

Chapter 6

Project II. Bystander

This project provides a case study of the design of *Bystander*, an interactive, immersive artwork built on video-based, motion-sensing technology. *Bystander* is a form of interactive, immersive environment that presents complex data through visual imagery, text and sound and utilises human presence and movement as input. The design of interactive, immersive spaces, such as *Bystander*, intended to be available to the public in gallery and museum settings, poses interesting, new challenges to the accepted practices of user- and use-oriented technology design. Existing methods, tools and techniques for representing users and situations of use need to be extended and new ones developed to explicitly consider the experiential, moving body (or bodies) in these kinds of interactive, immersive spaces.

It should be noted that our scope of design was limited to the exploration and application of user-centred design methods and tools. The overall design of the system was in the hands of the artists. They controlled the development process and were ultimately responsible for making design decisions across the board. Our experience of how these user-centred design methods and tools fitted into the development process has been reported on elsewhere (Robertson et al., 2004, 2006). Here, I specifically report on the extension of the traditional design tools of personas and scenarios to explicitly address human movement characteristics embedded in social interaction, resulting in *movement-oriented* personas and scenarios. In addition, a set of corre-

sponding *movement schemas* in Labanotation was constructed to visually represent the spatial and social interaction of multiple users over time. Together these three design representations of moving bodies enabled the design team to work with the aspects of human movement relevant to Bystander and ensured that the user concerns were explicitly addressed and kept active throughout the evolving design. These three design representations of moving bodies were also integrated into another design tool, termed the *interactivity table*. It is an adaptation of Suchman's (1987) analytic framework, which enabled the exploration, interrogation and evaluation of the interaction between the audience members and the system. The choice of research methods has been explained in Chapter 4.

6.1 Overview of Bystander

In this section, the history, concept and final implementation of Bystander is recounted to provide a setting for the development and use of the user-centred design methods and tools. Bystander is the latest work in *Life After Wartime*, a suite of multimedia artworks produced by Ross Gibson and Kate Richards since 1999. 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 and the file envelopes are all that are left from the original police files; the associated detective notes are no longer in existence. Gibson and Richards have intensively researched and organised the archive over some years, using a range of techniques to recognise existing patterns in the archive and to create new ones that, in Gibson's own words, "can add new meanings and moods that have the power of fictions but are historically founded" (Ross Gibson, interview). The photographs themselves are incredibly seductive, hugely evocative black-and-white images that can easily stand alone as museum or gallery artefacts in their own right (see Fig-



Figure 6.1 Photograph from archive of crime scenes

ure 6.1 for an example of a photograph). They evoke questions in those who view them such as “what happened here?”, “who is that person?” and “what have they done?” In addition, Gibson has contributed approximately 1500 original short haiku and prosaic texts to the ‘raw material’ for the Bystander project.

Bystander is designed as an immersive interface to this collection of images and texts. The artists’ concept for Bystander was of a *sacred room* for witnessing the fragments of past lives depicted in the images from crime scenes of Sydney in the period post-second world war. One of the primary concerns with Bystander as an interactive, immersive space, was that whatever form the interactivity and the interface took, it should not detract from the potential audience engagement with the historical and emotive power of the images themselves. Early prototyping and user testing suggested that gestural interaction could potentially detract from a satisfying user experience of this particular exhibited work and therefore, a simple treatment of human movement to be used as input would better support the experiential aims of the work. Ideas such as mapping a person’s proximity, position, focus or gesture to individual elements of the work (a single image or text haiku, for example) were seen as over-complicating the interaction and rejected. Ul-

timately the choice of position, proximity, mass/density and motion/stillness as inputs and the treatment of these inputs reflected the importance given to an individual's ability to engage contemplatively with the work and the need to accommodate a fluctuating and unpredictable number of multiple users in the space.

The artists' concept for the audience interactivity with the room was based on cultivating a contemplative audience engagement with a *spirit-world* of images, texts and sounds. They wanted a work where a quiet, attentive attitude from the audience would be rewarded with a greater divulgence of coherently related content. Restlessness and increased physical activity by the audience would result in the room sensing this lack of respectful contemplation and responding by becoming more chaotic in terms of the atmosphere created by the presented content. The relationship between the revealed media content is more coherent and more narrative when the audience is calm and attentive, less coherent and more associative when the audience is restless and physically active. In Gibson's words:

The room will behave as if it is hyper-sensitive and 'haunted'. The more agitated the visitors, the more turbulent the artwork. Visitors will learn that they must be composed and attentively still in order to gain the 'trust' of the space, and from there they can develop a 'dance' of intimacy with the images, sounds and texts that surge and retreat in concert with the movement of the people inspecting the space. (Gibson and Robertson, 2002)

The conception of movement in this system was initially one where the patterns of motion and stillness of the visitors are interpreted as indicative of the level of audience engagement with the interactive artwork. Increased motion and physical activity is taken as a gauge of less attentive audience engagement. A quiet and physically still composure is interpreted as a highly attentive audience engagement. This was the original assumption. In practice it was not quite so straightforward. Notions of stillness had to be teased out.

The final model of the system behaviour was conceived as a 'world' with its own logic that is inhabited by media content (images, prosaic texts, haiku

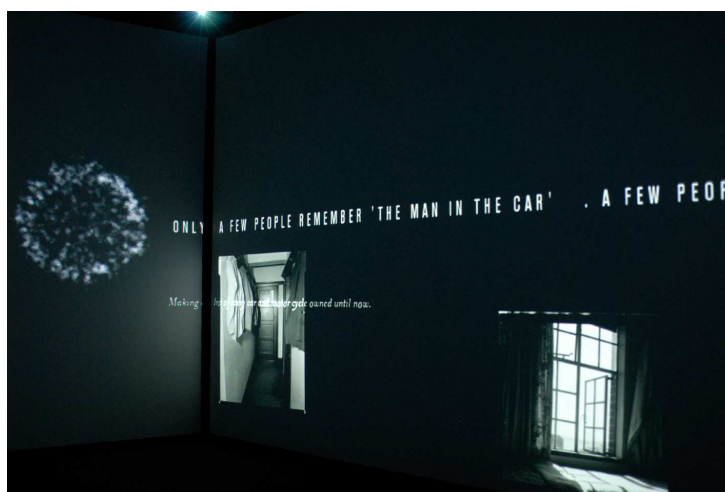


Figure 6.2 Image of Bystander visuals showing the flock, images and text haikus

texts, sound) and a dynamic, visual element called the *flock*. The flock is a particle animation and consists of an orb-like collection of shimmering, white particles that circles the walls of the room and echoes the state of the system. In its wake, a set of images and texts appears at key moments in the cycle of system behaviour (see Figure 6.2).

The design of the ‘world’ behaviours, rules and states was outside our scope of design and was handled by the artists and a software developer. To assist comprehension of the relationship between user activity and system behaviour, the mapping between user activity and system states is presented in Figure 6.3. The world can be in four states. The state of the system is dependent upon the presence and activity of audience members. This in turn, directs how the media content is presented in terms of size, density, detail, position, sound and motion. The world behaviour can be controlled and fine-tuned through a separate interface which provides access to the parameters relating input of audience activity to the system response.

Physically, the installation is a pentagon-shaped room of front-projected 4.5 metre by 3.4 metre video screens. Audience members enter through one corner of the pentagon. Audience movement is sensed using an infrared video camera mounted above the top of the screens in the centre of the room and pointed vertically downward. Sound is delivered by a 5.1 channel sound sys-

| System input + processing of user activity via overhead infrared video camera | Room state |
|---|---|
| No people present. | 0 – Resting: When the room is empty without visitors, it is at its most divulgent in terms of content. |
| Tracking audience position, density, distribution and movement to determine room state. Minimal motion detected. Most people standing quietly. | 1 – Composed: Visitors have found how to be attentive, still and reverent. The audiovisual output is highly related and narratively coherent. For example, pictures from the same crime are displayed. |
| Tracking audience position, density, distribution and movement to determine room state. Some motion detected as people walk around room and enter/exit. Some people standing quietly. | 2 – Semi-disturbed: Nervousness has been introduced, the mid-point between calm and panic. Some disassociation between displayed content. |
| Tracking audience position, density, distribution and movement to determine room state. Lots of motion. Excess number of people for system's threshold. | 3 – Chaotic. Very disturbed, unbalanced and freaked out. This is reflected in the audiovisual output. The flock is berserk. Only prosaic and haiku texts are displayed; no images. |

Figure 6.3 Mapping of user activity to system states

tem. All computing hardware is of fairly standard commodity specifications due to the need for the system to be portable and able to be mounted in a range of gallery and museum environments.

6.2 Understanding and representing moving bodies

This section describes how we represented the expected audience and their activities in the Bystander room. Traditional design representations of personas and scenarios were tailored to reflect the focus on human movement, given that audience activity and movement were direct input to the system. The rationale for using personas and scenarios is given in section 2.4.3. In this project they played an important role in design communication. They are a lightweight, yet very powerful technique, easily inserted into a process that is otherwise not user-centred. The *movement-oriented personas* and *movement-oriented scenarios* were grounded in data from user studies of visitors in similar immersive spaces in museums and galleries. The scenarios were organised into a *user activity script* for enactment during user testing and evaluation. A set of *movement schemas* was constructed in Labanotation to visually represent the movement and spatial trajectories of the audience activity. Care was taken to ensure these representations of moving bodies were generated within the context in which they had meaning and could retain their links to real human behaviour throughout the design process. A selection of personas, scenarios, movement schemas and the user activity script will be presented to illustrate how the various design representations were produced and how they were used in relation to each other. The details of the interaction between the audience members and the system was explored using another design tool, based on Suchman's (1987) analytic framework, described in section 6.2.5.

6.2.1 User studies

User studies were conducted by other researchers working on the project. I briefly summarise their work here, as it forms the basis for the construction of personas and scenarios. Two separate studies of audience behaviour in immersive spaces were done to ground the development of personas and scenarios in understandings of actual audience behaviour. The main study in gallery and museum spaces in Sydney involved several researchers who were at that stage not yet involved in Bystander (Kan, Robertson, Muller, and Sadler, 2005). A smaller parallel study of similar spaces in Paris was done by Toni Robertson. Both studies investigated audience behaviour within available examples of cultural/artistic installations that shared one or more qualities with the aims of Bystander. 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 the behaviour of the system.

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 and are presented below.

1. *Poke head in and retreat.* Rooms with narrow openings were often 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) around the whole room (or gallery) and stop if/when their attention was taken by something.
4. *Try to make something happen*. 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. *Children*. Museums and some galleries function as childcare/entertainment places where people do not have to keep still. Large groups of school children move *en masse* through spaces.

A particular individual might exhibit 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.

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 Bystander 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 (in this case, decisions were ultimately made by the artists) to consider what those responses might be. The findings from these studies formed the basis of the personas and scenarios developed and used in the later stages of development.

An important source of understanding how people move and conduct themselves in museums and galleries comes from researchers in interaction and conversation analysis (Lehn et al., 2001; Heath et al., 2002; Hindmarsh et al., 2005) and museum visitor studies (Fernández and Benlloch, 2000). 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. The aspects of social interaction we found relevant 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.

6.2.2 Movement-oriented personas and characters

Development of personas and scenarios was undertaken bearing in mind the importance of sufficiently situating the representations of users and their activities within the experience of the particular kind of technology that was being built (Bødker, 2000). A series of personas was derived from the understandings of audience behaviours gathered in the user studies, to represent the range of visitors to Bystander. Unlike Cooper’s (1999) recommendation of having three to eight different personas for task-related scenarios of use in a work context, we found we needed to develop multiple instances of basic personas to allow us to populate the Bystander prototype over time so that different combinations and effects of public use could be investigated. For this purpose, a range of individual ‘characters’ was created from each persona.

Our persona descriptions extended traditional descriptions of user history, skills and goals to include two distinct characteristics specific to the kind of interactive, immersive space under design: (1) a motivation for why that persona might be interested in the exhibit, either alone or with others and (2) the particular ways of moving for that persona that arise out of the interaction between their unique physical characteristics and modes of being, the setting

Persona - *Old folk, 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.

Figure 6.4 Example of a persona—old folk

Persona - *Young mother and toddler.*

Character - Sarah, the young mother, often takes her young child to art galleries as she finds them a great place with lots of space for young children. Sometimes she goes with other friends and their small children. They usually spend half the day at the gallery, visiting various exhibits, having lunch and letting the children roam around. When visiting an exhibit, she either finds herself being dragged around by her toddler or if the child is sleepy, carrying the child or pushing a pram around. When the child is sleepy she is better able to enjoy and appreciate the exhibited work. If seating is available inside the exhibit, she might sit down and rest. If an exhibit has loud or frightening music, then they often have to leave as the child finds it too much. It is difficult for her to properly engage with any of the new interactive works, so she usually skims through or stays to watch someone else interacting.

Figure 6.5 Example of a persona—young mother and toddler

of the environment, the prevailing social protocols and the nature of the exhibited work. A selection of movement-oriented personas and characters is presented in Figure 6.4 and Figure 6.5, that demonstrate the inclusion of these two characteristics. The comprehensive set of personas and characters used in this study can be found in Robertson, Loke, Kan, Muller, and Sadler (2005).

Particular kinds of bodies give rise to particular ways of moving. Some of the persona descriptions contain references to *physical characteristics* that give rise to particular ways of moving. For example, the first persona, Betty

has a bad hip and poor eyesight (see Figure 6.4). These particular physical characteristics may translate to Betty moving slowly and carefully, resting often and taking time to focus and look at the things around her. The details of how she might move are not given, only an indirect indication of the *way she might move*. The specification of *props*, *apparatus* or *relationship to another person* can influence the way a person might move in these kinds of immersive spaces. One example is the persona of the young mother, Sarah and her toddler (see Figure 6.5). Her movements are defined and shaped to some extent by the toddler and the pram. These constraints on her movement may lead to Sarah navigating through the space quite slowly, pausing often, rocking the pram or moving about holding the toddler by the hand. These two examples show different ways of including cues for movement-oriented characteristics of personas that can be linked to various audience behaviours and elaborated in scenario descriptions of audience activity. This form of description facilitates enactment and generation of the relevant kinds of movement and mobility for the system under design.

6.2.3 Movement-oriented scenarios and scripts

Scenarios of each character's movement and activity inside Bystander were developed and then joined together to form a *user activity 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 cut-outs were made of different characters to make multiple instances of each of the personas (see Figure 6.6). Care was taken to ensure that the full range of audience behaviours observed in the user studies 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. A synopsis of the selected characters and scenarios is presented below.



Figure 6.6 Making a scaled-down model of room and cardboard characters during development of scenarios

The scenarios are built on a combination of audience behaviours, movement trajectories, positions of stillness and spatial configurations of people, with characters taking on the range of audience behaviours. Scenarios contain a set of key events which highlight aspects of the design that are of interest or issue, much like Burns et al. (1994)'s performance scripts containing event sequences.

First scenario. This scenario explores the situation where a couple of people enter the Bystander room, which is currently empty. The characters, Val and Betty, are representative of older, retired people with a keen interest in the arts. They embody the fifth type of audience behaviour—*serious, quiet and contemplative engagement*. They enter the space and stand just inside the entry. A key event then occurs where a teenager attempts to enter the room but is blocked by Val and Betty. The teenager embodies the first type of audience behaviour, the *head-poker*. After the head-poker leaves, Val and Betty commence moving around the space, firstly towards the centre of the room and then towards one of the walls. They tend to move slowly with periods of stillness, as they observe the flock circling the room, revealing sets of images and texts. They chat and occasionally point things out to each other.

Second scenario. This scenario is concerned with the fourth type of audience behaviour—*try and make something happen*, embodied in the character of Luke. He is interested in working out the interactivity of the exhibit and does this by exploring the space, moving about and gesturing, while looking for some kind of response from the system to his actions. Betty and Val are standing near a wall, looking at the far walls. They eventually join Luke near the centre of the room and engage him in conversation, as they are curious as to what he is doing and whether he has discovered anything about the exhibit that they haven't.

Third scenario. This scenario explores the impact of a large group of noisy schoolchildren arriving in the space. Prior to their arrival, a middle-aged couple, Bob and Elena, are present in the space. A young mother, Sarah and her toddler enter the space. The toddler drags the mother around the outer perimeter of the space. Then a key event occurs with the arrival of a

group of active, noisy schoolchildren. They run around all over the room, some of them exiting and re-entering the space. Finally everyone leaves except for Bob and Elena. The audience behaviours captured in this scenario include the second, third and sixth types. Bob and Elena embody the second type—*walk in, stand for a while and then go out*—as their movement and trajectory is limited to entering and moving to the centre of the room and remaining there until the crowd leaves. The young mother and toddler embody the third type—*skimming*. The group of schoolchildren embodies the sixth type—*children*.

The user activity script was refined during the project, as the design evolved and user testing was conducted. For the first user testing session, a forty minute script was developed. Segments of the script were revised after the testing session and a few more scenarios were created to address specific issues and areas of the design. A sample of the script is presented in Figure 6.7. It links the scenarios to the movement schemas and details the timing and directions for movement activity, positioning, orientation and spatial paths of the characters.

6.2.4 Movement schemas in Labanotation

At the same time as the user activity script was developed, a set of movement schemas was constructed to illustrate the changing spatial configurations and trajectories of the users during the scenarios. The movement schema diagrams were drawn using Labanotation floorplans devised for group choreography (Hutchinson, 1977), as introduced in section 3.4.2. They provide 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. The use of Labanotation floorplans provides the same visual perspective on the movements of the audience as the viewpoint of audience activity for the system from the aerial view provided by the overhead infrared video camera.

By matching these schemas to the script of scenarios it was possible to map the movements of individual characters both within Bystander and in

| Time Min:Sec | Scenario and Key Events | Activity: Movement/Stillness | Spatiality: Path/Position/Orientation | Schema |
|-------------------|--|---|--|--------|
| Scenario 1 | | | | |
| 01:00 | <i>Slow-moving, contemplative visitors.</i> Betty and Val about to enter empty room. | Betty and Val enter room together and stand fairly still looking around with heads turning. | Stand just inside entrance. | 1 |
| 01:30 | <i>Head-poker.</i> Young teenager enters, blocked by Betty and Val, so leaves. | Young teenager enters room, then exits. | Just inside entrance. | 2 |
| 02:00 | Betty and Val decide to stay and watch more. | Betty and Val walk towards centre. | Straight path towards centre. | |
| 02:30 - 04:00 | They watch the flock. | Slowly turning to watch flock, taking 1 or 2 steps each way. | Stand in centre facing wall w2. | |
| Scenario 3 | | | | |
| 0:33:00 | <i>Slow-moving, contemplative visitors.</i> Bob and Elena arrive. | Bob and Elena walk straight to centre. | Straight path towards centre. | 14 |
| 0:34:00 | <i>Skimmers.</i> Mother and toddler enter. | Mother and toddler enter, holding hands. Toddler runs around pulling the mother around. | Path around perimeter. | 15 |
| 0:35:00 | <i>Children.</i> Group of 12 young school children arrive. | Lots of motion everywhere! | Constantly changing paths. | 16 |
| | Exit and re-entry of some children. | Running in and out of entrance. | Paths in and out of entrance. | |
| 0:36:00 | Mother and toddler leave. School group leave. | People moving towards entrance. | Many paths towards entrance. | 17 |

Figure 6.7 Excerpt from the user activity script for scenarios 1 and 3. Note that movement schema 2 is in Figure 6.8, movement schema 15 is in Figure 6.9 and movement schema 16 is in Figure 6.10.

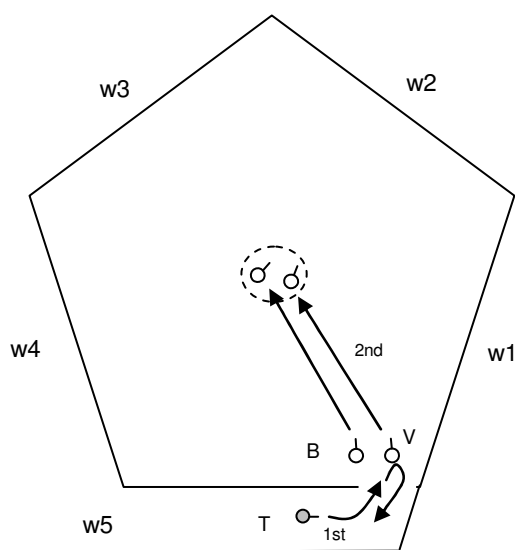


Figure 6.8 Movement schema 2 showing a head-poker

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, previously described in section 6.2.1, was represented within this design tool. Most importantly the movement schemas provided us with a way to visually represent findings from the user studies so these could be used to drive the testing and evaluation of the developing Bystander system. The movement schemas also assisted with enactment of the script as they provided visual markings of the spatial and social interaction between visitors, complementing the textual descriptions of the scenarios.

Figure 6.8, Figure 6.9 and Figure 6.10 are examples of such schemas, drawn from a set of twenty one. Refer to the legend in Figure 6.11 for an explanation of the notation symbols used here. The movement schema in Figure 6.8 corresponds to the part of the first scenario where a head-poker attempts to enter the room. The spatial trajectories have been numbered to show time sequential phrases of movement. In the first temporal phrase, the teenager (represented by the grey pin labelled T) attempts to enter the room but is blocked by Betty and Val (represented by the two white pins labelled B and V respectively), who are standing just inside the entrance. In the

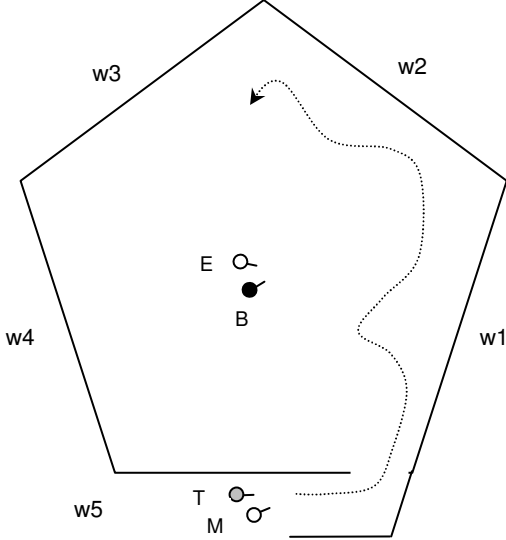


Figure 6.9 Movement schema 15 showing skimmers

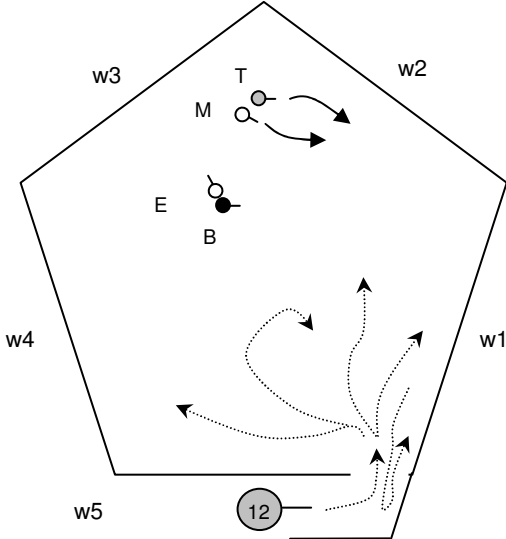


Figure 6.10 Movement schema 16 showing a group of children entering

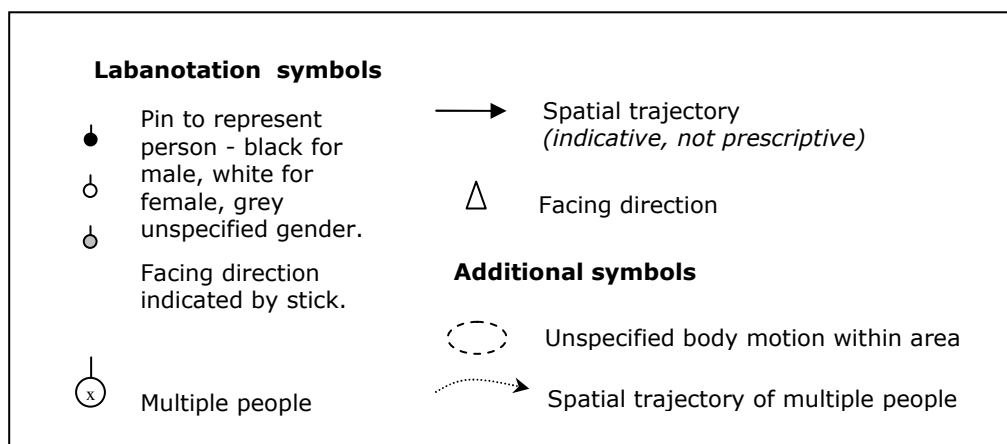


Figure 6.11 Legend for Labanotation symbols

second temporal phrase, Betty and Val move towards the centre of the room and stand there facing wall, w2. The dashed zone around them indicates that they are not standing completely still, but move around a little and talk to each other within a small area.

The movement schema in Figure 6.9 corresponds to the first part of the third scenario where a mother and toddler enter the room and proceed to skim around the edges. The room is already inhabited by the two characters, Elena and Bob (represented by the white pin labelled E and the black pin labelled B), standing near the centre of the room, facing walls w1 and w2. The mother and toddler (the white pin labelled M and the grey pin labelled T) enter the room and move around the periphery near the walls, w1 and w2.

The movement schema in Figure 6.10 corresponds to the second part of the third scenario where many people with lots of activity are present in the room. 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 (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 near wall, w2. It is interesting to note that once relatively large

numbers of people are in the room, their exact position and path becomes less significant to the system which is tracking the density, distribution and motion of people, rather than following their individual trajectories. As a result, indeterminate paths representing one or more people can be shown on the schema.

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 ellipse in Figure 6.8) and multiple people moving (see the dashed line of the trajectory in Figure 6.10). This was important firstly because the artistic authors of *Bystander* wanted audience presence and stillness to encourage revelation of the content and increased activity and motion to 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. Secondly, the designed 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 way a particular person moved their body. More relevant, was the fact that they were moving to some degree within some spatial bounds. During enactment, the person was free to improvise this movement, within the structure provided by that person's character and scenario. Given this rule of thumb, scenarios with many people can be depicted more roughly in a schema, as the need for precision lessens.

6.2.5 Suchman's analytic framework as a design tool

The design tools discussed so far—movement-oriented personas, movement-oriented scenarios, user activity script and movement schemas—were then linked together through another design representation, termed the *interactivity table*. It presented the script of scenarios of audience activity alongside the corresponding machine behaviour, so we could systematically examine the design of the interactivity.

We adapted Suchman's analytic framework to fit our particular design

context, as follows. In Suchman's original framework (see Figure 2.1), the interaction between the user(s) and the machine is framed in terms of the resources available, or not, to either side. We followed the principle used by Suchman of presenting the actions and available perceptual resources for both human user and machine, but in a slightly different fashion, one more suitable for the purposes of exploring and mapping the interactivity between users and machine when human movement is direct input.

One of the drivers for the way the table was organised was related to the nature of the input data. A single overhead video camera was selected as the sole input device. The input to the system is a raw video stream of an overhead view of the room. This raw video stream can be processed in many ways to derive other kinds of data, depending on how we wish to interpret the input. Because of the diffuse nature of the input data, it is not straight forward to separate out actions of the user that are available, or not, to the machine. This separation is dependent on design decisions regarding choices of input technology and interpretation of input data. For Bystander, what became of issue was the machine perception and interpretation of moving bodies in the room. This of course stems back to design conceptions of movement and assumptions about user behaviour and the interpretation of that behaviour.

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. The user or audience perspective was broken down into columns labelled *Scenarios and Key Events*, *Audience Activity: Movement and Stillness* and *User Perception*. Brief descriptions of each scenario, characters and key events were provided. Audience activity was described in terms of audience behaviours, as well as specific details of position, orientation, direction of movement, degree of movement/stillness, spatial paths and configurations within these specific scenarios of use. These characteristics were further detailed in the corresponding visual movement schemas. The User Perception of the exhibited work described what various characters could perceive or of what they took notice. The User Perception column was used to speculate on what the users might be perceiving of the

system behaviour in the form of its visual and sonic outputs. It was not used for prescribing user behaviour. Actual experiential data of user perception of the system behaviour could be gathered during user testing and evaluation to validate or extend understandings of user behaviour. To that end, we could confirm what the users perceive, for example, how noticeable are the transitions and changes in the system behaviour and what effect do they think their actions have on the system?

The machine or room perspective was broken down into columns labelled *Machine Perception*, *Room State*, *Flock/Sound Behaviour* and *Design Questions*. Machine Perception described what the system detected as input—basic data included the presence and position of individual figures and the degree of motion of people. Room State referred to one of the four states that the system could be in. Flock/Sound Behaviour described the nature of the system output in terms of the flock, the set of images and texts revealed and the sound effects. The Design Questions column allowed us to highlight areas of contention within the emerging design.

The resources available to the machine for perception of the user action, was determined by the video data input device. As the movements of the users were supposed to influence the behaviour of the system, it was a matter of deciding what particular aspects of the movement to detect and interpret. In the final design, the system detected presence, position, density of moving bodies and degree of 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 *interactivity table* meant that they could be continually addressed as the design evolved.

One of the original uses of Suchman's analytic framework was the identification of breakdowns or misalignments between user actions and machine detection and interpretation. In this project, user testing during development was the primary source of identifying misalignments (an option Suchman did not have). At the same time the interactivity table enabled reasoning about what was available to the users and the machine to resolve identified mis-

alignments.

I will now discuss in some detail how the *interactivity table* enabled the designers to continually interrogate the nature of, and refine the design of, the interactivity. The first and third scenarios introduced earlier are now presented in the form of the *interactivity table*. It is presented here in two separate tables purely for formatting reasons. The *Time* column connects the two tables. In practice, it is a single table in landscape format, with the *User Perception* and *Machine Perception* columns side-by-side. Figure 6.12 contains the audience or user perspective and Figure 6.13 contains the room or machine perspective. Links are included for the movement schemas corresponding to each scenario.

The first scenario begins with Betty (see persona, Figure 6.4) and her friend, Val, entering the space. When they first enter, they stand fairly still 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 1, where the flock changes in some way but still coherently presents images and text. A design question is, what is considered ‘still’?

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 (category of audience behaviour—a ‘head-poker’) is detected and registered by the system as a presence that will affect the subsequent behaviour of the system. Then (at time 2:00) Betty and Val walk towards the centre of the room. The system should detect 2 figures moving towards centre. A design question is, is this sufficient movement to trigger a transition to state 2? (See Figure 6.3 for a definition of the system states.)

Betty and Val remain in the centre for a couple of minutes, slowly surveying the exhibited material, turning and moving around occasionally. The system should detect 2 figures at the centre. The design question is, does position matter to the room? The system behaviour depends on the answers to the design questions. The description of the characters’ movement in space and time is represented visually in movement schema 2 (see Figure 6.8).

| | Time Min:Sec | Scenario and Key Events | User Perception | Activity: Movement/Stillness | Schema |
|-------------------|---------------------|--|---|---|---------------|
| Scenario 1 | 01:00 | <i>Slow-moving, contemplative visitors.</i> Betty and Val about to enter empty room. | See flock revealing on wall, w2. | Betty and Val enter room together and stand fairly still looking around with heads turning. | 1 |
| | 01:30 | <i>Head-poker.</i> Young teenager enters, blocked by Betty and Val, so leaves. | What they see depends on whether or not the room perceives the head poker | Young teenager enters room, then exits. | 2 |
| | 02:00 | Betty and Val decide to stay and watch more. | See flock moving, some images and text unfold. | Betty and Val walk towards centre. | |
| | 02:30 - 04:00 | They watch the flock. | See flock moving, more images and text unfold. | Slowly turning to watch flock, taking 1 or 2 steps each way. | |
| | | | | | |
| Scenario 3 | 0:33:00 | Bob and Elena arrive. | Watching flock slowly reveal images and text | Bob and Elena walk straight to centre. | 14 |
| | 0:34:00 | Mother and toddler enter. | Mother and toddler not taking in much. | Mother and toddler enter, holding hands. Toddler runs around pulling the mother around. | 15 |
| | 0:35:00 | Group of 12 young school children arrive. | Bob and Elena notice dramatic transition of flock and reveals as the room becomes more chaotic. | Lots of motion everywhere! | 16 |
| | | Exit and re-entry of some children. | | Running in and out of entry. | |
| | 0:36:00 | Mother and toddler leave. School group leave. | Bob and Elena notice flock calming down. | People moving towards entrance. | 17 |

Figure 6.12 Audience Perspective—Interactivity Table, Scenarios 1 and 3

| Time Min:Sec | Flock/Sound behaviour | Room State | Machine Perception | Design Questions |
|---------------------|---|------------------------|--|--|
| 01:00 | Flock coherent presentation on wall, w2. | State 1. | Detection of 2 figures, some motion. | What is considered 'still'? Standing still may realistically translate to slow, peaceful, gentle body movements and locomotion within a very small area. |
| 01:30 | Flock coherent presentation. | | Ingress of 1 figure. | Has this person been detected? May want dead zone at entry. |
| 02:00 | Does it change? | State change? | Detection of 2 figures moving towards centre. | Is this sufficient movement to trigger a state shift to state 2? |
| 02:30 - 04:00 | Flock behaviour depends on answers to design questions. | | Detection of 1-2 figures at centre. | Does position matter to the room? |
| | | | | |
| 0:33:00 | Flock coherent presentation | State 1. | Ingress of 2 figures | |
| 0:34:00 | Depends on state change. | State 2? | Ingress of 2 people. Detection of 2 figures moving. Detection of 2 figures fairly still. | Does the history of presence and activity in the room have any bearing on the system behaviour? |
| 0:35:00 | Flock very disturbed. | State 4 | Ingress of 12 people. | The activity of hyperactive children enables transition to state 4. |
| | | | Egress and ingress of x people. | |
| 0:36:00 | Flock semi-disturbed. | Transition to state 2. | Egress of 14 people within 30 seconds. | What is the transition like? |

Figure 6.13 Machine Perspective—Interactivity Table, Scenarios 1 and 3

The third scenario begins (at time 33:00) with Bob and Elena arriving in the room. They walk to the centre of the room and remain there watching. The system should detect two figures and transition to state 1, where the flock changes in some way but still coherently presents images and texts. One minute later (at time 34:00), a mother and toddler enter. The toddler drags the mother around the perimeter of the room. The system should detect two more figures and possibly transition to state 2. A design question is, does the history of presence and activity in the room have any bearing on the system behaviour?

The next event (at time 35:00) is a group of 12 young school children arriving and running wildly around the room. The system detects the ingress of 12 more figures. It transitions to state 4, where the flock is very disturbed. Bob and Elena notice a dramatic transition of flock, image and text reveals as the room becomes more chaotic. Over the next minute, several children exit and re-enter the room. The system detects the egress and ingress of several figures. At time 36:00, all the school children and the mother and toddler exit the room. The system detects the egress of 14 people within 30 seconds. It transitions to state 2, where the flock is less disturbed. Elena and Bob notice the flock calming down. A design question is, what is the transition like?

6.3 Enacting design representations of moving bodies

User testing was conducted with the design team and typical users during the development of Bystander. The primary aims of the user testing sessions were firstly, to verify the robust functioning of the system for various combinations of audience activity, secondly, to test the ideas for interactivity built into the current prototype and thirdly, to gain insights into the user experience of the system. Each iteration of testing was focused on the aspects of user experience that were possible, given the current form of the prototype environment. Enactment of the user activity script was used to drive the user

testing. Details of how the user testing sessions were set up and conducted follow.

Two user testing sessions were conducted using a temporary test room housing the working prototype in its exhibition format. The actual form of the test room evolved over the two iterations of testing. In the first testing session, 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 of white particles with no photographic images or text. There was also no sound linked to anything that was happening within the room. The focus of user testing was thus directed to the users' engagement and response to the flock, the physical shape and size of the room and the interaction with other people. In the second testing session, the test room became more like the final form of the environment, with close to full image, text and sound content, but with placeholders for the images. The focus of testing expanded, from that covered in the first session, to also include the users' engagement and response to the images, texts and sounds. The user testing sessions were videotaped from two perspectives—one fixed camera was discreetly located in a corner of the room and one roving camera was operated by one of the researchers inside the room. Video capture of scenario enactment through the overhead infrared video camera provided a source of audience input data for informing the mapping of audience behaviour to system behaviour.

For each testing session, a group of people representing the users were required to act out the user activity 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 activity script and the set of linked movement schemas that described a sequence of scenarios over a forty 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 to ensure their positioning, orientation, speed and spatial paths corresponded to the scenarios. They were free to improvise their actual behaviour and



Figure 6.14 Scenario enactment in a full-scale prototype environment with the characters, Betty and Val

movement, as long as it remained faithful to their character and the scenario directions. Figure 6.14 shows a photograph of the scenario enactment with the characters, Betty and Val, played by two members of the design team.

Directly after the enactment session, users were interviewed about their experience of *Bystander*. The interviews were videotaped. The interview data was analysed to understand the range of experiences and nature of engagement with *Bystander*. I particularly took note of the relations between people moving (and staying still) and the nature of their engagement with the system. Some of these findings were fed back into the design of the system. The three major findings from the user testing sessions relevant to this thesis were the value of enactment and immersion for design reflection-in-action, the importance of situated understandings of the notions of presence, movement and stillness and an understanding of the relations between movement, stillness and audience engagement in *Bystander*. Each of the findings will be discussed in more detail in the following sections.

6.3.1 Enactment and physical immersion for design reflection-in-action

Two experiential methods of design reflection—*enactment* and *immersion*—proved critical for grounding the conceptual design and providing situated points of reference for resolving design issues. Prior to the scenario enactment, much of the conceptual exploration of audience-room interactivity was speculative and ungrounded. The user testing sessions provided the design team with opportunities to directly experience a full-scale working prototype, drawing on felt, sensory experience through scenario enactment and immersion.

Some researchers have found value in the acting out of scenarios by improvisation-trained theatre actors (with designers observing and interjecting) rather than walked through by designers and users (e.g., Howard et al., 2002). Our experience of designing Bystander highlighted the importance of the designers themselves being involved in the scenario enactment, with the designers role-playing as users (Burns et al., 1994; Buchenau and Suri, 2000; Brandt and Grunnet, 2000). The use of personas and scenarios from the very beginning of the project gave the design team a way of orienting to the user experience. Taking on various personas allowed the designers to disengage from their own immediate concerns and roles and take on the life of another person. This enabled them to perceive and engage with the prototype environment in different ways. The persona descriptions provided a background and structure for character immersion, which was intensified with the particular expressive bodily and movement characteristics of that persona. The use of personas helped members of the design team to elicit different experiences of the interactive work and physical space. One member expressed that her experience as various personas generated interest for her in the content in different ways. The movement-oriented scenarios then provided direction and structure for exploring and engaging with the environment and for orienting to the user experience. 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.” In our case,

direct experience of the moving body in relation to other bodies, in the envisioned situation of use, enabled designers to access tacit understandings and qualities related to bodily experience. For us, scenario enactment provided a structuring device for designers to experience the kinds of movement and activity of multiple users in Bystander.

The designers' physical immersion in the working prototype vitally grounded their understandings of the emerging design and provided opportunities for "reflection-in-action" (Schön, 1983). This physical immersion gave them a felt, bodily understanding of the interactive work which was not possible until a full-scale prototype was available. I extend Schön's notion of "reflection-in-action" to explicitly acknowledge the role of the experiential, moving body in design reflection of interactive, immersive spaces that utilise human movement as direct input. We can experience and evaluate the prototype design through actively sensing, feeling and moving in the space, in interaction with others and the system itself. This kind of reflection arises in part from a felt, bodily experience; from learning anchored in a sensory experience of a visual, aural and kinaesthetic nature. When the experiential, moving body is one of the design materials, it becomes imperative for designers to develop understandings of the emerging design that are anchored in their own sensing, feeling and moving bodies (Buur et al., 2004; Jensen et al., 2005; Larssen et al., 2007a). In this way, imaginings of potential interactions and experiential opportunities within the specific interactive work are brought back to the realm of actual bodies, always situated and socially constituted, with distinctive perceptual and motor abilities that enable and constrain the possible kinds of interactions and experiences.

6.3.2 Situated understandings of notions of presence, movement and stillness

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 Bystander. A number of issues regarding the design could now be more fully explored and understood, in particular, notions

of presence, movement and stillness. Notions of presence, movement and stillness, in relation to real, human bodies, remained speculative during the design process and could only be fully understood through iterations of user testing with a full-scale prototype. The important thing to note is that these notions are constituted by the particularities of the system in its situated use. These same questions (e.g., “What is stillness?”) are raised by researchers in the area of computer vision and computerised human motion analysis (Pers, Vuckovic, Dezman, and Kovacic, 2003).

What counted as presence in the space?

The user studies had found that activity around the entrance to the space needed to be addressed separately from the rest of the space. This was because some gallery visitors 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 first scenario enactment on the basis that entry clearly did not equate with presence and presence could be more appropriately sensed by other means.

How would people move in the space?

This remained an open question until immersion in the full-scale working prototype was possible. Once changing configurations of people were present in the Bystander room, it then became evident that certain patterns of movement were emerging as described in section 6.3.3. These observations of the patterns of movements in relation to audience engagement specific to Bystander then tentatively grounded some of the assumptions that we had been using regarding how people would move in the space and complemented the understandings of audience behaviour drawn from the user studies. It was not until exhibition of the completed work and observations of actual visitors that we could know with conviction how people would move in the space (see section 6.4).

What constituted stillness in the space?

The artists' intention for the work was that audience stillness equated with a more contemplative and attentive engagement with the content. Other interactive works often encourage the opposite relationship—for example, a design driver for the interactive furniture installation, *Un-Private House*, included encouragement of visitor social interaction and activity through interaction with the exhibit (Omojola, Post, Hancher, Maguire, Pappu, Schoner, Russo, Fletcher, and Gershenfeld, 2000). This raised the question of what constitutes stillness, 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 (Kan et al., 2005). We needed an understanding of stillness that was defined in relation to people's experience of the content and behaviour of the room. The motivations for movement identified from user testing (see next section for details) indicated that audience engagement with the content did not necessarily correlate with physical stillness. A range of motion/stillness was observed for individual audience engagement with the work, if we take engagement to be indicated as a visible attention to the presented content. This range of motion/stillness included standing on the spot, shifting of weight, turning of the head, turning on the spot and walking in various directions, to maintain visual connection with the material. What was revealed here was the problematic nature of equating stillness with increased audience engagement for motion-sensing, interactive works.

6.3.3 Movement, stillness and audience engagement

The scenario enactments provided the design team with an extraordinarily strong sense of the physical and social aspects of the audience experience and how these related to the patterns of movement arising from the scenario enactment. A range of motivations for moving in relation to engagement with Bystander was identified from the interviews with users. Different people had quite different experiences regarding how, where and why 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, motivated by the set of factors below.

Moving to a position to keep the visuals in front

Each of the five walls was 4.5 metres wide by 3.4 metres high. Images and texts of varying sizes were dynamically displayed on the walls. Some people found that they needed to move a fair distance away from a given wall in order to have the content in full view. People tended to locate themselves in a position that allowed them to easily view the current set of images and texts, sometimes moving backwards to keep the visuals in front. Based on these findings, it was decided to constrain the display of the set of images and texts to three of the five walls at a time, so that a person could more easily take in the full set of images and texts in order to make sense of it.

Following the flock by moving around or watching from a fixed position

Some people were drawn to following the flock as it circled around the room, either by moving around the room to follow the flock or watching it from a fixed position. A small number of people reported suffering from vertigo if they fixated for too long on following the flock circling around the room. As a result it was decided that the speed of the flock should be slowed down sufficiently to avoid any ill effects.

Moving closer to the location of spatialised sound

The soundscape and dynamic sound effects were played through a set of five speakers to provide spatialised sound in the room. Some people moved toward or turned to look at the location of the source of sound if it seemed to be behind them.

Positioning of people in relation to others and physical characteristics of the space

The dimensions of the pentagon-shaped room (7 metres wide) produced a fairly contained space. This restricted to some extent the available paths of movement and positions for comfortable viewing, particularly when large numbers of people were present in the space. When a small number of people were present in the room, people were freer to wander at their leisure or take up a comfortable viewing position in the room. In contrast, when the room was filled with people, and especially with active children, it became more difficult for individuals to appreciate the work and find a comfortable viewing position. An individual's line of sight was often interrupted when there were many people in the room—this finding raised questions about varying the flight path of the flock relative to how many people were in the room.

What this analysis revealed was that the patterns of movement of the audience were predominantly *patterns of watching*. At this stage in the user testing, it was unclear what the influence of others in the space had on a person's experience of the interactive work, as the scenario enactment dictated to a large extent the relations between audience members.

6.4 Exhibition—how did visitors move?

The completed work was exhibited to the general public at Performance Space, Carriageworks, Sydney, Australia in August 2007. The patterns of activity and movement of actual visitors were observed and analysed from video recordings of the output of the overhead infrared video camera. The direct output of the infrared video camera fed into the EyesWeb (Camurri et al., 2000, 2003a,b) system for processing of the audience input data. A computer monitor displayed the screen for the interface to the EyesWeb system. The video data was a recording of this screen, showing the movement analysis treatment by EyesWeb of the audience activity.

Only small numbers of people visited the exhibition. A total of one and a half hours of video footage was recorded of visitor presence in Bystander.

This footage was transcribed and analysed with a focus on the movement activity and engagement of visitors. The results of the analysis were organised into a table showing over time, the movements and positioning of people, the category of audience behaviour and patterns of watching. A visual representation of the movements and positioning data was drawn in Labanotation floor plans. A 1 minute 46 second excerpt of the table is presented in Figure 6.15. It covers a range of movement-related audience behaviours and patterns of watching. The associated Labanotation floor plan is illustrated in Figure 6.16 (see Figure 6.11 for the legend). A catalogue of the patterns of watching is presented in Figure 6.17. These patterns of watching indicate the relations between movement, stillness and audience engagement. In this case, audience engagement is observed and interpreted as visual connection with the visual elements of *Bystander*, namely the flock, images and text haikus. Figure 6.18 shows a series of three stills of actual visitor activity taken from the overhead camera aerial view.

Visitors tended to enter the space and find a position for viewing the exhibited work. Many people stayed in one spot, only turning their head or torso to follow the flock or shifting images and texts. Some people moved often, walking forwards, backwards or sideways to find a better or different viewing position. When new people entered the space, the people already inside shifted their positions to accommodate the newcomers. This spatial distancing between people was amplified if they appeared to be strangers. When only one or two people were in the space, they tended to stand in the centre of the room. Most people exhibited very few expressive or large movements and tended to adopt a physically quiet manner. Some people remained physically still except for the occasional shift of weight or turn of the head. Others could not stay still for long and shifted position often, shifting weight, self-touching and fiddling with paper or parts of their clothing. Less common, yet observed, behaviours included sitting or lying down to survey the exhibited material. Unusual behaviours included a young woman closely following the flock as if in a dance and two young children running around inside and diving onto the floor. Two girls made a concerted effort to test the interactivity by swinging their arms around for extended periods. Another

| Duration (sec) | Time (min:sec) | Movements and positioning | Category of audience behaviour | Patterns of watching |
|-----------------------|-----------------------|--|--|--|
| a (57s) | 5:30 | Person p1 lies down in centre to view wall w4, with hands propped up behind head. | 5 - serious, quiet, contemplative engagement | Staying still |
| | 5:55 | Head turns to view wall w1. | | Turning head to maintain visual connection |
| | 6:14 | Rolls onto left side to view wall w2. | | Turning body to maintain visual connection |
| b (17s) | 6:21 | Some one entering. Person p1 rolls over to right side to view wall w4 | | Turning body to maintain visual connection |
| | 6:35 | New person p3 stands just inside doorway. | 2 - enter, stand for a while | |
| c (12s) | 6:38 | Person p3 starts to walk along wall w1. Another person p4 enters. | 3 - skimming | |
| | 6:45 | Person p3 and person p4 talking to each other. | | |
| d (10s) | 6:50 | Person p3 walks to other end of wall w1. | | Moving to find better viewing position |
| e (4s) | 7:00 | Person p4 walks a little to left, close to wall w5. Person p3 walks next to wall w2. | | |
| f (6s) | 7:04 | Person p1 rolls over to view wall w2. | | Turning body to maintain visual connection |

Figure 6.15 Excerpt of observed visitor movements and positioning, audience behaviours and patterns of watching. Each duration labelled a, b, c ... corresponds to a temporal phase in the Labanotation floor plan.

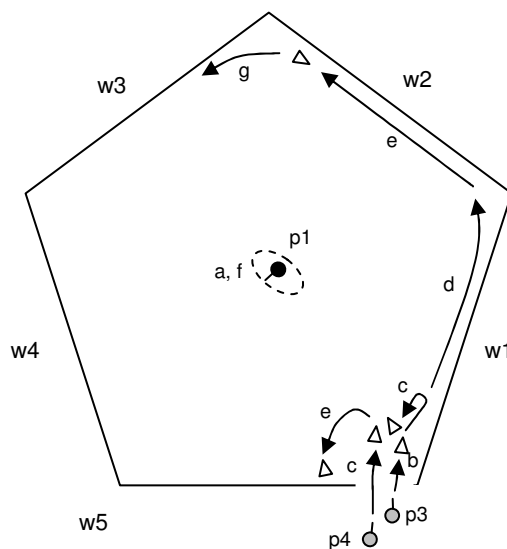


Figure 6.16 Transcription of visitor movements and positioning, drawn in a Labanotation floor plan, for a 1 minute, 46 second excerpt

- | |
|--|
| <ol style="list-style-type: none"> 1. Staying still 2. Shifting of weight 3. Turning body/torso to maintain visual connection 4. Turning head to maintain visual connection 5. Moving to find better viewing position 6. Moving to periphery 7. Moving to centre 8. Moving backwards to keep visuals in front 9. Moving towards visuals |
|--|

Figure 6.17 Catalogue of patterns of watching: movement and stillness in audience engagement with Bystander



Figure 6.18 A series of three stills of actual visitor activity taken from the overhead camera aerial view

visitor brought a dog in with him.

The observation and analysis of actual visitors' activity and movement in the exhibition space from the video data revealed patterns of activity and movement very similar to what was generated during scenario enactment with the full-scale prototypes. We found that the observed movements of actual visitors were similar to the kinds of movements generated in the scenario enactments. The categories of audience behaviours from the user studies of other immersive spaces, which informed the scenario construction, were all observed to varying degrees in the actual visitors to the exhibited work. This finding served to validate (in the sense defined in Chapter 4) the construction of our personas, scenarios and movement schemas and added to the existing body of observations of visitor behaviour in gallery and museum exhibitions of interactive works (Lehn et al., 2001; Heath et al., 2002; Hindmarsh et al., 2005; Fernández and Benloch, 2000). It should be noted that Carriageworks is a very specialised art exhibition space and not a general public space like a museum or a large public gallery. This meant that the movements and patterns of watching of the visitors tended to reflect the seriousness of engagement. In a large public gallery we may have obtained different or additional kinds of movements and patterns of watching.

6.5 Findings

The three design representations of moving bodies presented in this chapter—*movement-oriented personas*, *movement-oriented scenarios* and *movement schemas*—were extremely useful for exploring and reflecting on the kinds of movement people generate in interactive, immersive spaces like Bystander (Robertson et al., 2004; Loke and Robertson, 2005; Loke et al., 2005b; Robertson et al., 2006; Loke and Robertson, 2008b). The design representations provided direction and structure for designers to orient to the user experience. The movement-oriented personas and scenarios were informed by user studies of gallery and museum visitors to similar interactive, immersive spaces. The user studies identified six categories of audience behaviour that specifically focused on people’s movements and passage in and out of the space. The scenarios were devised to include these audience behaviours in combinations that provided the full range of input to the system. This simultaneously ensured that the experiential effect for the audience could be gauged as well as the robust response of the system to the varying inputs of people moving in the space.

The movement schemas in Labanotation floorplans are a visual representation of the movements and spatial trajectories of the people in the space. They present an at-a-glance overview of the changing presence, position, orientation, spatial path and degree of body motion of the set of people in the space. Each schema is linked to a particular scenario and visually indicates the categories of audience behaviour that are captured in the scenario. The schemas provide guidance for scenario enactment on the scripted movements and social interaction with other people in the space.

The design representations of moving bodies also supported two experiential methods of design reflection-in-action—enactment and immersion—that were vital for grounding designers’ understandings of the specific interactive nature of the work in their own sensing, feeling and moving bodies and for providing situated understandings of notions of presence, movement and stillness. The use of these methods and tools in the design of Bystander enabled us to cater for a range of user experiences for shifting configurations

of people in the interactive, immersive space.

The ‘workability’ or validation through continued use of the design representations of moving bodies is supported by the successful insertion of these user-centred design tools into an otherwise non-user-centred design process. It is also supported by the uptake of the design tools into one of the artist’s ongoing professional practice, as evidenced by this quote (Richards, 2006, personal communication).

The designers’ techniques, brought sophistication and clarity to the development, design and production stages of Bystander. My own creative and production processes have been strongly informed by the experience of working with these techniques.

The adaptation of Suchman’s analytic framework, the *interactivity table*, was a useful design tool as it enabled us to explore, interrogate and reflect upon the developing design of Bystander. It integrated the scenarios of user activity and movement with the system behaviour and framed the interactivity in terms of the resources available to both user and machine for perception of the other’s action. It framed the design questions and issues within the scenarios of user activity and machine interpretation and response, ensuring that any design assumptions about user behaviour were made explicit and continually interrogated throughout the evolving design.

The patterns of movement and stillness of the audience in relation to engagement with Bystander were predominantly *patterns of watching*. A catalogue of the patterns of watching (see Figure 6.17) was derived from the analysis of actual visitor activity to the exhibited work in a public setting. These patterns of watching contribute to the existing literature on understandings of audience behaviour in interactive, immersive environments and gallery/museum settings.