for “exceptionally meritorious conduct in the performance of outstanding service” in the Gulf War.

### *Exit and gift*

All of those, who had left their outdoor clothes, a shirt or a cardigan with pockets in the antechamber, would find a small transparent plastic box full of sand in his or her pockets. The box bore the inscription:

The figures symbolise the number of Iraqi people that were said to have been killed during the Gulf war (the figures vary between a 100.000 and a million).



## An Artistic Evaluation<sup>4</sup>

### "Virtual war" as the topic of an artistic environment

Mixed reality elements are used in *Desert Rain* in a double sense:

- as a new technological form of combining a collaborative VR environment with the direct physical communication between real persons and
- as a metaphor of mixing various layers of realities.

Very early, Blast Theory imagined the structure of the piece as follows: “ ‘Virtual Rain’ (the older title of *Desert Rain*) will use a combination of virtual reality, installation and performance to explore the boundary between the real and the virtual. It will involve participants in Collaborative Virtual Environment (CVE) in which the real intrudes upon the virtual and vice versa. It will use the real, the imaginary, the fictional and the virtual side by side and will seek to juxtapose these elements as a means of defining them” (eRENA 1999). In fact, the relationship between content and technology in *Desert Rain* is as narrow as possible. The technology provides neither the form, or the medial infrastructure, or theatrical effects, nor is the content at all conceivable without the specific technologies utilised.

It is the setting of the elements of such different characters, which - collected in the mind of the participant - defines or creates the content. The beginning, when the participants are instructed, is pure theatre. What follows is a kind of collaborative computer game, where each of them has to find his or her personal target and which is based on somehow generally known VR technologies. The Virtual Reality then turns out to be a mixed reality: a real person crosses the “screen”, which, by this time, turns out to be a permeable water spray curtain. By switching off the water supply, the participants can leave their somehow destroyed cubicles and walk through the wet zone to a dry sand dune. And again they have to leave the world of natural elements to experience another kind of “meta-world”. They find themselves being brought to a natural looking hotel room, created by realistic photo prints on the wall. The only real thing is a TV monitor where people who are somehow linked to the Gulf Wars are giving their individual witness or opinion. Shortly before the exit, the audience reads an information text about an extraordinary incident in the first Gulf War. And having left the theatre they will find a souvenir in their pocket that symbolically reminds them on the high number of war victims in the second Gulf War.

<sup>4</sup>This section is edited by Heike Staff, ZKM, and based on contributions from J Row Farr and M-L Rinman



The first thing which becomes clear is that the piece deals with war in general – without gun shooting and bombing noises, dead or injured persons, that is, without any naturalistic theatrical elements. There are allusions to a situation of threat in the antechamber and there are various hints in the graphical and acoustical design of the virtual world. Here the participants are starting their journey in a projected hotel room and leave this for a kind of desert space with entrances to bunker-like corridors and rooms. The topic war becomes explicit in the witness videos, in the text about the Vincennes incident, and - indirectly - in General Powell's quotation of on the sand box. After having seen and heard the Gulf War witnesses and after having read the information text, the audience member must go back in his or her memory of what previously happened, in order to create something like the statements of piece.

By putting all the elements together, one can say that the piece parallels the abstract experience of modern warfare, and hints at modern war reporting, and more generally speaking, questions the naive usage of VR technologies and their impact on real life. Having played within the Virtual Environment and then read about the Vincennes incident, various questions are going through one's mind: "Where is the difference between military training and military reality (= war)?" or "Can the responsible persons, the soldiers, still perceive the difference?" or "When so many things are automatically programmed in complex software environments, what is the role of human communication in making decisions?"

The whole piece is constructed around the contrast of technological and natural elements and it moves constantly between different layers of social reality, theatrical reality, media reality and virtual reality. The proper element of mixed reality provides the strongest artistic moment of the piece: the minute in which the performer crosses the rain curtain, virtuality and reality are not longer separate realms. No theoretical discourse could ever achieve such mixed feelings about the difference between virtual and "real" reality: surprise and fear, astonishment and suspiciousness. The realm of the real intrudes on the realm of a computer game. This is the most impressive moment of *Desert Rain*, repeated and mirrored in many other contrasts and shifts.

The critics of the performances in England and in Germany emphasised this aspect, as the Sunday Times did: "This change from virtual to real is remarkably sudden and strangely disconcerting. Previously, we have been within the well-accepted paradigm of the computer game. We know the rules. (...) If we had the power to shoot opponents or destroy buildings, it wouldn't seem strange to us. It's a computer

game, after all, and in computer games, we are immortal. Computer games allow us back in the schoolyard to play Cowboys and Indians or War without connecting to the lessons of such encounters. In the mocked-up hotel room, the videos actually make that connection.”<sup>5</sup>

The German journal “tanzdrama” speaks of a “convincing synthesis out of a spatially directed cyber computer game and a performance, in which the audience comprehends, while acting, the confusing overlapping of different levels of reality.”<sup>6</sup>

The doubtful nature of modern war reporting, that the whole world experienced during the second Gulf War, is questioned by the reports of the six video witnesses and their opinions on the number of victims and, more strongly, by the text about the Vincennes incident and its revelation that the western media did not report on the error which caused the death of 290 persons in a civil airplane. Only after the experience of the game-like synthetic world, the audience is confronted with the confusing statements of the witnesses and the historical information about real wars.

Blast Theory answered my question as to the choice of the Vincennes incident from 1988: “It was a background event to the Gulf War, possibly one amongst many. It provides a good example of Western Media coverage of events. They decided that this was less important news than the Lockerbie bombing, for example, even though more people were killed as a result. It suggests a faith in advanced technologies and knowledge/training with these systems over and above that of human ability to make decisions. For us this reflects upon ourselves as we control and operate *Desert Rain*, but also on the users’ decisions within the experience. It is also of interest to us as the fetishisation of technology is something we are implicated in. As a result, people are commended for their dexterity with technology. We may use it but we are attempting to interrogate it too and do not embrace technology with open arms.”<sup>7</sup>

Indeed, one of the starting points of the *Desert Rain*-concept was “Jean Baudrillard’s assertion that the Gulf War did not take place because it was in fact a virtual event. Whilst remaining deeply suspicious of this kind of theoretical position, Blast Theory recognise that this idea touches upon a crucial shift in our

<sup>5</sup> ibid. (footnote 1)

<sup>6</sup> Söke Dinkla, Vom Zuschauer zum vernetzten Teilnehmer, tanzdrama, 2/2000, p. 51

<sup>7</sup> Quoted from a personal letter exchange between Ju Row Farr and Heike Staff

perception and understanding of the world around us. It asserts that the role of the media, of advertising and of the entertainment industries in the presentation of events is casually misleading at best and perniciously deceptive at worst. As Paul Patton says in an essay about Baudrillard, *the sense in which Baudrillard speaks of events as virtual is related to the idea that real events lose their identity when they attain the velocity of real time information, or to employ another metaphor, when they become encrusted with the information which represents them. In this sense, while televisual information claims to provide immediate access to real events, in fact what it does is produce informational events which stand in for the real, and which 'inform' public opinion, which in turn affects the course of subsequent events, both real and informational. As consumers of mass media, we never experience the bare material event but only the informational coating which renders it 'sticky and unintelligible' like the oil soaked sea bird.*" (Adams & Row Farr 1999:68)

In the metaphorical sense, the "mixed realities" of *Desert Rain* provides a setting of personal and social experience in a virtual world and in a theatrically defined world with counteracting elements of informations in mass media style (or about the behaviour of mass media). On an artistic level, *Desert Rain* expresses a more complex understanding of how the virtual and the real are blurred than we find in everyday discourse about the impact of mass media and new technologies.

### The "rain curtain" as a new mixed reality boundary

The eRENA project, namely the University of Nottingham, emphasises the research on new boundaries between real and virtual spaces, driven by concerns of supporting new forms of awareness and communication between the participants of collaborative environments. The rain curtain, as one type of boundaries between real and virtual spaces, is an example of a mixed reality boundary to support performance.

The eRENA deliverable "Pushing Mixed Reality Boundaries" defined the technical and artistic aspects of working with this boundary:

- a novel material for creating a mixed reality boundary. The rain curtain has a
- number of interesting properties, especially with regard to permeability, dynamics and symmetry.
- the use of the rain curtain in creating performances that establish new relationships between performers and audience.
- a fully permeable mixed reality boundary, i.e., one that was not solid and through
- which performers, audience members and objects could pass.



- an appropriate style of interaction with the rain curtain (Benford 1999:42).

After having experienced the performances of the final piece, we can now report on the artistic achievements of this mixed reality boundary. The expression "rain curtain" mirrors precisely the aesthetic quality of the projected image on the falling water spray. The spectator sees a clear but somehow unstable image of which the lower margin becomes wavy like the lower margin of a softly folded curtain.

(Footnote: Please, be aware that this impression cannot be documented on video; one only realises the beauty of the projection in physical reality.) The specific physical quality of water spray vanishes from one's mind the longer one looks on the projected image. You forget that the thing you are looking at is not a screen, nor the fourth wall of the cubicle, but just something as unsolid as rain, made from water drops.

Through this aesthetic aspect, which we might call a poetic one, the spectator's mind becomes open to all kinds of illusions. The suggestive power of the rain curtain provokes various associations<sup>8</sup>: it is water and you can think of rain, but it could equally be dust, a sand storm, or other particles suspended in the air. You know that it is an illusion, a mirage, a wet kind of Fata Morgana. And because it is beautiful, you easily accept and integrate even the technical aspects: the round light of the projector, which you see through the falling water, can be interpreted as the merciless, white sun over the desert. Even though you feel the illusionary character of the material on which the front images are projected, you are strongly disappointed the minute it stops: "something real seeming to last, but it really doesn't; somebody has turned a switch and it is all over."

Ju Row Farr from Blast Theory acted several times as the performer who traverses the rain curtain and she likes the tension of the moment, "when a performer goes through the water and the participant realises they are not alone in the cubicle, that the screen isn't the end of their perspective and that something else is possible. This moment for me brings together all of the elements perfectly - mixed reality boundaries, the fusion of the real with the virtual, implication and communication. What is especially nice is that people often try to touch your hand, go with you, they speak to you and trust you. At this moment for me it is a performance, a game and an installation using new technologies. It is about trust, about deception or illusion, about the unknown person watching you and coming for you and you not knowing what happens next."<sup>9</sup>

<sup>8</sup> The collection of associations is based on statements by the artists and audience members.

<sup>9</sup> Quoted from personal letter exchange

### The "journey" through the collaborative virtual environment

Traversing the rain curtain is for both the performer and the participant the most exiting moment of the piece. The journey through the virtual environment is the longest lasting phase, the central period of *Desert Rain*. Each of the six participants has been asked to find his or her personal target in the virtual world through which they are navigating, standing on footpads. Each one is standing alone in a cubicle and is equipped with a parka, a headset and a microphone. They can talk to the operators/performers and in certain spaces of the virtual world they can talk to each other.

In regard to the topic "Gulf War", how are the rules defined in the computer game like CVE? Which are the artistic goals behind the definitions? "We were not interested in stressing or reiterating the macho, the gung-ho, the loner, the leader. We were interested in the joint experience, the communication between the players in the virtual world, in the headsets, in the real spaces, but especially when faced with a set of tasks and circumstances that needed to be negotiated," answers Ju Row Farr from Blast Theory on this question. "We are more interested as a group of artists in the social rather than the solo nature(s) of technological experiences. It would have been much easier to make a piece about a war, that was gamelike, competitive, using familiar structures of drama and conflict to create the narrative of the piece. However, for us and for *Desert Rain* that would have provided a set of criteria that we were not interested in exploring and it was not appropriate. We were not interested in who was best/strongest/quickest/the best fighter/gamer etc - the aspects of the Gulf War which reduce it to winners, losers, victims, victors and we were not interested in bringing these qualities out in users."<sup>10</sup>

Instead of this, she points out: "We were interested in how do you negotiate a situation with a group of people even though you can't see them but with whom you can communicate in some way. How does a real event and set of circumstances relate to an event that is represented by a virtual environment, a fictional scenario? Where is the line? This idea felt much more appropriate to us with regard to the Gulf War and came into play when making the rules of navigation. How do you find someone in a desert? You can hear them for a while and then you cannot, you can't see them, but you know they are out there and they know you are out there. And if you do meet up, how can you work together? How can you get somewhere and achieve tasks? From the outset, from the antechamber, everyone is on the same side looking for similar things, it is against the clock but not against each other.

<sup>10</sup> Quoted from personal letter exchange

And the water curtain added its own set of challenges in order to complete the tasks.”<sup>11</sup>

Nevertheless, it is obvious that there is a link between computer simulations, games and military training. As Marie-Louise Rinman stated: "Computer games and simulation games are widely used in military contexts as training devices. These games train and demand various abilities and faculties, such as strategic planning, logic calculation and memory. The US Marines, for instance, used networked Doom in Bosnia to teach teamwork and tactics."<sup>12</sup>

Ju Row Farr comments the experiences which the members of Blast Theory made with the real behaviour of audience members: "I think that it is interesting to be placed alone within a zipped cubicle, headphoned and miked up. Your own survival instincts or desire to succeed on the one hand naturally rises. This is set off against the tasks that you have to complete and the other five participants you know are a real part of it. Certainly as a performer on the headphones, our role was sometimes ambiguous in this area and we could inflect the experience accordingly - for example if the users had all found their targets and were close to finding the exit within the given time allowance, we could give them more information and heighten the sense of climax. Listening to users' conversations within the virtual world also revealed a competitive level which some people were bringing to the experience or which the experience was bringing out in some people. Certainly after users left the virtual world and took their coats off their conversations on the whole were about the competitive nature of the world – “Did you find your target?”, “Did you find the exit?” etc.”<sup>13</sup>

Also this potential contradiction, the rise of one's "survival instinct" and competitive behaviour and the reality of a game-like situation where one is supposed to communicate and to help each other, is an important aspect of the content of *Desert Rain*. Nothing has been shown or performed or demonstrated, but it is the carrying-out of one possibility of what we call “content production by audience participation.”

<sup>11</sup> Quoted from personal letter exchange

<sup>12</sup> Marie-Louise Rinman: *The Desert Rain Performance. An exploration of the boundary between the virtual and the real, stage and audience*, unpublished article, 2000, p. 8

<sup>13</sup> Quoted from personal letter exchange

### Desert Rain - a theatre play?

Not only are the borders between the real and the virtual being blurred in *Desert Rain*, but the production also questions the traditional borders of art genres. Is it correct to call it a play or a theatre production or is "artistic environment" the more adequate general term? Is its character more dominated by the elements of interactive installations or by the performance aspects? In the flyer of *Desert Rain*, Blast Theory called it "a game, an installation, a performance". Stephen Armstrong from the Sunday Times takes it for "an intermeshing of computer game, installation, live performance and cultural polemic."<sup>14</sup>

Modern art, and especially media art, generally questions the well-defined realms of traditional art genres. The interactive media usually changes the roles or the aspect of typical role behaviour of both parties, the creators - artists, technicians, scientists – as well as the audience - visitors, participants, players. The members of Blast Theory act in different roles: as an actor in the antechamber, as a speechless performer at the end of the journey, as bodiless voices and as operators "back-stage". The audience behave as spectators and players and "interactors". They are the ones who are moving around. Climbing on the footpad might remind the one or other of being on a stage. When the rain curtain and the projection has been switched off, the audience might have the feeling of being in a cinema, where the film has ended the flashing lights are destroying the former illusionary world.

*Desert Rain* might be described as a defined tour through four installations, where the audience interact as players, walkers, spectators etc. Accordingly, Marie-Louise Rinman defines *Desert Rain* "partly as an installation through which the visitors can move around, not freely but according to a certain order and during a limited period of time. *Desert Rain* is better and more regarded as a performance though, because of the limited number of people let in at a time and the interaction between performers and audience. The latter are participating in a drama / play following a pre-written script, yet the outcome of it is to a certain extent unpredictable."<sup>15</sup>

As so often in modern performances (in contrast to traditional theatre), here the stage is not any longer separated from the audience space; in fact, it is impossible to employ these terms on *Desert Rain*. Here, spaces have become transitional in their character. There is no space or place in *Desert Rain* that is not stage.

<sup>14</sup> Sunday Times (see footnote 1)

<sup>15</sup> Rinman, *ibid.* p. 3

## 4 Relationships and Forms of Interaction, an Audience Perspective

“Computer scientists and traditional interface design theory may discover rich new sources of theoretical and productive knowledge that can be brought to bear on the design of human-computer activity” (Laurel 1993:xix).

This chapter illustrates how various forms of interactions; relationships and task-oriented activities may be designed and orchestrated by using theatre and games formats as foundation. The use of well-acknowledged conventions, as in performance practices, is one way to introduce novel forms of interactive media art to the general public, not the least to novices in technology.

The headings follow the various steps in *Desert Rain* chronologically revealing / showing how conditions of relationships and interactions are created and developed as well as how tasks are accomplished.

### **The dramatic process: elements and structures in drama**

Despite historical and cultural changes, theatrical situations are by tradition marked by a set of conventions such as a building, a mask, all clearly indicating the “theatre”. A theatrical situation implies of necessity a performer and a spectator in order to create a representational or fictional world. “[W]hen people come

to the theatre, they not only accept a world of fantasy, but they actively engage in constructing it. The basis for this step from physical to the imaginary world is the...theatrical agreement between performer and spectator. According to this agreement, and only then, the performer invites the spectator to interpret the scenic reality as something that it is meant to represent. The spectator, aware of the representative character of the scenic actions, accepts the invitation and builds his or her fantasies” (Martin & Sauter 1995:82).

The making of drama contains certain elements that are useful in the analysis of engagement, experiences and participation. The description below deals with form and structure in drama as suggested by O’Toole and Haseman in the form of eleven “elements” in *Dramawise* 1988.

1. “The human context”. One basic element in working with drama is the creation of and participation in a fictional world. “To make this imaginary world of drama meaningful and purposeful, it must have aspects of the real world in it. The central, real-world component of dramatic situations is human relationships” (ibid:3). Relationships are central to all dramatic action and consist of relationships between people, between people and ideas and between people and the environment. In a drama one takes on a role. Developing a role implies defining the purpose of a role, which may change, and its status. Status concerns hierarchies and the amount of power a certain character possesses in relation to others. Purpose and status form part of the characters motivation, which in turn refers to what the character wants to achieve.

2. “Relationships” are driven by a “dramatic tension”. There are four major means of creating and intensifying dramatic tension: task, relationships, surprise and mystery. The tension of a task is created by the problem that the characters must complete and is resolved by completing the task and either achieving the goal or not. In drama the tension of relationships is based on the problem between the characters and is resolved by how these relationships are managed. Someone may change or someone may leave. The tension of surprise is caused by the problem of the characters not knowing what is to come, which is resolved by the circumstances that suddenly unfold. An finally the tension of mystery consists of the problem characters have not knowing what it all means, which is resolved when everything becomes clear, a change from ignorance to knowledge, and the action moves forward.

3. This tension is directed by the “focus”, which concerns framing the action.

4. “Place and space” deals with when and where the dramatic action occurs (*Hamlet* or science fiction).

5. "Time" concerns how events are linked together by cause and effect. Other aspects are tempo and timing. The tempo relates to the kind of action and to the mood whereas the precise use of time, from one moment to the next is called timing.
6. "Language" concerns the words we say, how we say them as well as body language.
7. "Movement" deals with movement and stillness, gestures and so forth.
8. "Mood" deals with creating through music, words and so forth.
9. "Symbols". An artefact can play a central part by indicating a change in the drama (a knife can be used to cut bread or as a murder weapon).
10. All these elements create the whole experience of "Dramatic meaning".
11. "Improvisation" refers to the art of improvisation.

In Aristotelian terms a dramatic structure has a beginning, middle and end and consists basically of rising action, climax and falling action.

In the text, that follows, we shall see how these elements are used in *Desert Rain* in terms of interaction, form and structure and how these elements are designed.

## **The significance of spaces, creating mood**

"Many ad hoc theatres created in usurped or 'hijacked' spaces reveal highly conceptual boundary mechanisms. These differ radically from patent architectural demarcations like footlights and orchestra pits, but are often just as powerfully operative in the theatre context" (Norman 1999).

During the last decades the performance space and its immediate surroundings have gained more significance. The performance space has been "deconstructed" through the use of water towers factories, streets and so forth. Settings carry with them strong associations. Different contexts will attract people of different age, gender and background, who in turn have different anticipations and experiences. Choice of place is important in the creation of expectations and mood.

*Desert Rain* has been staged at various places (museum, campus, cinema, and a factory) and contexts (festivals). For example, at the opening in Nottingham in October 1999<sup>16</sup>. *Desert Rain* was performed in an empty factory. Tickets were booked in advance and the audience was picked up (six at a time) by a hired cab down town and then driven to Strella House, a disused brick factory in the red light district, far away from the usual sites of "high culture".

<sup>16</sup> The studies carried out in Nottingham do not include audience responses.

## The steps into Desert Rain

### The Antechamber

#### *Step one: breaking codes and invitation to the fictional*

A performer dressed in a green parka fetches the six members of the audience saying: -“Follow me, please!” During this initial face-to-face meeting between performer and members of the audience the performer “is in costume but not in character” (Schechner 1994: 81). S/he can answer questions, but not be engaged in small talk. As members of the audience are let inside the performance space the boundary code, or “fourth wall” convention is broken. The entrance door constitutes an interfacial demarcation, as a boundary between two entities that in turn coincides with the fourth wall. Closing the door is shutting the ordinary world out. Being inside the framed area is being part of the performance within a limited time and space and entering the world of make-believe. A first step of participation is taken.

The distance between entrance and antechamber differs depending on where the performance is staged, which may influence experience and mood. If it takes too long to cross the floor before entering the next passage of the “journey” the participant may start paying attention to objects not connected to the performance and the illusion may be broken. In the vast factory hall in Nottingham the four installations were separated and scattered over a vast area. It was possible to see all the separate installations although one could not see what was inside. In the Stockholm performance on the other hand all four installations were placed in close connection to each other. The way the installation was constructed made it resemble a maze: one could neither see the previous space nor what was ahead. The maze metaphor carries with it strong associations, which contribute to a feeling of mystery and puzzle.

#### *Step two: establishing common ground and fictional world*

The performer asks the six members of the audience to sit down and says, -“You are now about to enter a virtual world”. This utterance is crucial in terms of establishing common ground and a shared understanding of the unfolding story.

Through this phrase the visitors are invited to a world of make-believe, which they will either accept or reject. Acceptance or rejection may depend on the way the performer utters these words. It is essential that the performer “is in character” playing his or her part in order to convey the right mood.

Sub-text. The sentence creates a mood as well as mediating “objective” information, fiction and fact (although the information is related to the game world).



*Step three: creating common ground for collaboration through the use of a game format*

This step is equally important and concerns the establishment of audience participation and collaboration. As said in chapter 3 the performer informs members of the audience about what they are supposed to accomplish in the virtual world and through what means. The performer makes a point of stressing that each one has to find their target and that they are supposed to collaborate in order to find the exit, which is the goal. The mission consists of a clearly defined task and goal and there is a time limit of twenty minutes. One could say that the basic rule or guideline of the game is to collaborate. In a game rules should be followed and executed. In an interactive artwork on the other hand breaking a rule may be part of the happening or game. An image of an avatar, the participants' representation in the virtual world is hanging on the wall. A participant / avatar has to be within a certain distance to be able to communicate through the headset.

*Step four: shifting roles, involving the audience, the human context, symbols, role-playing and simulation.*

So far communication is built on a one-to-one relationship or the “two-part paradigm”, that is, only the performer has been talking. Participants are sitting down facing the performer. They are informed that they can ask any question concerning “targets” or cards, but they are not encouraged to communicate with each other. From this moment various forms of interaction are introduced. Cards are handed over to members of the audience and they are told to take their outdoor clothes off and put waterproof jackets on. Doing so people change from being members of the audience to become participants and part of the performance. This act is transitional and has a symbolic property, like changing skin or mask from that of ordinary life. The waterproof jackets are “threshold markers” marking the transition from “audience” to “participant” although they have a functional purpose protecting participant's clothes from being wet. The jackets have a military touch. The role of the performer shifts as well, from performer to “helper” assisting the participants.

**The cubicles**

*Dramatic tension, focus / framing the action, role-playing, tempo and timing*

Two performers / helpers take turns in fetching the participants one at a time and bring them to the cubicles. The short time of waiting prevents participants from talking, which would break the carefully prepared mood of illusion. Assisted by the performer each participant steps up on the footpad that is placed in the water puts a headset on and is then left alone. Facing the water screen with the 3D world

projected on it and encircled by the distorted images on the fabric walls, the reflections from the water pool and the light from above, the participant is surrounded by an immersive<sup>17</sup> environment. The sixth wall, the ceiling, has neither reflections nor images, but is shaded off by spotlights. Stepping up on the footpad is like entering a stage. The water curtain constitutes a fourth symbolic wall and the navigational device is a threshold object that brings the participants on a journey into the virtual. All these elements create tension of the task.

As the game starts there is an addition to the participants' role. They are also become players and take a further step into an imaginary world. The players now face a number of difficulties, challenges and obstacles. First to interpret the graphic, which gets blurry due the moving surface -. the water screen, in order to be able to navigate. Second to accomplish a task an achieving a goal while managing the technology. And above all to locate and collaborate with other players. All these elements constitute a basis for creating a dramatic tension or destroying it. As mentioned above there are four major means of creating and intensifying dramatic tension: task, relationships, surprise and mystery. Besides the dramatic tension, there are other elements involved here: role- playing, focus of action, tempo and timing.

### *Surprise and mystery*

A decisive moment is (if and) when the player finds and hits the target. As the dark landscape shifts to an image a white spinning object with the text "Wait here", a performer emerges through the rain curtain. The performer asks for the card with the target name on and replaces it with a new swipe card. If a player fails in finding her / his target no performer will emerge through the water screen and thus the card will not be exchanged. The effect of this "failure" is discovered in the hotel room later on in the performance. The water curtain has several properties. Like an interface it is a boundary between two entities. As a screen it has a "tangible" property: it works as a surface onto which images are projected as well as hiding what is behind. The permeable property of the curtain that allows a performer to walk through it is a crucial part of the performance as it elaborates the concept of "a mixed reality". For an instant performers are part of the graphical world before participants identify them as "real people". Although performers become "real",

<sup>17</sup> The experience of being transported to an elaborately simulated place is referred to as an immersion. It is a sensation of being surrounded by a completely other reality, that takes over all our attention, our whole perceptual apparatus and implies a "movement" out of our familiar world (J. Murray 1997).

that is, stepping out of the virtual world - they are still role-playing and part of the performance. Meanwhile players / participants may wait and watch in silence or make comments on the happening to other players over the headphones, which may add a sense of “reality” to the situation.

#### *Significance of transitions: change of mood and relationships*

The transition between the cubicles and the sand-tunnel is crude. When the water screen is turned off and the general light is turned on, the surroundings abruptly change – vision, sound and the quality of the air. Cables on the floor are exposed as well as projectors, water pipes etc, which points out rather than hides the reality behind the magic (the setting differs depending on the dimensions of the performance space). The fiction created in the previous space is disrupted indicating falling action as well as a transition from one point of the journey to the next. In the Stockholm performance the light revealed a space reminiscent of Frankenstein’s laboratory containing amazing power towers for production of lightning and strange equipment. At the request of a couple of helpers standing on the opposite side of the basin the players give the water- proof jackets back. There is a shift again from a level of high participation to a level of reflection. Participants are no longer role-playing, but are still part of a journey and visit. They are showed into the next space framed by high wooden walls: a tunnel full of sand.

#### **Sand tunnel**

##### *Communication*

A change from player and participant back to visitor starts just before entering the tunnel. This change coincides with the falling action. As external stimuli are reduced to a minimum compared to the former space, or act, the visitor has time to reflect and slowly come back to “reality” during the minute it takes to walk through it. Emotionally it takes some time to change from arousal and total engagement to a “normal” state of mind. Visitors would start talking when reaching the end of the tunnel discussing the events in the previous space.

#### **Hotel Room - Everything starts to fall into place and make sense**

When leaving the tunnel the role of the participants shifts yet again. In the brightly lit hotel room visitors lively discuss the game event. Reactions would concern the performer emerging through the water curtain, problems with the footpad, funny incidents or disappointments. Here visitors make use of their cards turning on a television – set. At this stage the consequences of the climax in the game are revealed and things fall into place so the significance of the card swapping is made clear. As people start watching the interviews they turn into observers of a histori-

cal event. As well as the transition between cubicles and tunnel marks a change of mood, so do the recorded interviews. People would react very differently towards the various comments and opinions about the Gulf War made by the interviewees on the video clips. Various figures are mentioned that concern the amount of people killed during the war. They vary from a thousand to a hundred thousand, a number that will be of significance later on in the performance.

A viewer may find the information mediated by the interviewee video clip highly interesting and so s/he gets completely involved again. In that case the hotel room may indicate a rising action.

### Texts

Some people lost interest when entering the hotel room, because they were still too engaged in the previous game world whereas some became touched by and involved in the interviews and thus more receptive to the content in the texts. The texts contain information, political standpoints and quotations from newspapers. The content in interviews and texts sometimes make visitors express disappointment about the short time in the game world, the turn from fun to seriousness, whereas others would express appreciation about the events' complexity.

### Exit and Sandbox

As a helper / performer gives visitors their bags back and put their own jackets on the situation returns to a normal stage. In jackets and bags a little sandbox is hidden. The effect of this gift or "legacy" may have on visitors is hard to tell, because they would generally find it afterwards, outside the performance space. If neither bag nor jacket is left in the Antechamber they will for obvious reasons not get sandbox. Some people coming back for a second round would make a comment on the sandbox. Reactions would shift from pleasant to unpleasant surprise. Some would experience it as an intrusive act whereas some would return to ask for a box if they had not got one. In terms of drama the sandbox is a legacy indicating a number of possible endings but also a number of starting points. The drama thus may "be continued".

## **Making sense of tools attributing them with new functions and transforming their usage**

Exploration of the virtual world and the physical installation is constrained by limitations in time and space. Despite these constraints participants are allowed free scope to add new meaning to actions and props and give them new functions by transforming their usage. The observations made from behind the rain curtain revealed how participants would play their own games, put new meanings to situations or attribute new meanings to props.

Different cultural background and experience may influence the way participants interpret and use props. One example is a player who scanned his “target card” along the fabric walls surrounding him in the cubicles seemingly expecting to trigger a reaction of some sort (the card has a black strip that resembles a magnetic strip). He seemed convinced that the card had a magnetic code that should correspond to an equal code on the wall. A quite logical reaction would be to translate everyday activities into the world of make-believe. Facing the water screen he continued scanning the thin air with the card as if invisible beams could be cut through and activated. Incidentally he “hit” the target and the performer emerged through the water screen. Actually he was using the prop as an interface, as an interactive device, to make something happen and to -“open” - a gate between one entity and another. If the player had continued swiping his card through thin air a performer / helper (at the headphones) would have told him to hit the target with the use of the footpad. Since he succeeded in doing so anyway the performer never interfered.

## **Audience reactions and responses to separate events**

At ZKM I observed participants’ activities in the cubicles as well as sitting outside at the “ticket office” (a table) waiting for people to contact me. And so many did. The variety of comments below gives a hint of the performance’ complexity.

On the last evening of the *Desert Rain* performance at ZKM a group consisting of a hundred young (male) Quake gamers invaded most of the foyer space. The gamers met a couple of times a year at ZKM playing a 24-hour networked Quake gig. They literally invaded the usually strict and quiet space and turned it into an informal, lively scout camp placing a vast number of tables loaded with each gamer’s own computer and other personal belongings (such as a huge horn of china meant for beer), bottles of Coke, pizza slices etc just in front of the theatre,

almost blocking the entrance. They slept everywhere, on hidden shelves high above the floor, leaving their sleeping bags, blankets and pillows in every corner. A small group of gamers participated in a *Desert Rain* “round” and were quite impressed, not the least by the 3D environment, despite its “blockiness”. They were quite enthusiastic about the whole set-up of the performance because it was immersive in quite another sense than the graphically superior computer games. “You were actually surrounded by a graphical environment and a sound-scape, and you were able to communicate with the others. We just missed a little bit more of action in the desert, and wanted to stay longer there and explore it”.

Participants accustomed to virtual environments would say about *Desert Rain*:

“This is the best immersive environment we’ve ever seen or experienced, because it really enfolds you. And you can move more freely than in a cave for instance”.

“What a fantastic experience, what a game, why couldn’t we play longer investigating the 3D world? ( twenty-year old Quake gamer)”.

“It was a scary experience. I felt deserted and alone in the virtual world. I realised how it would be like to be left all alone in a desert. I almost panicked when I didn’t find my way out of the tunnel”(thirty-year old woman).

“I didn’t understand anything! What was it all about? I didn’t know what to do! What’s the intention with the piece? Absolutely pointless!” (Female player in her fifties).

British woman in her forties (very upset): “A very hard and serious piece. I am personally involved in the Gulf War. My ex boyfriend was killed there. I could hear the aircraft leaving for the war”. She felt completely tensed and frustrated and could hardly move through the world. She was frightened that she would get an electrical shock from the footpad, because it was placed in the water.

“Putting the jacket on was like going to war, becoming a soldier. And the word ‘target’ sounds threatening. It means you have to, eh..., are forced to kill other people”.

Most comments tended to be about the cubicles and the virtual world, problems with managing the footpad or comprehending the 3D world projected on the moving water screen.

To give a somewhat simplified picture of audience responses and to generalise I could distinguish three major groups.

Firstly a small group of people (approximately 5 %) who did not seem to understand the meaning and the purpose of *Desert Rain* at all, especially the game part, which seemed to them be too challenging and alien towards old behavioural patterns: playing around standing on a footpad, the point of participation, the purpose of navigating, interpreting the 3D graphics, co-ordinating problems etc.

The second group (approximately 30%) were deeply affected and provoked by *Desert Rain*. A few felt uneasy and affected due to personal involvement in the Gulf War. The rest had a special interest in its political part, that emphasises the notion of the remote war, media coverage and military statements, and the danger of confusing simulation games with reality in war situations. There was also a large number of people who got disappointed when they ended up in the hotel room and realised *Desert Rain* was about the Gulf War.

"I would have preferred the game world only. It is so sad to realise that it was all about a real war. It took all the fun away. It changes my experiences and thoughts in and about the game world (woman in a group of four who shared the same opinion)".

It turned out that some of these members of the audience regarded the little box of sand put in the jacket or bag as trespassing. They did not enjoy finding an alien "artefact" in their personal belongings days after the performance.

The third and largest group had the opposite experience and feeling. Most of them though were in their twenties and early thirties and not paying that much attention to the connection to the Gulf War. They enjoyed the game elements and "let themselves go" in the virtual environment talking and laughing.

Some participants would find it hard to cope with the mix of free play and structured game elements in the virtual world. The pre-programmed 3D world permits a restricted mobility only. Conversations over the head-phones are "free" though, which means that the outcome of every round differs depending on the constellation of the group. If the group consists of six friends they probably feel more free in the way they communicate than in a group mixed with strangers.

Complaints mostly concerned insufficient information in the beginning about the piece concerning game rules, the outcome, what was going to happen. An "unsuccessful" outcome (that is failing to hit the target) was blamed on language problems. As one person said: "Why didn't we get enough information so that we could have done it properly and succeeded in getting our targets? And we never got any feedback whether we were doing alright or not". Here the game turned into a real serious "win or lose" game, where pride, success and failure seemed to be at stake. These people wanted to know exactly what was going to happen beforehand, since the prospect of ending up in a situation out of (their) control seemed too frightening. The need for "control" and the preference for "competition" (in games) are generally tightly linked together, which was quite evident in this case.

One woman, on the other hand, got stuck in the motel room sat down on the footpad and put her feet in the water, leaning her head in her hands, said: "I'll just sit here and enjoy the whole thing,

the beauty of it all". Sitting on one side of the footpad made the image spin around in quite a compelling way. She could let herself "play around" in her own way and did not feel she had to follow the rules or the rest of the company. In another perspective though, she let the others down by neither looking for nor finding the exit. Just one (male) participant complained that the "whole piece was a complete bore and not worthwhile; nothing new in it what so ever".

The artists would constantly change and add their ways of assisting participants, which is further elaborated in the next chapter.

### **Role of the audience / user**

The role of the audience / user as well as the role of the performers / helpers shift throughout the performance. The audience changes from being spectators, to players and participants and back to being spectators again whereas performers shift to helpers and to spectators. These shifts are made possible through the use of "threshold objects" that mark a shift in action and participation along the trajectory. A "threshold object" may be a jacket, a word or a card, anything that implies a change of action.

Participation status as well as degree of participation would differ within groups. Various kinds of hierarchies would be formed within participating groups like for instance, an "aggressor", the one who drives and pushes the rest of the players to keep going as opposed to the person who does not want to do it, to participate, who is freaked by it. There could be a "Friday or Saturday night crowd", a leader or "follow me" and / or the "pacifier"<sup>18</sup>. Each character could easily be identified through choice of words and the way utterances are communicated - giving orders, urging or encouraging or staying silent and just follow.

The performer at the headphones would stay "in character" when giving information and encouraging players to keep on going during the event, thus staying in character and playing their role. Keeping the distance to members of the audience means maintaining the symbolic properties of the performance world.

Conversation between player and performer is not encouraged since the performer is following a script and shall maintain an atmosphere of make-believe and fiction.

<sup>18</sup> From an interview with performers in Blast Theory Rotterdam 2001-11-04



## Summary

In the observations and analysis of audience participation and reactions to the *Desert Rain* performance I found the following results, categorised in the eleven elements of form and structure in drama as suggested in Dramawise (O'Toole, Haseman 1988).

1. "The human context". One basic element is to create a fictional world as a basis for common ground as may the format. The virtual game environment can be experienced as for instance a win-or-lose game or an art installation. As a game some may value the competitive properties, whereas others would feel certain stress.

2. Relationships are driven by a "dramatic tension". In this context relationships may be divided into either as "task-oriented" or "experience-oriented".

The aim to execute the task would urge participants to contact each other over the headphones just by calling

"Hallo!?", "Anyone there?", and that would start the game, talk, collaboration.

If it took too long for participants to get in touch with other avatars a helper would assist them over the headphones. Some players would just shout loud enough to make themselves heard and thus get information about other participants' / avatars' whereabouts.

Collaboration is sustained by limitations in time and space (standing on one spot, limited possibilities in the virtual world) as well as clearly defined tasks and goals.

3. This tension is directed by the "focus", that is, to define what is central to the action. The players know what is expected from them, that is, to find a target, locate other players / avatars in order to exit together during a limited time. They will thus pay attention to the collaborative elements in the game. A member of the audience who decides to be a "visitor" throughout the installation can dedicate her / his time to experience and enjoy the virtual environment as a piece of art. A focus makes collaboration possible whereas an experience is individual and introvert.

4. "Place and space". Certain settings will intensify the action (cubicles and virtual world), while the use of contrasting settings (transitions, sand tunnel) can help to build the dramatic tension. The silence that follows when the water is turned off emphasises the action in the virtual world as does the transition between cubicles and sand tunnel. Participants need time to calm down from the emotional arousal to be able to absorb new information.

5. "Time" concerns how events are linked together by cause and effect. The whole event is based on levels of understanding. Questions or mysteries get an answer on the next level. The same motel room in the virtual world is realised as an installation at the end of the performance. The "targets" that come to talk on the video

clips are sitting in the “same” hotel room as the one the visitors are standing in and so forth.

6. “Language”. The phrasing of the sentence “You are now about to enter a virtual world” is important initiating a “fictional” common ground. It concerns the tone of voice or the way performers or helpers communicate with participants over the headphones. Although participants / players have the leading role, helpers are still in operation, or “character”, sustaining the world of make-believe.

7. “Movement”: Transitions between spaces may indicate a shift in action and mood, which in turn is related to the role of the audience. Level of participation is related to level of action. Rising action: high degree of participation and “lots of action”. Falling action: lower degree of participation. Reflection.

8. “Mood”. Each room mediates a separate meaning and mood.

9. “Symbols”. The swapping of cards, their significance, function and use.

10. All these elements create the whole experience of “Dramatic meaning”.

11. “Improvisation”. Space is left for participants to elaborate the game and add new meanings to props.

Improvisations as ad-hoc solutions? The observations made from behind the rain curtain included the work and actions of the performers as well. It may happen that several players hit their targets at the same time helpers / performers have to assist each other in order to hand over all the cards within short time. If a player got stuck they would check with the helper at the headphones whether s/he had noticed the situation. The helper at the headphones at the hidden computer space would consult the technician and vice versa if a participant had been immobile for some time. The helper would then ask the participant in question if s/he had any problems to manage the footpad or to orient in the virtual world.

## 5 The Artists' Perspective of Designing an Interactive Performance

The aim of this thesis is to describe and analyse how audience participation is accomplished in collaborative mixed reality environments from a theatre point of view. The previous chapter examined participation from an audience point of view as well as their shifting role. This chapter describes the performers role as well as how the artistic design was accomplished.

The assertion that an interface may be political, social, organisational, and emotional as well as technical agrees with other researchers working within HCI, such as Bowers, Rodden, Bannon and Kuutti. Within the theatrical frame there is an invisible boundary between public and stage maintaining the imaginary world on stage. This “fourth wall” resembles the notion of the interface in terms of being a boundary between two entities. When performers and members of the audience interact this boundary is transgressed. Furthermore when members of the audience are made participants and co-actors in a game, performance and installation, new demands are put on designers and audience / user respectively.

### Interfacing

What constitutes the “interface” in *Desert Rain*? It consists of a complex set of phenomena, actions and artefacts with tangible as well as symbolic properties as

part of an extended “interface” or “interfaces” as suggested by Bowers and Rodden as “a resource for social action and interaction” (Bowers, Rodden 1993).

Which are the properties of an “interface”? A traditional explanation of an interface is “a boundary between two entities”, an interpretation that could be problematised. Could a human actor during certain circumstances be regarded as an interface for instance? In *Desert Rain* a number of activities are part of the “interfacial context”. The interface is extended to involve a complex set of social interactions and communication: human-machine interaction (the water screen-plus-footpad-plus-headset interface), interaction between performer and player, communication between two or more players at the same time and between performers off-stage, who could be communicating about matters concerning members of the audience and how to assist them. Interaction between player and performer is triggered when a player “hits” a graphical sign in the 3D world. When the performer emerges through the water curtain players may exclaim, “Who’s there?”, “Someone’s there?”, “Are you Sam?”, and so forth connecting or confusing the performer with the photo on the target card, which corresponds to the target’s image in the world. If the player does not understand the signal of the performers’ outstretched hand, that is, to hand over the card an invitation is uttered: “Give me your card, please!”. Is the performer an extension of the water screen’s interface in this specific moment or a proper interface in the capacity of deliverer of artefacts and “gate-keeper” between the real and virtual? The significance and outcome of the interaction performer – player, the new swipe card, is made evident in the hotel room where the card is used to turn on a video clip. Functions of interface and threshold objects coincide. Props, cards and performers are part of the interface and as well as threshold objects.

People participating in the *Desert Rain* event are involved in multiple relationships with other people making the two-part paradigm inadequate (Goffman 1981:132). Bowers and Rodden introduce the notion of a multiple interface, “When we consider a “working practice” as our unit of activity, it seems that we should no longer speak of an interface but of interfaces”. The interface becomes “a resource for social action and interaction” (Bowers and Rodden 1993). How could such complex patterns of interaction be designed? Goffman suggests a model for conversation analysis more suitable for complex systems, “footing”, where “participants over the course of their speaking constantly change their footing, these changes being persistent feature of natural talk” (Goffman 1981:128). Goffman’s analysis is based on live conversation between individuals where sight is significant, as well as gestures, gaze and so forth. He describes the role or function of

members through the act of speaking in a social gathering giving members “participation status” within the “participation framework” (ibid:137). In *Desert Rain* most communication is auditory and during the game activity players have no eye contact. The only visual images of other players are the blurry transmitted live video images inside the booths in the live-link.

Traditional conversation analysis supporting a “simplistic sender-receiver arrangement” or “a statement-reply format” (Goffman 1981: 129) exclude the non-structured quality of talk why “free-wheeling, self-referential character of speech receives no place” and so “[T]he essential fancifulness of talk is missed” (ibid: 147). Directives, interrogatives and exclamations communicated over the headphones in *Desert Rain* would be addressed to anyone within earshot. And anyone could take the “floor” and answer. Participants who already know each other might have a “subordinated communication” outside the “dominating communication” (ibid. 133). In that case a selected individual within the group may be addressed, with whom personal ideas about what is happening is discussed. The flavour of communication (quantity and quality, loudness, laughs, seriousness etc) between participants in different groups would differ depending on group composition, that is, gender, age, cultural background (different nationalities as well different social groupings) and so forth.

### **Making social interaction possible**

Except for reserving and paying for their tickets “[E]ach person who is a theatre-goer is something else, too. He collaborates in the unreality on stage. He sympathetically and vicariously participates in the unreal world generated by the dramatic interplay of the scripted characters” (Goffman 1971:130). And a performer or “an individual employed in stage acting will demonstrate at least a dual self, a stage actor...and a staged character” (ibid.129). Accordingly one could assume that despite different cultural background and experience people would participate in maintaining the performance world of make-believe. Judging from posters and flyers - *Desert Rain* is a game, an installation, a performance - most people will probably be aware of that the performance contains participatory elements, but not in what way and to what extent.

### **Facilitating social encounters and interaction**

A formal concern for both design groups, Blast Theory and The Nottingham research group was to explore the boundary concept and to elaborate collabora-

tion in a mixed reality environment. The issue in the early design process therefore was to find a common platform and impetus for collaboration recognisable to the general public, game being such a phenomenon. Goffman introduces the notion of “gaming encounters” (Goffman in Lemnert and Branaman 1997:129), which basically deals with social encounters. One reason why *Desert Rain* succeeded in engaging the audience is that it combines social encounters and game activities. Encounters and collaboration are made possible through the use of a game format that in turn ensures “euphoric interaction” and “engrossment” (ibid: 129). A way to ensure what Goffman calls “euphoria” is to practice handicapping, adjust betting limits, limit participation to skill classes and so forth introducing “sufficient malleability into the materials of the game to allow the game to be molded and fashioned into a shape best suited to hold the participants entranced” (ibid: 129). A game that remains unsettled until the end of play is regarded as fun to play as is “all work to ensure that a prior knowledge of the attributes of the players will not render the outcome a foregone conclusion” (Lemnert and Branaman 1997: 130).

“The developing built up by alternating, interlocking moves of the players can thus maintain sole claim upon the attention of the participants, thereby facilitating the game’s power to constitute the current reality of its players and to engross them. We can thus understand one of the social reasons why cheaters are resented; by locating the power of determining the outcome of the play in the arrangements made by one player, cheating, like mismatching, destroys the reality-generating power of the game. (Of course, whereas the mismatching of teams prevents a play world from developing, the discovery that someone is cheating punctures and deflates a world that has already developed.)” (ibid: 130)

Yet another way to engage players and making a game fun to play is to “give players an opportunity to exhibit attributes valued in the wider social world, such as dexterity, strength, knowledge, intelligence, courage, and self-control” (ibid: 130).

Fritz Redl introduces “ego-supporting” functions of successful games suggesting that a game stops being engaging and breaks down when it loses attributes described below (ibid: 132).

A game breaks down when it is not fun any more, that is, when it stops being gratifying for the sake of which people started to play. The gaming time in *Desert Rain* is limited to twenty minutes. During this time people learn how to manage a device, to navigate and carry out a mission in a virtual world. Most players thought the time was too short. Either they did not have time to explore the envi-

ronment or did not find the exit in time. In other words it stopped when the engrossment was at a peak. What visitors might not reflect upon is the learning curve they took part in: search for a solution of a task resulting in discovery, a change from ignorance to knowledge (Aristotle). If the gaming time had been longer people might have discovered all the restrictions and shortcomings within the design.

A game breaks down if it is not safe any more and if there is a danger of loss of self-control. This would happen a couple of times in *Desert Rain*. Some people would just feel uncomfortable with the situation especially in the cubicles and express a feeling “being locked up”, experiencing it too hot, too noisy or just unpleasant and just stepping off the footpad and out of the space. When a game gets too fantastic or comes too close to reality it might break down as well.

“An encounter provides a world for its participants, but the character and stability of this world is intimately related to its selective relationship to the wider one” (Lemnert and Branaman 1997:138). In the *Desert Rain* case the image of the world as well as the engrossment in the game is sustained through the silent agreement among participants.

“The framework of strategic interaction is quite formal; no limit is placed on its application, including the type of payoff involved, as long as the participants are locked in what they perceive as mutual fatefulness and are obliged to take some one of the available, highly structured courses of action. Because of this inclusion of any kind of payoff, the game approach has an easy application to almost everything that is considered under the ill-defined rubric “interaction”. Furthermore, howsoever interaction is defined, the actors involved must be accorded some attributes and given some internal structure and design, and here the propensities of a gamesman will have a place. The strategic approach will therefore always apply in some way; it is important to be clear, the, about the limits of this application” (ibid: 144).

### **Role of Performers and Technicians: invisible ad – hoc helpers.**

While staging *Desert Rain*, Blast Theory enlarged their group of four to five people due to all tasks that has to be carried out. The performers have to be totally attentive during the performance.

Their role vis-à-vis the audience as well as their function shifts throughout the performance. During the first minutes the performer creates a shared sense and under-

standing of the game activity in the virtual world. “As a performer in *Desert Rain*...is the ability to control that, the different groups,...and your ability to subtly change and manipulate that... so that you read and give them an experience that you think they will find most receptive. So the moment you go to the antechamber...So if they all look a bit scared...I will subtly glide you into this...ok I am ready...And if they are a bit punchy... then I play more with fear and the fact that you don’t know what my role is. But you have to respond to them as a group: one is terrified and one is playing the ”leader”, then you have to balance that group”<sup>19</sup>.

At some performance spaces it was cold, humid, and draughty back stage causing cold or sleepiness due to long hours spent in the dark. The more involved members of the audience get the more performers “hand over” the role of acting to participants. Performers step back without loosening the grip of the action. Performers have to interact helping participants as soon as they need it, but without letting participants knowing it.

*Desert Rain* is an exclusive piece of art in terms of amount of staff. Five members of staff for six players, makes it possible “to respond very accurately, in real time, to people’s need. Modifying for each group, slow older ones, fast young kids and so forth”<sup>20</sup>. One performer at the headphones and a technician at the six computers are seated beside each other behind the cubicles and out of sight of the audience. The technician has an overview of the six players’ whereabouts in the 3D world and can at any moment move a player who is stuck without his or her knowledge by pressing a key. The performer at the headphones can overhear every player and is in control of the six channels. Instead of moving a player by pressing a button, a performer could verbally guide a player through a difficult passage, inform whether someone in the group had not found the target and how much time they have left to play (“You have five more minutes to play!”), urge participants to find a lost player and so forth.

### **Interaction from a performer’s perspective: swapping roles with the players**

In an interview with the performers in Rotterdam in November 2001 we discussed the reverse role of audience and performers respectively. “Slowly you don’t feel like

<sup>19</sup> Interview with Jamie Iddon, Blast Theory, Rotterdam, November 4, 2001

<sup>20</sup> Interview with Matt Adams, Blast Theory, at the same occasion



a performer, there are glimpses of performativeness, the role is reversed. I watch six performers or players. Either I am bored by their performance or I'm completely enthralled and stimulated. A reversed situation, a flipped position. Coming up - with the projector light behind you - That's, I think, is a moment when I come up slowly and I'm performing, I walk and I'm performing - and there's a tension - and I'm performing, until I give them the card - and then again I become a function, and I try to do that as a performance. The players are performing rather than us." The initial face-to-face interaction between audience and performers are thoroughly directed from the performers point of view. The performer creates the basis for participation in a game taking place in a virtual world. "Playful" interaction only occur between players / participants.

### **Experience-oriented design**

Collaboration between technicians and artists often seems to be a problem due to lack of communication, clearly defined goals or mutually interesting concepts. Consequently a shared interest is vital in order to make collaboration feasible and meaningful. In this case system designers and artistic designers had a shared interest in exploring the possibilities of a mixed reality boundary as well as of novel forms of interaction between performers and audience. The technical concept and system, a Collaborative Virtual Environment, was artistically useful. The artistic elaboration was useful to the system designers.

As described in chapter four theatre has well acknowledged conventions to create and establish a theatrical situation and a world of fiction. In *Desert Rain* this world of fiction and shared sense is created by the performer's opening phrase. "You're about to enter a virtual world". The enigmatic words invite the audience to be part of a drama or story that will unfold. The impetus of the game is created through increased expectations as traditionally done in the construction of drama. Tasks and goals make collaboration possible and limitations in time make participants focus on a limited amount of stimuli (restrictions in movements, activities and communication). *Desert Rain* is not an ordinary installation in that sense that it allows visitors to walk around as they please. Every step of the trajectory is carefully directed, or designed, so that participatory elements is connected to levels of learning and motivation that in turn make sense of the unfolding story. In theatre (or film) the order of events is vital in order to arouse predetermined feeling or reactions according the director's intention. The transition space between cubicles and sand tunnel is a shocking rapture in sharp contrast to the speed and experience in the former game environment as an indication that "you are now leaving the

virtual world entering the real”. The reality is to be revealed in the hotel room where the six video clips containing interviews with the “targets” are shown.

A performance or art installation are cultural events and leisure time activities and as such the main purpose is to entertain, to communicate something to an audience or arouse feelings of some sort. In other words an artist’s main goal is to mediate an experience whereas utility and applicability are usually the main goals from an HCI point of view. When users are invited to test a new device the aim is to find out whether or not it serves its purpose. As the notion “user” indicates the user is supposed to use something in order to obtain something. When it comes to aesthetics though, experience (feelings) is decisive. The appearance of a technical device or how it feels like to hold is often more important than its usability. In other words aesthetics seem to be the common dominator and a bridge between performance practices and HCI. The task-oriented approach informing HCI may benefit from the “experience -oriented” approach that characterises the work of dramatists and artistic designers.

How is it possible to design interaction involving multiple social roles? What makes co-operation between diverse groups possible? How can one make people agree and find mutual benefits? The use of acknowledged game and theatre conventions may be one way to create common ground between groups of different age and gender and with different social and cultural backgrounds. *Desert Rain* offers different experience for different groups. There is something for everyone. It could be perceived and experienced as game but also as a piece of art, an installation, and / or a political piece conveying critical reflection of media.

In classical drama events are organised in order to constitute a “whole”, by which Aristotle means a beginning, middle and end. The events should have internal coherence and follow one logic sequence from beginning to conclusion. This classical dramatic concept is used in *Desert Rain*: introduction (revealing context), climax (searching for a solution of a task), and finally discovery or change from ignorance to knowledge. The complex set of social interactions and communication is a challenging design problem: interaction with devices, interaction between performer and participant, and communication between participants. Except for multiple relationships with other people props are exchanged, which make sense as a story unfolds. Artists have designed interaction and encounters, the unfolding story and the use of props minutely. Each prop is a key and indicates a dramatic turn. Furthermore they indicate a change of level and way of participation. At the end of the performance participants / members of the audience have the necessary information to understand the overall concept.

## 6 Conclusions and Future Directions

One reason to the successful outcome of the *Desert Rain* event is the process-oriented research and development programme in Nottingham that gives artists R&D time, which in turn make it possible to elaborate an artistic project thoroughly. During a period of almost two years and a half, artists and technicians had time to elaborate and respond to problems that evolved. These problems can concern practical matters as well as matters concerning communication and relationships such as:

- Elaboration and refinement of graphics, such as “undulating” properties of sand dunes or the visualisation of “the hundred thousand”, the estimated figure of people killed in the Gulf War.
- Development of the navigational device and sensors, and maintenance due to heavy wear and tear
- Successive refinement of ways to attend to participants’ needs specifically over the headphones (“Player five turn right to find the exit to the desert”).

Or matters concerning communication and relationships:

- Language. The whole event is performed in English: performers / helpers speak English, texts and interviews are all in English. This is one reason for why participants / visitors attending *Desert Rain* in Karlsruhe and Rotterdam tended to spend shorter time in the hotel room. The six interviewees speak fast conveying quite strong information about their personal experiences related to the Gulf

War. In the cubicles language was less of an issue. Most of the time visitors would attend the performance together with somebody and they could therefore help each other if any problem due to lack of understanding would arise.

Although the political message in many ways ties the performance together the artists did not perceive this fact as a problem. As long as participants “remake” the performance by adding new meaning to props / artefacts and invent ways of communicating and subjects to communicate about in the virtual world artists thought the event successful. And more important, that they experience something good or bad, pleasant or unpleasant is successful from an artists’ point of view.

This approach towards audience / user is possible as long as the purpose with an event is experience oriented rather than utilitarian oriented. The use of dramatic form and structure combines both approaches: it has to be fun but it also has to work practically (navigational devices have to work and graphics have to be legible and so forth).

## **Conclusions on dramatic structure elements**

Conclusions drawn from the studies of the *Desert Rain* performance reveal that using drama as foundation may contribute to interactive design. Participants in a mixed reality environment can accomplish a set of complicated and interrelated tasks if each element is introduced successively and structured as levels of learning. Interaction with devices is facilitated when introduced in an engaging context. A game activity based on conventions, guidelines and rules recognisable to the general public may facilitate the use of technical devices. If participants get involved and made part of a “drama” or “narrative” barriers between user and system can be overcome.

As described in chapter 4 drama can be analysed as based on the following elements

- One basic element in working with interactive art forms is creating common ground,
- The human context: Role-playing and role, developing the role and motivation.
- Dramatic tension focus on tension of the task, relationships, surprise and mystery
- Focus concerns focusing on the action, framing the action

- Place and space: choice of performance space, settings and associations.
- Time (tempo and timing): rhythm, action • reflection, activity – stillness, talk/music /sound – silence. Working with opposites, contradictory moods
- Language: forms of communication, tone of voice, vocal pitch, intonation (different languages)
- Movement: mix of action and reflective stages in the performance, light and sound
- Mood is created through several means; sound of water, smell, humidity, visual appearance and so forth
- Symbols: props, cards, jackets may have symbolic properties attached to them, which allow participants to add new meaning
- Dramatic meaning: the overall context, how everything fits together
- Improvisation: accuracy in meeting participants needs, ad-hoc solutions

A theatrical situation is basically built on relationships and interactions between people creating and sustaining a fictional world. How are these elements created and accomplished / resolved?

- Common ground: facilitating introducing of novel forms of interaction in a known “package” based on well-acknowledged conventions and prior-knowledge
- Creating an engaging environment
- Constraints within time and space:
  - The navigational device, the footpad, is approximately 5 decimetres x 5 decimetres. The small size limits the set of the participant’s movements. A successful handling of the footpad depends partly on the weight of the player, of co-ordination of body-movements and of balance (for children the footpad was changed for a joystick).
  - The headset keeps participants “in place”.
  - Play time is twenty minutes, visit time approx. 30 min.
- Creating a focus, offering a “plot” etc, around which participants can unite
- Significance of rules, guidelines, tasks and goals
- Dramatic turn (emergence of a performer)

## Advice on how this dramatic experience can complement design for HCI

- Create a shared sense through rules and guidelines, shared tasks and goals. Accomplish something together with other people.
- Stimulate relationships between people through communication in real-time and allowing “free scope” for participants to influence the events and the outcome of it.
- Shift focus from task-orientation to experience-orientation
- Create direct engagement through hands – and – feet – on activities. Users could add new functions to props and interfaces and create their own “story” and the outcome of the event.
- Design a variety of activities involving participants at several levels.
- Levels of motivation keep participants engaged and going on looking for answers to enigmas and questions.
- Be aware of the shifting role of the “user” depending on level of participation. The shifting role of the audience is directed by accumulation of understanding and structures of motivation in *Desert Rain*. The way to perform in an installation space is unfolded within an earlier one. Members of the audience gradually get accustomed to a higher degree of participation and involvement through a shared sense of understanding and a common goal. In the *Desert Rain* case participants are will share a common story or drama, execute common tasks and reach a common goal, if they choose to follow these formal instructions.
- Introduce an unfolding story, where it is recognisable how different sections are connected at the end. When leaving the performance members of the audience will have diverse experiences that could be discussed and compared. A “story” may have multiple meanings as opposed to a simplistic “Whodunit” story. A “legacy”, in this case a sandbox, accentuates the ambiguity of the media, which leads to further discussions.

Conclusions drawn from the studies reveal how various forms of interaction, collaboration and participation, may be designed and orchestrated using drama as foundation. Participants in a mixed reality environment can accomplish a set of complicated and interrelated tasks if each element is introduced successively and structured as levels of learning. Interaction with devices is facilitated when introduced in an engaging context. A game activity based on conventions, guidelines and rules recognisable to the general public may facilitate the use of technical devices. If participants get involved and made part of a “drama” or “narrative”, barriers between participant / user and system can be overcome.

## Future Directions

The study of an art - work reveals a number of problems, methodological as well as theoretical. What methods can be used when experiences and emotions are addressed? Is it possible to “design” and orchestrate emotions through the use of dramatic form and structure? In the Introduction I claim that an interactive art - work is more oriented towards experiential matters compared to the HCI perspective where applicability and usability are the major goals. The thesis deals with the utilitarian side of the *Desert Rain* performance as well as with audience perception and reactions. By utility is meant the functionality of the spatial set-up, the graphics and its projections and the navigational device, whereas reactions deal with attribution of new functions and meaning to props and action / activities. Future work could imply hermeneutics that focus on the spectator as the essential player in interactive art as well as phenomenology. The latter deals with the realisation of the fictional world through a spectator providing a deeper understanding of the theatrical event as a phenomenon. Another research question is the phenomenology of the body.

## 7 References

- Aristotle: *Poetics*, translation Kenneth McLeish, Nick Hern Books: London 1998
- Adams M & Row Farr J (1999): *Pushing Mixed Reality Boundaries*.  
In eRENA Deliverable D7b.1, CID, KTH, August 1999
- Bannon L J. (1991): *From Human Factors to Human Actors: The Role of Psychology*. In Design at work, ed. J. Greenbaum, M. Kyng, Lawrence-Erlbaum Associates Hillsdale: New Jersey
- Barker C (1977): *Theatre Games*. Eyre Methuen: London
- Barth R (1977 /1990): *Image. Music. Text*. Fontana Press: London
- Bateson G (1972): *Steps to an ecology of mind*. Ballantine Books: New York
- Benford S (1999): *Pushing Mixed Reality Boundaries*.  
In eRENA Deliverable D7b.1, CID, KTH, August 1999
- Best S & Kellner D (1991): *Postmodern Theory: critical interrogations*.  
Guilford Press: New York
- Bowers J & Rodden T (1993): *Exploding the Interface: Experiences of a CSCW Network*. In proceedings of INTERCHI'93 the conference on Human factors in computing systems. Amsterdam, The Netherlands May 1993
- Bowers J & O'Brien J & Pycock J (1996): *Talk and Embodiment in Collaborative Virtual Environments*. In proceedings of CHI'96, the conference on Human factors in computing systems, Vancouver, Canada April 1996



- Bowers (1999): *Production Tools for Electronic Arenas: Event Management and Content Production*. In eRENA Deliverables D4.3/D4.4  
CID, KTH, August 1999
- Bowers J & Rinman M-L (1999): *An early practical experience and demonstration of using a permeable mixed reality boundary in a performance*. In eRENA Deliverable D7b.1, CID, KTH August 1999
- Bowers J & Rinman M-L (1999): *Art – Work: the Practical Production of Interactive Media Art*. In eRENA Deliverable D6.4,  
CID, KTH August 1999
- Burr V (1995): *An Introduction to Social Constructionism*. Routledge:  
London and New York
- Caillois R (1962): *Man, Play and Games*. Mc Free Press of Glencoe. Inc
- Davies E (1998): *TechGnosis. Myth, magic + mysticism in the age of information*.  
Serpent's Tail
- Ehn, P (1988): *Work Oriented Design of Computer Artefacts*. Arbetslivscentrum  
Stockholm. Chapter 7 and 17
- Fairclough N (1995): *Media Discourse*. Arnold
- Gange J (1998): *Act 4 Art, Technology, Technique*. Pluto Press
- Gibson A (1996): *Towards a postmodern theory of narrative*. Edinburgh  
Edinburgh Univ. Press
- Goetz P (1994): *Interactive Fiction*. Inter°Action#1
- Goffman E (1971): *Frame analysis*. Harvard University Press
- Goffman E (1981): *Forms of talk*. University of Pennsylvania Press
- Goffman E (1997): *Social Life as Game*. In the Goffman Reader ed. by  
Lemert C & Branaman A Blackwell Publishers Ltd
- Goldberg, R (2000): *Laurie Anderson / RoseLee Goldberg*.  
Thames & Hudson: London
- Gross K (1992): *A Dream of a Moving Statue*. Cornell University Press:  
Ithaca, N.Y.
- Hables – Grey C (1997): *Postmodern War*. The Guildford Press Routledge London
- Hall E T (1984): *The Dance of Life*. Garden City, N.Y. Anchor P.
- Hammersley M & Atkinson P (1996): *Ethnography, Principles in Practice*.  
Routledge second ed.
- Huitzinga J (1976): *Nature and Significance of Play as a Culture Phenomenon*  
In *Ritual, Play and Performance*. Ed Schechner, Schuman, Readings in The  
Social Sciences / Theatre, The Seabury Press
- Johnstone K (1989): *Impro. Improvisation and the Theatre*. Methuen Drama
- Jones S G ed. (1994): *CyberSociety : computer-mediated communication  
and community*. Thousand Oaks California Sage

- Jones S G (1997): *Virtual culture : identity and communication in cybersociety*. London SAGE
- Kammersgaard J (1990): *Four different Perspectives on Human-Computer Interaction*. In J. Preece, L. Keller Human Computer Interaction. Prentice Hall: University Press, Cambridge
- Kaprow A (1993): *Essays on the blurring of Art and Life* (edited by Jeff Kelley). Berkeley Univ. of California Press
- Kuutti B & Bannon L (1993): *Searching for unity among diversity: Exploring the "Interface" concept*. Conference proceedings on Human factors in computing systems May 1993 Amsterdam, The Netherlands
- Laurel B (1991, 1993): *Computers as Theatre*. Addison-Wesley Publishing Company, Inc.
- May R (1975): *The Courage to Create* 1965 Bantam Books
- Martin J & Sauter W (1995): *Understanding Theatre – Performance analysis in theory and Practice*. Almquist och Wiksell International, Stockholm
- Murray J (1997): *Hamlet on the Holo-Deck*. MIT Press: Cambridge, Mass.
- Nardi, B (1996): *Context and Consciousness: Activity Theory and Human-Computer Interaction*. MIT Massachusetts.
- Norman D A. & Draper S W (1986): *User Centered System Design. New perspectives on Human – Computer Interaction*. Lawrence Erlbaum Associates, Hillsdale
- Norman S J (1999): *Mixed reality boundaries as a founding principle of theatre*. In eRENA Deliverable D7b.1, CID, KTH Aug 1999
- O'Toole J & Haseman B (1986, 1988): *DRAMAWISE, An introduction to GCSE Drama*. Heineman Educational Publishers
- Piaget J (1962): *Dreams and Imitation in Childhood*. W.W.W. Norton and Company.
- Schechner R (1994): *Performance theory*. Routledge London
- Schechner R & Schuman M ed. (1976): *Ritual, Play and Performance. Readings in The Social Sciences/ Theatre*. A Continuum Book, The Seabury Press, NY
- Staff H & Rinman M-L & Row Farr J & Adams M & Taylor I (2000): *Staged Mixed Reality Performance 'Desert Rain' by Blast Theory*. In eRENA Deliverable D7b.3 CID, KTH August 2000
- Suchman, L (1987): *Plans and Situated Actions: The Problem of Human-Machine Communication*. Cambridge University Press: Cambridge
- Turkle S (1995): *Life on Screen*. New York: Simon and Schuster
- Winnicott, D W (1971): *Playing and Reality*. London Tavistock Publication
- Virilio, Paul (1989): *War and Cinema*. London Verso