MOVING BODIES, SOCIAL SELVES: MOVEMENT-ORIENTED PERSONAS AND SCENARIOS

Lian Loke, Toni Robertson, Tim Mansfield
University of Technology, Sydney
PO Box 123, Broadway, NSW, Australia
lian.loke@uts.edu.au, toni@it.uts.edu.au, timbomb@timbomb.net

ABSTRACT

This paper describes the development of movement-oriented personas and scenarios for representing multiple users of an interactive, immersive environment, designed as an artistic work for a public space. Personas and scenarios were integrated into a user interaction script and linked to a set of movement schemas using Labanotation for group choreography. Enactment of the script within a prototype environment enabled the designers to experience the aesthetic and kinaesthetic qualities of the work, as well as the social interactional aspects of the user experience. This ensured that the experience of those visiting the exhibition was always central to the design process.

KEYWORDS: *enactment, Labanotation, mobility, movement, persona, scenario, social interaction*

1. INTRODUCTION

The development of novel technologies for public use in public spaces signals the shift from work-oriented technology to that where the user experience becomes primary to the design of such systems. This is of particular relevance to artistic works that are now utilising available technologies and expanding the aesthetics of user engagement to include aspects of interactivity and immersion. The design of interactive, immersive spaces intended for public consumption requires re-examination of the accepted user- and use-oriented technology design practices. We undertook this investigation during our involvement with an established collaboration of artists in the design of a multi-user, immersive, interactive environment called "The Bystander Field ". Our motivation was to investigate how the methods, tools and techniques from human-computer interaction (HCI) and related user-centred computing traditions might be made useful in designing the potential interaction and experiential opportunities within these new kinds of environments. The Bystander Field is intended for public use in a museum or art gallery, but it is not 'used' and has no tasks or goals, as traditionally defined in work-oriented settings. In these new public settings the emphasis is on the user experience more than traditional task-oriented use. It was intended that our careful use of user-centred methods in the development of the Bystander Field might reduce the risk of a chaotic user experience. Instead they might foster more meaningful, reflective and satisfying engagements with both the semantic and aesthetic content of the environment.

Specifically, this paper describes the use of movement-oriented personas and scenarios for representing multiple users of an interactive, immersive environment, which utilises the presence and motion of people as input for interaction. We extended the traditional user-centred design tools of personas and scenarios to explicitly address human movement characteristics that are embedded in social interaction. A major concern was to make visible the effects of multiple users on the behaviour of the Bystander Field, and on each other's experience of it. Personas and scenarios were one means of ensuring that this could be explicitly addressed and kept active during the Bystander Field's design and development.

The paper is structured as follows. Section 2 situates the paper, providing background on the Bystander Field , personas and scenarios, and ways of understanding movement and social interaction in galleries and museums. Section 3 describes the evolution of personas and scenarios during the iterative design

process. It describes how the scenarios were synthesised into a user interaction script that was linked to a set of movement schemas in Labanotation that could show the spatial and social interaction of multiple users over time. Section 4 describes how scenario enactment, using the script, enabled the design team to explore, reflect, evaluate and continue to develop the emerging design.

2. BACKGROUND

The Bystander Field is the latest work in *Life After Wartime,* a suite of multimedia artworks created since 1999 by Ross Gibson and Kate Richards, assisted by a production team that has included a graphic designer, a composer and several programmers. All the works in the suite are based on a collection of several thousand photographs, taken by forensic detectives in Sydney, Australia, between 1945 and 1960. These were selected from a much larger archive of crime scene photographs stored at the Justice and Police Museum in Sydney. The photographs are from police files and show crime scenes, places where something potentially illegal, potentially violent, happened to some other living person in the past. The photographs themselves are incredibly seductive, hugely evocative black-and-white images that can easily stand alone as museum and/or gallery artefacts in their own right. One of the primary concerns with the Bystander Field as an interactive, immersive space, was that whatever form the interaction and the interface took, it should not detract from the potential audience engagement with the historical and emotive power of the images themselves.

The Bystander Field is not intended to explicitly encourage or support cooperative behaviour among its audience but the recognition that any user experience of the Bystander Field is social, "constitutively interactive and irremediably situated" (Hemmings et al., 2000) underlies its development. The Bystander Field is designed as a space for living, moving and active bodies to be in, that responds to their presence, their movement and stillness, as they actively make sense of the different images and texts that are displayed to them. It was originally conceived of as a sacred room, inhabited by these haunting images, that were given form as a 'flock of finches'. It was envisaged that the audience sees a flock of white particles that is present in the room with them but also in the spaces 'behind the walls'. The activities of the flock are represented by changes in size, density, detail, position, sound and motion that respond to the presence and activity of the room's current and shifting inhabitants, disturbed by intrusion and inappropriate, 'disrespectful' activities, calmed by stillness and solitude. As the flock moves around, it reveals sets of images and texts. The relationship between the revealed media is more coherent and more narrative when the flock is calm, less coherent and more associative when the flock is disturbed. This changing relationship has been represented as a series of states that the room can be in.

The relationship between audience behaviour and flock/room behaviour is the part of the design that was explored most effectively using a range of user-centred design tools such as mockups, prototypes, user studies, personas and scenarios. Our experience of how these user-centred design tools and techniques fitted into the development process has been reported on elsewhere (Robertson et al., 2004, 2005). It is the development and use of personas and scenarios in the design process of the Bystander Field that we address in this paper.

2.1. Personas and Scenarios

The use of personas and scenarios in technology design has arisen out of a nexus of developments in user-centred design practice from the various perspectives of HCI, computer-supported cooperative work, participatory design and software engineering. Each of these fields has found different ways of using personas and scenarios for varying reasons. Scenarios have traditionally been used in the design of task and work-oriented technology as a means of representing users and the context of use in work situations. They have typically been used for envisioning and simulating future use situations, allowing reflection-in-action and the continuous presence of the users during the design process (Kyng, 1995; Bødker, 1999; Carroll, 2000). More recently, scenarios have been used for exploring situations where the setting is less well-defined and contextual information and awareness are desired such as in mobile and ubiquitous computing (Howard et al., 2002).

Grudin and Pruitt (2002) argued that most scenario-based design focuses predominantly on the context of use, and actually pays little attention to the users themselves. They contend that scenarios can be much

more effective when built on *personas*. Personas can be based on stereotypes or archetypes of human behaviour (Cooper, 1999) or on data collected from real people (Grudin & Pruitt, 2002). Apart from the usual persona descriptions of a user's goals, behaviour and motivation, from the personal, social and work, to the political, we wanted to include descriptions of bodily and movement-oriented characteristics because these form the essential input into the system being designed.

2.2. *Understanding movement and social interaction*

The Bystander Field does not use the gestural aspect of human movement as input because gestural interaction was ultimately seen as detracting from a satisfying user perception and experience of this particular exhibited work. Our understanding of the relevant kinds of human movement was thus directed to patterns of mobility, general body movement and locomotion. Recent studies of human movement by anthropologists indicate a shift from "an observationist view of behaviour to a conception of body movement as dynamically embodied action" in semantically rich spaces (Farnell, 1999). Conceptions of movement range from movement as physical behaviour and motor activity to movement as situated and embodied action. Even though we can more productively think of the moving body involved in acts such as walking, conversing and dancing in a particular place/space/time, when movement is input into technical systems, we still require descriptions of human movement at the physical and functional level. The important thing is to ensure that these descriptions are generated within the context in which they have meaning and can retain their links to real human behaviour throughout the design process.

An important source of understanding how people move and conduct themselves in museums and galleries comes from researchers in interaction and conversation analysis. They have shown that people's experience and perception of an exhibit is fundamentally shaped by and through social interaction with others in the same space (vom Lehn et al., 2001; Heath et al., 2002; Hindmarsh et al., 2005). The aspects of social interaction we applied to our work include how visitors collaborate and coordinate activity; have sensitivity to others' presence and orientation; encourage or discourage participation; continually monitor the environment; and maintain peripheral awareness of and align their activities to the conduct and performance of others, be they companions or strangers.

Thus the kinds of movement that we wished to describe in our scenarios are the patterns and forms of movement and the spatial trajectories as people move through the space and interact or engage with the exhibited material. These patterns and trajectories include aspects of timing, position and orientation that are influenced by social interaction and social protocol, people's aesthetic and emotional engagement with the exhibited work, as well as their response to physical properties of the space. Apart from textual descriptions of the patterns and forms of movement, we wanted a way of representing these visually to support the reflective design practices of the project team, and to facilitate enactment of scripted movement. We examined existing movement notations for this purpose.

2.3. *Labanotation for group choreography*

Various notations exist for documenting human movement. Most have arisen for use in documenting dance choreography and include Labanotation, Benesh and Eshkol-Wachmann (Hutchinson, 1977). Benesh was devised for recording ballet scores, and Eshkol-Wachmann is a system that is not specifically tailored to the human body, whereas Labanotation is suited to describing all forms of human movement. Labanotation is a system of analysing and recording movement, originally devised by Rudolf Laban in the 1920's. There are three essential forms of description - Motif, Effort-Shape and Structural - which focus on the movement characteristics of an *individual* body. Earlier research by Loke et al. (2005) investigated the suitability of the individual descriptive forms of Labanotation as a design tool for movement-based interaction with technology.

In this paper we describe how the part of Labanotation intended for *group* choreography has proved to be extremely useful in the design of the Bystander Field for representing the social and contextual aspects of interaction that influence how and where people move and locate themselves in the space in relation to others. Spatial trajectories can be mapped onto floor plans indicating the position, orientation, direction and path taken through space and time of individual and multiple people. This form of visual

representation also provides a guide, for those enacting scenarios, to the scripted movements and interaction with other people in the space.

3. DEVELOPING MOVEMENT-ORIENTED PERSONAS AND SCENARIOS

Very early in the project we developed a number of personas, related use scenarios and a preliminary script of scenarios over time to represent the expected museum audience and their activities in the room. At this stage no formal user studies had been done and these initial personas and scenarios were developed from interviews with the artists about their impressions of those who visited their own and similar exhibitions in the past. These people were described as "usual museum goers, retired people, school groups, others" (Ross Gibson and Kate Richards interview). The intention was to provide some use-focused tools for the design team "to think with" (Suchman, 1994) that would make the potential visitor's possible experience of the room a driver of the design from the very beginning. These early personas and scenarios made a major contribution to the then newly formed project team in developing a shared understanding of the initial concepts of the project. They were then put aside until user research could ground and guide their redevelopment and further decisions had been made about the scope and direction of the project itself.

3.1. User studies

Two separate studies of audience behaviour in immersive spaces were done. The main study in gallery and museum spaces in Sydney involved several researchers who were at that stage not yet involved in the Bystander Field. A smaller parallel study of similar spaces in Paris was done by one of this paper's authors. Both studies investigated audience behaviour within available examples of cultural/artistic installations that shared one or more qualities with the aims of the Bystander Field. Traditional museums as well as a range of art gallery environments were visited in both cities because it was (correctly) assumed that audience behaviour would vary according to the prevailing social protocols of the particular institutions. The aim of the studies was to provide the design team with a working understanding of potential audience behaviours that could be mapped to whatever behaviour was to be available to the flock of images and texts within the room.

Over a dozen immersive spaces were studied using participant/observation methods for periods ranging between one and three hours at a time. To get some sense of the effects of changing visitor frequency, density and demographics the spaces were visited at different times of day and on different days. There were two strands of investigation. The first was what actually happened in these spaces: who the audience were, how people were inhabiting the exhibition space and what kinds of activities they were doing. The second was the patterns of mobility and motor activity of the visitors to the exhibits.

Six main audience behaviours were identified:

1. *Poke head in and retreat*. Rooms with narrow openings and/or very dark rooms, were either to be avoided or just peeked into briefly.

2. *Walk in, stand for a while and then go out*. These people did not move around the room but entered and stopped. Most remained for between 30 seconds to three minutes depending on what was happening.

3. *Skimming*. These people would cruise (often quite slowly) round the whole room (or gallery) and stop if/when their attention was taken by something.

4. *Try and make something happen*. In this behaviour individuals would either work any obvious input devices that were available or else perform a range of gestures to try and get a response.

5. *Serious, quiet and contemplative engagement*. These people appear to have gone to the exhibit to 'experience' it. They would enter a room, sit down for a while if there were seats, and/or stayed and moved to different and better vantage points over time (between 5 and 20 minutes).

6. *Kids*. Museums and some galleries function as childcare/entertainment and places where people do not have to keep still. Large groups of school children move en mass through spaces.

A particular individual might exhibit a range and various combinations of these behaviours during their visit. For example, a visitor might perform the first three behaviours, as they sample the various exhibits in the wider institution and decide where they will spend their time. They might then shift to serious engagement with a specific work, either alone or in collaboration with others, until it was understood.

These behaviours were common to each of the spaces studied and to both studies. But there was enormous variation in the prevalence of particular kinds of audience behaviour in different spaces, different institutions and at different times. The range of movement that characterised each behaviour provided the range of audience 'input' that the Bystander Field needed to be able to respond to in some kind of coherent and robust way. At the same time a consideration of the effects of the different kinds of audience behaviour provided resources for the designers to consider what those responses might be. The findings from these studies formed the basis of the personas developed and used in the later stages of development.

3.2. Evolving Personas

A series of personas was developed from the main user study to represent the range of visitors to the spaces considered. These were compared to those developed early in the project from interviews with the artists. There were remarkable similarities in the two sets of personas despite those people developing the personas from user research not being aware that the original set existed. The two sets were combined and several extra written that also incorporated findings from the smaller user study. Unlike Cooper's (1999) recommendation of having 3 to 8 different personas for task-related scenarios of use in a work context, we found we needed to develop multiple examples of basic personas to allow us to populate the Bystander Field prototype over time so that different combinations and effects of public use could be investigated. A range of individual 'characters' was created for each persona. Note that these characters were not a return to individual users but were designed to carry the characteristics of the personas through multiple instances within the testing environment.

These persona descriptions evolved from traditional descriptions of user history, skills and goals to include two distinct characteristics specific to the kind of interactive, immersive environment under design: 1) a motivation for why that persona might be interested in the exhibit, either alone or with others; and 2) the movement characteristics that reflected the persona's unique bodily expression and movement styles, and the kinds of movement that this person might perform in a specific situation encountered within this particular setting. An example of a persona and character description is given in Table 1.

Table 1. Persona description

> **Persona** - *Old folks, often go together. Slow-moving, contemplative visitors.*
>
> **Character** - Betty is a retired librarian. She lives in a small house about 20 minutes by train from the middle of the city. When she was first trained she worked in the state library cataloguing bequests from the estates of writers. Once her kids were old enough to go to school she got a job in her local library and worked there for years. She organised the switch from the old card catalogue to the computer catalogue and did all sorts of training courses so she could understand the changes and use the new technology. She bought herself a computer at home and uses email all the time to stay in touch with her friends and family. She is writing a book about her life for her family to keep.
>
> When the weather is nice she gets an all day concession ticket and goes into town. She likes to have lunch by the water and then go to the library, one of the museums and maybe a gallery or two. It is getting harder for her to get around now. She has a bad hip and the city is so busy – everyone is rushing and the traffic is awful. She worries about falling or being knocked over and knows that her eyesight and hearing are not as good as they used to be. Still, she is not ready to give up yet! Sometimes she meets up with her old friend Val who she met at the maternity hospital when they were both having their first babies.

3.3. Scenarios and the user interaction script

Scenarios of each character's movement and activity inside the Bystander Field were developed and then joined together to form a user interaction script that could structure the exploration and evaluations of various models and prototypes over time. The basic script was produced during a design session that involved developing and simulating various scenarios of audience activity and behaviour that were grounded by the observations made during the user studies. A scaled-down model of the room was constructed out of foamboard and cardboard cutouts were made of different characters to make multiple instances of each of the personas. Care was taken to ensure that the full range of audience behaviours we

had observed was captured in the script, as well as different configurations of people in the room so that full functional testing of the system could be done with particular regard to state definitions, boundary cases and transitions between states.

The script was structured so that the audience activity was listed on one side of a table along with what was available to them to sense in the room at the time. On the other side, we defined whatever was actually available for the room to sense and its corresponding behaviour. This approach was directly inspired by the analytic framework Suchman used to identify available conversational resources in her classic study of photocopy use (Suchman, 1987). The matching of audience and system behaviour and perception allowed for the mapping of action and response, where appropriate, from both the user and the system perspectives, as well as making the perceptual asymmetry between the two available. Audience activity was described in terms of position, orientation, direction of movement, degree of movement, spatial paths and configurations within specific scenarios of use. In contrast, the machine's perception of the action, and hence the resources available to it, was limited to detecting presence and motion in the space. It was the interpretation of the audience input data that continued to remain open in the design through several iterations. Presenting the design questions regarding the mapping of audience input to system response within the analytic framework of the user interaction script meant that they could be continually addressed as the design evolved.

A three minute excerpt (see Table 2 and Table 3) from the 40 minute user interaction script illustrates two scenarios. We have presented it here in two separate tables purely for formatting reasons. In practice it is a single table in landscape format, with the *User Perception* and *Machine Perception* columns side-by-side. The *Time* column connects the two tables. Table 2 contains the audience or user perspective and Table 3 contains the room or machine perspective.

Table 2. Audience Perspective - User Interaction Script

Schema	Time (M:S)	Scenario	Activity Movement/Stillness	User Perception
1	01:00	*Slow-moving, contemplative visitors*. Betty and Val enter.	Betty and Val enter room together and stand fairly still looking around with heads turning.	See flock revealing on wall, w2.
2	01:30	*Head-poker*. Young teenager enters, blocked by Betty and Val, so leaves. (see Figure 1)	Young teenager enters room, then exits.	What they see depends on whether or not the room perceives the *head poker*
	02:00	Betty and Val decide to stay and watch more.	Betty and Val walk towards centre.	See flock moving, some images and text unfold.
	02:30 - 04:00	They watch the flock.	Slowly turning to watch flock, taking 1 or 2 steps each way.	See flock moving, more images and text unfold.

Table 3. Room Perspective - User Interaction Script

Time Min:Sec	Machine Perception	Room State	Flock/Sound behaviour	Design Questions
01:00	Detection of 2 figures, some motion.	State 1.	Flock coherent presentation on wall, w2.	What is considered 'still'? Standing still may realistically translate to slow, peaceful, gentle body movements and locomotion within a very small area.
01:30	Ingress of 1 figure.		Flock coherent presentation.	Has this person been detected? May want dead zone at entry.
02:00	Detection of 2 figures moving towards centre.	State change?	Does it change?	Is this sufficient movement to trigger a state shift to state 2?
02:30 - 04:00	Detection of 1-2 figures at centre.		Flock behaviour depends on answers to design questions.	Does position matter to the room?

The first scenario involves Betty (see persona, Table 1) and her friend, Val, entering the space. They represent visitors who are slow-moving and contemplative. When they first enter, they stand just inside the entrance, looking around to watch the flock revealing images and text on the wall opposite. At this point in time, the system should detect two figures and transition to state one, where the flock changes in some way but still coherently presents images and text. The second scenario involves a young teenager attempting to enter the room. But the entrance is blocked by Betty and Val, so the teenager leaves. The question arises, for the designers, as to whether the young teenager (persona - a "head-poker") is detected and registered by the system as a presence that will affect the subsequent behaviour of the system. Then Betty and Val walk towards the centre of the room and remain there for a couple of minutes, slowly surveying the exhibited material, turning and moving around occasionally. The system remains in state one, with the flock moving dynamically around the five walls of the space and coherently revealing images and text. The description of the characters' movement in space and time is represented visually in movement schema 2 (see Figure 1).

3.4. *Movement schemas*

At the same time as the script was developed, an augmented set of Labanotation intended for group choreography (Hutchinson, 1977) was used to describe a set of movement schemas. Figure 1 and Figure 2 are examples of such a schema, drawn from a set of twenty-one. These were developed to illustrate the changing spatial configurations and trajectories of the users during the scenarios. They provided an easily learnt, at-a-glance view of the overall activity in the room in terms of the path, position, orientation and movement of multiple users in space and time. By matching these schemas to the script it was possible to map the movements of individual characters both within the Bystander Field and in relation to other characters participating in the experience with them. This enabled us to ensure that the interaction with others that has been identified as defining of user experience of interactive art works (e.g., vom Lehn et al., 2001; Heath et al., 2002; Hindmarsh et al., 2005), was represented within this design tool. Most importantly it provided us with a way to represent findings from the user studies so these could be used to drive the enactment and evaluation of the developing Bystander Field.
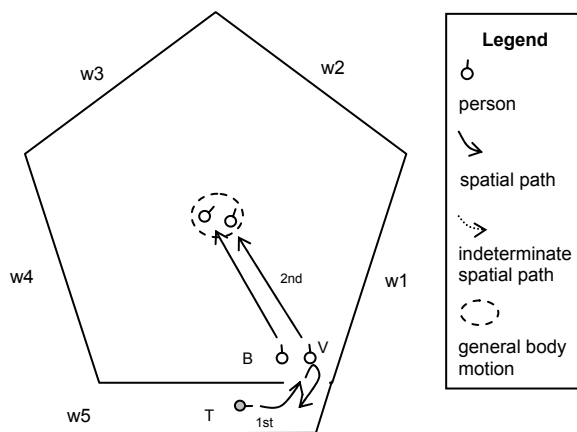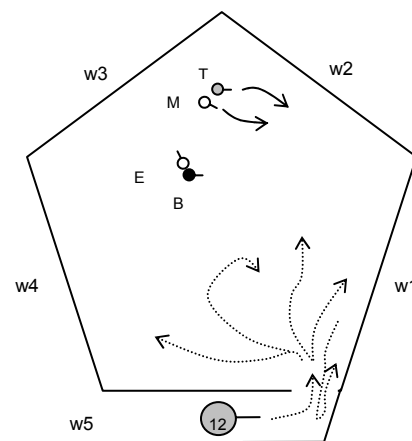

Figure 1. Movement schema 2

Figure 2. Movement schema showing group entering

The movement schema in Figure 2 illustrates a group of people entering: A group of 12 schoolchildren (represented by the big grey pin with the number 12) enter the room over a period of 60 seconds and disperse throughout, some exiting and re-entering. The characters, Elena and Bob (derived from the same personas as Betty and Val; represented by the white pin labelled 'E' and the black pin labelled 'B') remain where they are, facing away from each other. A mother and toddler (the white pin labelled 'M' and the grey pin labelled 'T') move around the periphery of wall, w2. Note these figures were tied to specific scenarios and characters in the script. This schema illustrates a scenario where many people with lots of

activity are present in the room. It is interesting in that once relatively large numbers of people are in the room, their exact position and path become less significant to the system as it becomes progressively harder to distinguish individual movements. As a result, indeterminate paths representing one or more people can be shown on the schema.

We found we needed to augment the standard Labanotation symbols with a few of our own to enable us to represent, for example, undifferentiated body movement or 'motion' within a bounded area (see the dashed circle in Figure 1), and indeterminate trajectories (see the dotted spatial path in Figure 2). This was important firstly because the authors of the Bystander Field wanted audience presence and stillness to encourage revelation of the content, whereas activity and motion would result in less coherent and more turbulent presentation of the content. Body movements (be they gestures, postural shifts or locomotion, etc.) were treated as motion in the room: a source of disturbance. This raised the question of what constitutes 'stillness' in interactive spaces as people are rarely ever completely still in these environments. User studies also found that stillness can sometimes be associated with a lack of engagement, when for example, people are ignoring the exhibited work to talk to each other about something else. We needed an understanding of stillness that was defined in relation to people's experience of the content and behaviour of the room. Secondly, the sensitivity of the input system was such that it was oblivious to the exact nature of any movement in the room. We did not always need to be specific about the path taken by a particular person. More important was the fact that they were moving to some degree within some spatial bounds. During enactment, the person was free to improvise this movement, according to the context provided by that person's character and scenario. Given this rule of thumb, scenarios with many people can be depicted more roughly, as the need for precision lessens (see Figure 2).

4.   LIVED EXPERIENCE: ENACTMENT AND ROLE-PLAY

Ideally we would have liked to have had a permanent test room set up during the development of the Bystander Field, so that continuous prototyping and user testing could be carried out with a full-scale system. As this was not possible, a temporary test room was established on a few occasions for the working prototype in its exhibition format. The actual form of the test room evolved over several iterations of testing. Initially the pentagon-shaped test room consisted of three contiguous curtained walls; the other two walls and the entry to the room were marked on the floor with masking tape. The visual display consisted solely of a circling flock with no photographic images or text. There was also no sound linked to anything that was happening within the room. In later testing sessions, the test room became more like the final form of the environment with full image, text and sound content. Each iteration of testing was thus focused on the aspects of user experience that were possible to observe and experience in the current form of the prototype environment. The user interaction script was used to drive the user testing. For each testing session, a group of people representing the users was required to act out the user interaction script. These people included members of the design team and people outside the design team that were typical of the expected audience. Participants were provided with the user interaction script and the set of linked movement schemas that described a sequence of scenarios over a 40 minute period. Characters were allotted to each participant and they were briefed on the purpose of the script, their roles in playing out the script and how to follow the movement schemas. During actual enactment, the participants were directed through the script.

The interaction script and its accompanying movement schemas were intended to enable the design team to experience aspects of the work that had not been possible until they could immerse themselves in the piece. Until this point, much of the design conversation about the nature of the interaction between different members of the audience and between the audience and the room had been speculative and ungrounded. The first enactment had as its second aim the development of some sense of audience 'stress testing' that those building the system could use to ensure the system did not break down if too many people and/or too few people and/or too much movement and/or too little movement was in the room at any particular time.

Later versions of the user interaction script were developed to support the design team's understandings of other aspects of the design such as audience movements in response to different experiences of the aesthetic content of the room. Once the scenarios in the script were well established, video capture of

scenario enactment could then provide a source of audience input data, from which the mapping of audience behaviour to system behaviour could be drawn.

4.1. *Physical and social aspects of user experience*

The first scenario enactment provided the design team with an extraordinarily strong sense of the physical and social aspects of the audience experience. The use of different personas helped members of the design team to elicit different experiences of the work and physical space. One member expressed that her experience as various personas generated interest for her in the content in different ways. As another member articulated, "The scenarios brought very strong ideas and intuitions about user experience ... some surprising revelations from being in a role and being in a scenario". The influence of other people's presence and activity in the room on an individual audience member's experience and perception of the work was made evident (vom Lehn et al., 2001). It was clear that for an individual to experience all aspects of the work, it might not be possible without the presence of several other people (Hindmarsh et al., 2005). For example, it may only be possible for a quiet and attentive couple to witness the full extent of the work when a group of hyperactive children enter. This meant that audience understandings about how the interactivity of the room 'worked' could be only loosely tied to the experience of participating in whatever the current behaviour of the room actually was. It also meant that the design team needed to think in terms of a range of 'satisfying' experiences for various configurations of people in the room.

Different people had quite different experiences regarding how and where they wanted to move or position themselves in the space. There was a tension between moving into the centre and moving to the periphery or corners. This pattern of movement was influenced by several factors such as moving to a position to gain a wider field of view; moving backwards to keep the visuals in front; following the flock by moving or watching; the sense of scale and physical shape of the room; the presence, position and behaviour of other people in the space and corresponding accommodation or sensitivity; the social interaction between companions and strangers; and actively engaging with the images and text.

4.2. *Lived experience for design reflection*

This lived experience of immersion in a working prototype by the design team resulted in a refinement of our shared understandings of the specific interactive nature of the Bystander Field. A number of issues regarding the design could be more fully explored and understood. For example, the user studies had found that activity around the entrance to the space needed to be addressed separately to the rest of the space. This was because some gallery goers could just peek in or enter only briefly and then leave again. There were design questions that needed to be asked about what actually counted as presence in the space itself. The working assumption had always allowed for sensors to be placed at the entrance but these were dropped completely after the scenario enactment on the basis that entry clearly did not equate with presence and presence could be more appropriately sensed by other means.

The timing of the script was improvised over several enactments. There were indications of timing in the script. However, at this stage we deliberately kept timing loose because we were still asking design questions about it. For example, what was the optimal timing of the transitions between room states so that it was noticeable to users? When should the room transition to another state? These kinds of questions regarding time could only be properly answered during enactment when we could fine-tune the 'performance' of the work in relation to an ever-changing and participating audience.

One of the most interesting results of the first scenario enactment session is that during all further testing using the test room all members of the design team, who were not actually driving the session, moved into the test room itself. Prior to the enactment some members of the team had sat with those driving the tests or in some other position outside the room looking in. After the enactment, it was assumed that the testing was best experienced directly rather than observed from the outside.

5.   CONCLUSION

Our two core concerns in this project are, firstly, how we as technologists concerned with user-centred design might best assist with the design of interactive, immersive environments, and secondly, how our

design tools and techniques need to be extended to make them useful and usable in these novel design contexts. We have described the development of movement-oriented personas and scenarios for representing multiple users of an interactive, immersive environment, the Bystander Field. The enactment of the user interaction script within a prototype environment enabled the design team to experience the aesthetic and kinaesthetic qualities of the work, as well as the social interactional aspects of the user experience.

The use of scenarios, personas, immersion and enactment revealed crucial aspects of the emerging design in ways that enabled them to be reflected on and used to build robust shared understandings among the designers. They functioned as "tools to think with" (Suchman, 1994) to enable the design team to test, reflect and refocus their decisions throughout the design process. Most importantly, the use of personas and scenarios as design tools ensured that the experience of those visiting the exhibition was always central to the design process and that design decisions were always accountable, in a range of ways, to user experience of still emerging and novel technologies.

6. REFERENCES

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7. ACKNOWLEDGEMENTS