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Control and Being Controlled: Exploring the use of Technology in an Immersive Theatre Performance

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ABSTRACT

Immersive theatre is a growing trend within theatre entertainment: audience members can now wander around performances and choose how the story unfolds in front of them. Technology can be used to create novel, multi-modal experiences for audiences in these performances; but when the rules of such an experience are ill-defined, how do users react to this technology? We present an evaluation of 25 performances of an immersive, in the dark performance. Issues of control can arise in situations where technology becomes an important part of such a performance. Participants take and relinquish control in three key areas: navigation, exploration and attention during the performance, and this affects their perception of both technology and the piece itself. We discuss how technology can play a positive role in immersive theatre and other cultural settings, yet its use must be carefully choreographed to ensure the audience experience matches the intended goal.

Author Keywords

Immersive Theatre; User Experience; Navigation; Haptic; Audio; Visual Impairment.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

INTRODUCTION

Museums, galleries, theatres and places of historical interest are striving to engage their visitors in varied ways. Interactive audio guides have become a common service in most museums, which also often include interactive objects for hands-on learning and exploring [4]. Technology is becoming more important in cultural settings. Over the years HCI has extended its reach into this area by creating a range of more complex cultural user experiences where

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digital media, props, and physical locations are integrated [3,5,9,16]. Such visitor experiences are no longer characterized by passive absorption of facts and information, but are about active involvement, immersion and about creating moments that are of personal interest to the visitor [28].

Immersive theatre installations are an example of this trend [25]. No longer is the audience required to sit in assigned seats, at a distance far from the action of the play. Instead, the audience moves around freely and becomes part of the play, sometimes taking on roles and altering the course that the performance takes. In such performances previous boundaries can be blurred: the audience can directly influence and interact with the performance. As noted by Papaioannou, immersive theatre performances can be described as having a “choose-your-own-adventure” narrative in that audiences can pick which aspects of the performance they watch, engage with, or alter [18]. This approach however, can lead to unclear rules of engagement, with the audience unsure about what is “allowed” in the space and to what extent they are expected to push the apparent boundaries they are given [2].

In this paper we present an evaluation of the use of interactive haptic technology in an immersive theatre setting. The performance was set in complete darkness and centered around a play, based on the 1884 novella *Flatland*, about an imaginary world where hearing and feeling are the dominant senses. Alongside other interactive technologies, a hand-held shape-changing device was developed to be part of this performance, in order to guide the audience through the dark performance space, allowing them to find various places and objects of interest. The only human actors in the play were involved at the start and finish of the performance; for the majority of the time the audience were able to move around the open, dark space and find different “scenes” comprised of scenery and props which they could feel and listen to.

In this paper we explore the range of different user experiences that were had through an in-depth qualitative study of 25 performances. We explicitly aim to understand the breadth of user response compared with creative intention using a bottom-up evaluation approach based upon post-performance user discussion. We particularly explore how issues of control arose when asking audience

members to interact with novel pieces of technology, and how this was affected by the overall sense of the unknown when experiencing an immersive theatrical performance.

RELATED WORK

Ubiquitous computing offers new opportunities to engage audiences in novel, engaging cultural experiences. Collaborations between artists, designers and engineers have created immersive theatre experiences where audience members take part in the performance by becoming an actual character in the play, or in the role of passers-by and witnesses to events. Well known examples of this approach are the performances by theatre group Punchdrunk, or the mixed reality games by Blast Theory. Benford et al. analysed the development of such user experiences, describing them as carefully orchestrated trajectories – where experiences unfold over space and time [6]. At appropriate moments the audience may be handed a variety of technologies to interact with – mobile phones to send SMS messages to characters in the play, swipe cards to open doors, or wearable sensors to capture the audience’s emotional response to the performance – all carefully designed to provide complex user experiences, in which the digital and the physical are traversed in innovative ways. Benford et al.’s trajectories framework [6] aims to provide a lens to reflect on critical points in the development of such user experiences, particularly highlighting moments where transitions take place. Transitions could be moments at the beginning or end of the play, or issues to do with the sharing out of a limited set of physical resources. Managing such trajectories involves resolving the tension between participant trajectories and authors’ intended canonical trajectories.

Discussions around how to resolve such tensions are not dissimilar to work by HCI researchers who have studied mental models, i.e. the user’s understanding of the interaction and the way the designer had intended it, and how to minimize the distance between these two understandings [17]. Sengers [23] argues that while there may be disagreement on whose interpretation (e.g., the users’ or the designers’) should be privileged, there is general agreement that there should be a single, correct way to interpret an interactive product (e.g. how it works or the emotion it should exhibit or engender), and that the goal of the designer should be to convey that interpretation accurately to its users. Getting a certain interpretation across to users is often appropriate and useful. However, as argued by Sengers, we should also recognize, design for, and evaluate with a more nuanced view of interpretation, in which multiple, even opposing, views of interpretation co-exist. With this approach evaluation shifts from determining whether an authoritative interpretation was successfully communicated to identifying, stimulating, and analysing processes of interpretation in practice.

Guidance and control

The technology device used in the Flatland performance presented here was designed to support people navigating in a dark space. The issue of guidance versus instruction is central in the context of using navigation systems, as is the question about who is in control: the user or the technology?

Robinson et al [21] argue that for certain settings a person may not wish to receive precise instructions, as their main aim could be to wander and enjoy the journey itself, for example as a tourist visiting a foreign city. They developed a system where a user could request a reminder of whether they were still ‘roughly’ heading in the right direction (through a subtle squeeze on their phone), but otherwise move along on their accord. This method resulted in the user group taking a variety of paths between the same two points. This suggests that giving navigational control to the user, rather than the technology, can result in more “creativity” in path finding. However, this approach did result in users finding dead-ends during their navigation which can be highly frustrating, and is avoided by moving the locus of control back to the technology.

These issues demonstrate the large variety of demands on a navigation system: the need to get somewhere, the need for information and the need to enjoy the journey – all of which must be balanced. In an immersive performance there are also the demands coming from the narrative, where the creative team plan and anticipate a complex user experience to unfold in a particular way, including the places that are visited by the user. What level of control is most appropriate and “successful” in this situation?

Immersive Theatre

Immersive theatre allows audience members to have a more embodied experience of the performance they witness in comparison to the more traditional arrangement involving rows of chairs facing a stage. In immersive theatre, audience members are invited to view the performance whilst moving around the scenery and occasionally going beyond merely “observing” by interacting directly with actors. This level of interaction with a performance leads Reeves [20] to introduce the distinction between being an audience member and an active *participant* in such immersive pieces. Whereas an audience member spectates, watching the scene occur in front of them, the participant takes part in some way and has some control over the performance. This need not mean they control the narrative, or the actions of the actors, but means they can change what they see and how they respond to it.

A key aspect of such performances is that they often use “spatial” narratives rather than linear [15]. The audience are able to control the way that they engage with the narrative, choosing what order to encounter various elements of the performance. Such variations allows the audience members to choose whether they want to become “spec(a)tors” or remain “distanced theatre-goers” [18]. Papaionannou refers

to a particular piece of immersive theatre as “a huge ‘living’ installation, or ... an assemblage of tiny ones” [18] again highlighting the variable nature of the form.

Immersive theatre also offers an opportunity for a heightened sensory experience. Alston notes that although sitting in a theatre is a multisensory experience in itself, immersive theatre may purposefully create touch-, audio- and smell-based interactions [2].

Alston also highlights one of the aspects of immersive theatre that is most appealing for audience members: becoming an audience member in such a performance can feel “risky” but allows audience members to experience otherwise negative emotions such as fear or guilt in a positive or stimulating way [2].

Technology in Performance

Technology has been successfully used previously in immersive games [5,6]. In these instances, existing technology is utilized to create exciting mixed reality worlds, where players are able to interact in the city around them in a parallel game world. The ability of technology to heighten previously ordinary experiences to thrilling gaming arenas again highlights a trend in immersive performance. Often this technology is screen based or visual, for example asking participants to interact with characters using SMS messages [7].

Initial uses of technology in theatre allowed actors to augment their performance by interacting with visual displays on stage [22]. Modern uses of technology can allow drama groups to play with presence and multiple stages [26]. Technology can also be used to play with our senses in performances. In 2011, the immersive theatre performance ‘The Question’ used navigational technology to guide participants around a completely dark space with no visual input [14]. The research showed how technology had the ability to create a similar, yet not ‘same’ embodied experience for sighted and visually impaired users. The research highlighted how uncomfortable sighted users can feel in immersive experiences when they cannot rely on their sight, even if they have technology to support them.

In this paper we set out to evaluate the technology that was designed for an interactive, in-the-dark performance. We wanted to go beyond issues of usability and efficiency to understand how participants – many of whom had visual impairments – interpreted the technology as part of the performance. What did they feel were the capabilities and purpose of the device? How did that affect their confidence and enjoyment of the piece? How did the technology fit within the complex journey through Flatland?

THE RESEARCH APPROACH

The research approach involved the development of an immersive theatre performance in collaboration with a drama group and technologist. The drama group, a company of visually impaired people, have a particular interest in creating accessible performances. The show was

therefore conceived to run in complete darkness, with participants hearing and feeling the various scenes in the performance. Throughout the piece, participants would be given instructions on where to move via a handheld device, and once at their target destination would find “scenes” to explore. These scenes comprised of audio narratives and haptic interactive technology.

A range of different data collection techniques were used throughout this project, generating both quantitative and qualitative data. Throughout the performances, the participants’ locations were recorded and mapped, showing their paths through the space. This data showed both the moments when the participants were being given instructions by navigation technology on where to move, and when they were allowed to freely explore at each of the scenes without instruction. Notes taken by the technical team during performances also aided in understanding when the technology may have behaved erratically, thus altering that particular user’s experience. For example, in a small minority of performances, some individual users lost audio information to their headphones, or their navigation devices became disconnected from the network.

Evaluations were run immediately following each performance to gather participants’ reactions and responses to the piece. These were conducted in the form of a group discussion, led by a facilitator who aimed to follow a set of high-level questions relating to use of technology within the performance and reaction to the piece as a whole. These sessions lasted for approximately one hour. They were filmed and recorded.

By combining the multiple data sources, we were able to paint a rich picture of the user experiences throughout the piece. Our aim was to base our evaluation not just on the creative intent, but on the reported experience of all users. We highlight overall performance metrics, alongside more in depth response and expectations from the participants and discuss the themes that emerged from the data.

THE PERFORMANCE

The performance was based upon the book: *Flatland*, a novella by E. A. Abbott [1]. In the book, the inhabitants of the Flatland world exist in 2-dimensions, meaning every citizen is a flat shape. As the world is 2-dimensional, using vision to identify other people is not beneficial, as everyone appears as a line; for this reason, characters in the story use ‘the Art of Hearing’ and the ‘Art of Feeling’ to communicate with each other. These elements of the book map directly on to the immersive theatre performance that was produced: participants would move around in the dark, and would be asked to rely upon their sense of touch and hearing to understand the world around them. The storyline of the performance involved participants optimistically entering Flatland in order to witness the peaceful society but slowly discovering a world full of social oppression, fear and euthanasia.

The performance took place in a former church that had since been converted to a venue for cultural events. Four participants at a time were invited to attend the performance. After a brief, daylight training with the Animotus (the hand-held navigation device) the participants moved towards four individual corridors that led into Flatland and eventually, complete darkness. At this point, each participant was guided by the Animotus, to one of four scenes in the performance to be experienced individually, without the other participants. After arriving in a scene, the participant would put down their device (in their pocket) and explore the space around them. After they had interacted with the scene they would be asked to retrieve the Animotus and navigate to the next location (as determined by the Animotus). It was important to the artistic team that the participants feel like they were “exploring” and therefore the scenes were placed in various locations around the performance area and not in a linear fashion which could be easily navigable without the aid of the Animotus.

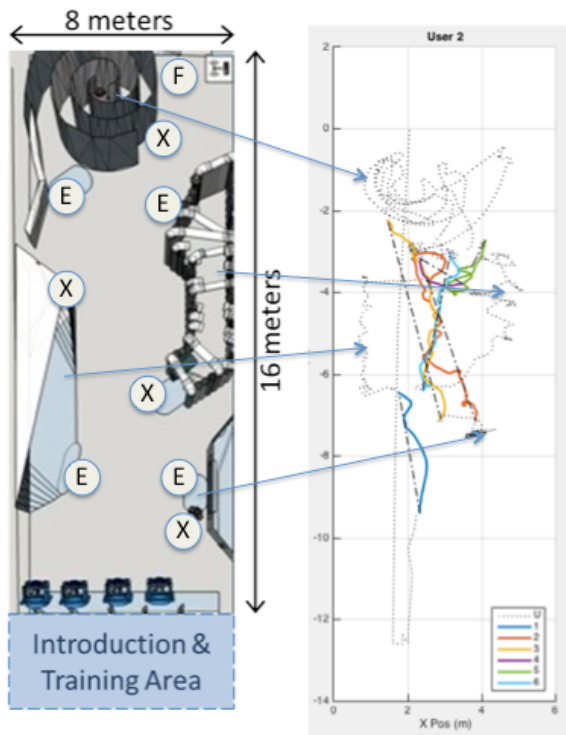


Figure 1. The left hand figure shows an over-head view of the performance space, with the four different scenes. The entrance to each scene is marked with E and the exit with X. On the right-hand side you can see the path a participant took through the space. Coloured lines show times that the participant was following guidance from the Animotus

The scene areas can be seen in Figure 1, which shows a view of the hall from above. The scenes were loosely based on an interpretation of the book, including zones such as (i) the ‘university’, where controversial lectures could be heard and people could physically move through a triangular

pathway created using elasticated ropes (to the left of the figure); (ii) the church, a large velvet spiral construction playing an unnerving-sounding sermon (at the top of the figure); (iii) the hospital, a place of much cruelty in Flatland where a construction of pipes gave participants the impression they were overhearing conversations between doctors discussing the future of a child with uneven sides (a severe disadvantage in the Flatland society) (at the right of the figure); and finally, (iv) the domestic quarters, consisting of a brick wall and a soft “window” (fabric stretched across a frame) for the participants to feel. During this interaction, it was possible to hear the sounds of the women of Flatland (an oppressed people) crying out and moaning in abstract ways (lower, right of the left hand figure).

Each scene had an associated audio track which could be heard via headphones. Each participant heard a different track depending on which scene they were currently experiencing. Some audio provided a narrative, detailing the unrest within Flatland, whereas at other audio tracks provided a soundscape. Once several minutes had passed in each scene, an instruction was given to the participants via headphones to take their Animotus from their pocket and begin following it to leave and explore another scene.

THE TECHNOLOGY

Technology was required for three distinct roles within this piece: to guide the participants around the space performance, to provide audio narrative and ambient sounds, and to provide interactive haptic feedback when the participants began to explore the area around them.

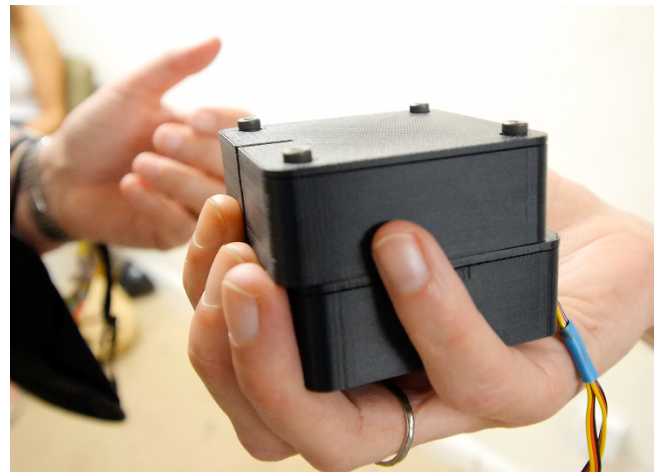


Figure 2. The hand-held “Animotus” navigation device. The top half of the cube extends slightly, an instruction for the user to move forward.

Navigation technology

During the performance, participants walked between locations in pitch black. This difficult task would be aided by a small piece of hand-held technology designed specifically for the performance. The “Animotus” device, a cube with dimensions 60x60x40mm, used novel shape-changing technology to guide its user on where to move

(see Figure 2). The top half of the device could protrude (indicating the user should move forward) or rotate (indicating a move to the left or right was required). Combined with positioning technology, which used small radio tags to determine the user's location in the space, the Animotus was able to guide users to particular locations simply by changing shape. This location was determined by a technician controlling the destinations for all four participants during the performances. Further technical details can be found in [24].

The Animotus was the result of multiple iterations of testing, beginning with an array of alternative devices. While several designs were considered, some of which turned out to be too dangerous as they might hurt participants, or too complicated to use, two designs emerged as contenders for the immersive performance: one (device A) directed users to a specific location using left/right/forward commands and the other (device B) provided information about proximity alone, alerting the user as they got closer to their target. Device A therefore took control from the user whereas device B allowed the user remain in charge of their navigation by simply suggesting movement around the space. The designs were tested both in lab-settings and in the performance space itself. These tests firstly ensured that participants could use the device to successfully navigate between two locations without the aid of sight but secondly they allowed us to begin initial inquiries into how participants perceived the varying levels of control from both devices. When discussing the two devices with a pilot user with visual impairments, device A was likened to walking with a guide dog – the device “pulled” the user in various, specific directions. Device B on the other hand was likened to a cane – it was a tool that the user could use to explore the environment around them. After multiple rounds of testing, device A was chosen as the final Animotus design as it was most successful in terms of getting users to a specific point. It was clear though from this initial testing that this device would be perceived as more demanding by participants.

Audio Technology

During the performance, participants would be able to hear the narration of the play through bone-conducting headphones. These headphones sit just in front of the ear and allow the user to hear audio via facial bone vibration. In using this technology, the participants would be able to hear audio intended solely for them (through bone conduction) whilst keeping the ears free to listen to the ambient sounds in the performance space.

Interactive Technology

At various points of the performance the participants would be asked to explore the area around them. To make this experience richer, several haptic and audio technologies were introduced into the piece. In one instance, a stretchy piece of fabric with small, capacitive embroidered dots on it responded to touch by gently buzzing. This represented the

women of Flatland moving to make themselves seen. In the University scene, elastic ropes stretched from ceiling to floor would cause small snippets of subversive conversation to play when touched and pulled (see Figure 3). Finally, in the church scene, a piece of velvet curtain would, when stroked, cause the sound of sharpening metal to play. The dissonance between the soft touch of velvet and grating noise of sharpening metal was intended to create an uneasy feeling for the participants. Each of these elements used technology to reward exploration – making elements of the performance world react to the participants' touch.

EVALUATION

By their nature, immersive theatre pieces are often non-linear, and as such the experience that each participant has differs. However, despite this variation between participants' journeys, the performance itself is carefully choreographed to create singular experience. For instance, in this piece the creative team hoped that the participants would move throughout the space with the aid of the Animotus, which would take them to the four individual scenes in different orders. At each of these locations, the participants would have a chance to hear the narrative, feel the world around them, and gain an understanding of the disconcerting situation in Flatland. One aim of the creative team was that participants should feel immersed in the experience – our definition of “immersion” here is not a formal measurement (as per [13] for example) but is instead self-reported by the participants themselves.



Figure 3. A participant touches the elastic ropes in the piece, causing sounds to play. (Taken with Infrared camera)

It is with this creative aim in mind that we evaluated how participants responded to technology in this immersive theatre production. Did their experiences match the intended outcomes? What successfully contributed to creative vision, and what hindered it? To answer these questions group discussions were held after each performance with the participants. Group discussions were chosen as they encourage deeper reflection and feedback on cultural stimuli [11]. A device was used to ensure that each member of the group was able to note their response to each question before beginning the discussion; this allowed the

facilitator to ensure any varied opinions were brought up and were not lost in discussion.

The initial questions used to provoke discussion during the group sessions immediately after the performances covered a variety of topics, including control, immersion, emotional response to the Animotus to name a few. When analysing the data, a grounded theory approach was taken: each group discussion was transcribed and individual sentences coded. After the initial coding had been completed, the codes were grouped into themes. From these themes, it was clear that control was a key issue that audience members felt they wanted to express and had intriguingly differing opinions on. Lines of questioning which did not produce rich data were not reported.

Based upon observations, data from participant movements and this coded interview data, we focussed on the area of *control*. Control moved between participants and the technology around them at a number of points throughout the piece – for some these moments helped immersion in the performance, yet for others it felt constricting. Others made subconscious control decisions without being aware of them. In this section, we present an evaluation of three aspects of control that arose during the performance:

- Control in Navigation
- Control in Exploration
- Control in Attention

Control in Navigation

Within immersive theatre, participants and audiences are often required to move around a space between locations. This was the case in Flatland as participants moved between the interactive scenes. Rather than happening upon the scenes themselves, which may have resulted in overlap between participants, they were guided by handheld technology. The handheld technology required cooperation from its user, in the sense that the user had to follow its instructions in order to successfully guide them. Here we briefly discuss the ease of use of the Animotus before exploring participant reaction to the cooperative nature of using the device to explore the space.

Ninety-four participants took part in the experience as some performances ran with only three participants. Analysis of data after these performances do not suggest that this had an affect upon participants' experience. Navigational data was collected for all participants as they moved through the Flatland space. Each participant travelled several paths (usually five, one between each zone and a final path to the exit). The majority of participants were able to follow the guidance of the Animotus to some extent, and successfully found the scenes within Flatland.

The Flatland path data shows for each participant (i) the optimal paths and (ii) the travelled paths as guided by the device and (iii) the paths travelled without device. Figure 1 shows a participant who is well able to navigate their way

to the various zones accurately, not straying far from the optimal path.

The majority of participants were able to navigate in the space with a middle to high degree of accuracy. Those who navigated accurately found the device easy to use *"I thought it was just so delightfully simple that I didn't have to worry about the device, and I could concentrate on thinking about my environment"* (Performance2User4). Others mentioned the intuitiveness of the device, P10U4 (a visually impaired participant) explained that he didn't need to consciously think about his movements when following the device *"When it was actually starting to twist and things, I wasn't consciously thinking, "I turn right or turn left". I just thought, "Go with the flow"*". P4U2 went further to say *"It sort of became really part of me"*. These experiences suggest that not only was it possible for the device to accurately guide its user, but the user could follow its commands without thinking, allowing them to focus on the experience as a whole.

The success of navigating with the Animotus meant that some participants were entirely happy to let go, and hand over all navigational control to the device *"I was just like, "Fine, obviously it knows where it's going", and just walked straight wherever under the assumption that I wasn't going to fall down a hole or something"* (P15U1) others even found the hand-over of control to be exhilarating *"trusting the [Animotus] is the most dangerous thing there rather than trusting yourself. So that makes it more exciting"* (P15U3). However, handing over control like this also came with an expectation that the device would look after the user; this caused tension when the user failed to understand what the Animotus was trying to convey *"I did very much kind of imbue it with a lot of responsibility to look after me and I was sort of cross with it when it felt like it was ... being tricky or when it was wrong"* (P14U4).

Interacting with the Animotus required the user to obey to the device, and willingly follow its guidance. For some this was counter to their expectations of an immersive theatre experience: *"A lot of the time, there was a temptation just to really put [the Animotus] away and just explore it that way.(P16U3)"* Another participant (P25U1) felt she was having to fight the urge to explore: *"I knew I really wanted to run around in the dark, but I couldn't"*. One participant even described herself as a puppet, being controlled from afar *"It sort of made me into a - it was like a sort of - it had a puppeteering quality to me"* (P12U2).

Of those who expressed a dislike of how controlling the device was, the majority had identified as having visual impairments. One participant expressed that there were so many attention seeking things in her life that that she didn't appreciate having another piece of technology telling her what to do *"Being blind, I have so much technology. I have a talking GPS, you know, there's always vibrating canes or ... sunglasses that are giving you beeps in the world and*

it's just like, yet another tool to navigate and say, yes, I was just looking at it as yet another piece of technology" (P20U4). Another participant with visual impairments decided that the lack of control was too much for him. P12U4 began navigating in a highly accurate manner, but half way through the performance began to ignore the navigation device and started to explore on his own. This was a conscious decision on his part, he felt this performance was a chance to get away from the everyday experiences of lack of control: *"And actually in a place like that, as a blind person, you should be very free and incognito... unrecognised, because most of the time we're kind of shepherded from one place to another or you're taken to one place and then taken up to another place."* This reaction led to him trying to push the boundaries and take back control: *"And I spent the whole time very conscious that I was being watched and working out ways in which I could evade being watched. So I was always looking to go crossways".* This sentiment is clear to see from the path he took, initially obeying the device and finally ignoring it in order to have his own experience.

Control in Exploration

Transitions during immersive theatre are an opportunity for the participants to experience a change in narrative, change roles or be exposed to new technology [6]. These moments are key, and require careful choreography to ensure that the participants do not become lost or confused, it is at these transition moments where engagement and immersion must be maintained.

During the Flatland piece, the Animotus technology was at the forefront of important transitions for the participants. These occurred when the participant had successfully navigated to their designated scene location, and were therefore asked through audio command in the headphones to put away their Animotus and explore the area until they were instructed to move on, at which point they would be asked to retrieve their Animotus from their pocket. On a physical level, this transition simply involved the participant changing from interacting with a piece of handheld technology (the Animotus) to interacting with the haptic and audio technology in the scene around them. However, from examination of the transcripts we see that a higher-level *cognitive* transition is also occurring at this point: the transition of being controlled, to being given freedom to explore.

When designing the experience, the artistic team had a clear vision of an "expected" experience. That is, an ideal trajectory through the space that a participant could take; the participant would navigate to and explore each of the four scenes. This is not to say that the participant was required to navigate the performance as though on a conveyer belt, the route they took to the scene could change as they desired, and if they wished they could have explored far beyond the scene they had navigated to, however ideally they would at least experience the elements

that the director envisaged. This is similar to other theatrical performances as the creative team had a narrative they wished to convey to the participants as they moved round the experience with a beginning, middle and ending which all follow the journey of a key protagonist. From a technical perspective this journey, if taken as intended by the artistic team, would involve the participant interacting with the Animotus and the scenery interchangeably, requiring many elements of transition between control and free exploration. It is with this "minimal expected trajectory" in mind that we explore the various participant reactions to this control transition boundary.

For the bolder participants, the transition from following the Animotus to exploration was a welcome one: it represented a chance to explore freely, without having to obey the technology in their hand. When the Animotus was put away in their pocket, they felt they were able to immerse themselves fully, for example *"I quite liked putting it in my pocket and just going free-fall, not knowing what's going to be in front of me next. I quite liked that" [P22U2].* Or P4U3 *"But I was always very glad to get rid of it."* These participants did not find the Animotus technology challenging, but its role in their experience of the performance was inhibitive. For them, this control transition boundary was a welcome one, allowing them to move from the strict guidance of the Animotus to a freer, exploratory experience with the performance.

For other participants however, this transition of control did not fully take place. After using the Animotus and obeying its instructions, at the point at which they were given the freedom to explore, they felt they were unable to be adventurous in their explorations: *"I didn't know what the boundaries of what I could explore were" (P15U1).* This difference in exploration can be seen between two other participants, P20U1 and P20U2. Figure 4 shows their trajectories around the performance space. Both are able to navigate fairly accurately between the scenes (the coloured lines) whereas their exploration paths (the dotted lines) are very different. U1 wanders in many directions, looping around the space, whereas U2 seems static, unsure of where she is allowed to move. This sense is embodied particularly well in the interaction between two other participants discussing the experience after the performance. P14U4 spoke of kneeling down to feel the ground around her. When the other participant (P14U3) was asked to discuss whether she found the Animotus a useful guide, decided that it had restricted her too much, stating *"I think I'm divided by that question, because I think when [P14U4] was saying, whenever I knelt down, I [P14U3] was like, "You were kneeling? You were like feeling around on the floor?" And I think I was really unadventurous."* It appears the control transition was in some way stunted: the participant felt as though their experience obeying the device had hindered their ability to freely explore.

The control transition in the reverse direction was also occasionally problematic for the participants. The nature of the sound and Animotus control meant that at times the audio cue told the users to retrieve the Animotus from their pocket, with a lag of 5-10 seconds before the Animotus began moving again, ready to guide them to their next destination. As with all technology that does not respond within the time frame we expect, for some this transition was simply annoying, P5U1 explained that she “*definitely got frustrated with waiting sometimes*”. For this participant, the Animotus was similar to any “buggy” piece of technology she might encounter in her everyday life. However, for others, the fact that this problematic transition occurred during an immersive theatre piece caused concern regarding control. For sighted users who were unused to navigating without the aid of vision, this meant that the Animotus represented their best chance of moving around the space. Some sighted participants therefore found the lull before the Animotus began moving very unnerving, “*The times that I was most concerned when using it was after I was told to hold it again, it didn't move. He had stopped speaking to me and the cube wasn't moving, and I just felt very lost and like no one was looking after me*” (P1U2). This participant was particularly welcoming of the transition away from free exploration and specifically sought guidance from the Animotus. When that guidance and control was not forthcoming, she began to feel concerned and vulnerable.

Control in Attention

The multi-modal nature of the performance ensured that there were a wide range of stimuli for the participants to interact with throughout the piece: from ambient sounds, to audio narration, to tactile and responsive surfaces and even smell in some locations. This is highly unlike a traditional theatre experience, which presents a single, visual and audio experience which is intended to be consumed by the audience in a linear fashion. In Flatland, the audience were participants and therefore able to pick and choose the aspects of the performance that they wanted to engage with. This experience is perhaps more similar to browsing an art gallery: despite the immense array of art on offer, a visitor might choose their own path through the gallery, stopping to view only the pieces they want to.

Here arises another issue of control in immersive theatre productions – *control in attention*. With so many aspects of the performance demanding attention, how did the participants choose what to engage with? And to what extent was that choice a conscious one?

We sought to explore how aware the participants were of the narrative being presented to them and how that related to the touchable world around them. For some, the audio and haptic feedback balanced well, “*I felt like I was very aware, and directly making links between what I was hearing and what I was feeling*” (P3U1) and for others the sensory experience as a whole was very rewarding “*I stood*

at the centre and heard all that was happening. That was the deepest experience I had, when I was right at the centre, cuddled into this room” (P1U1).

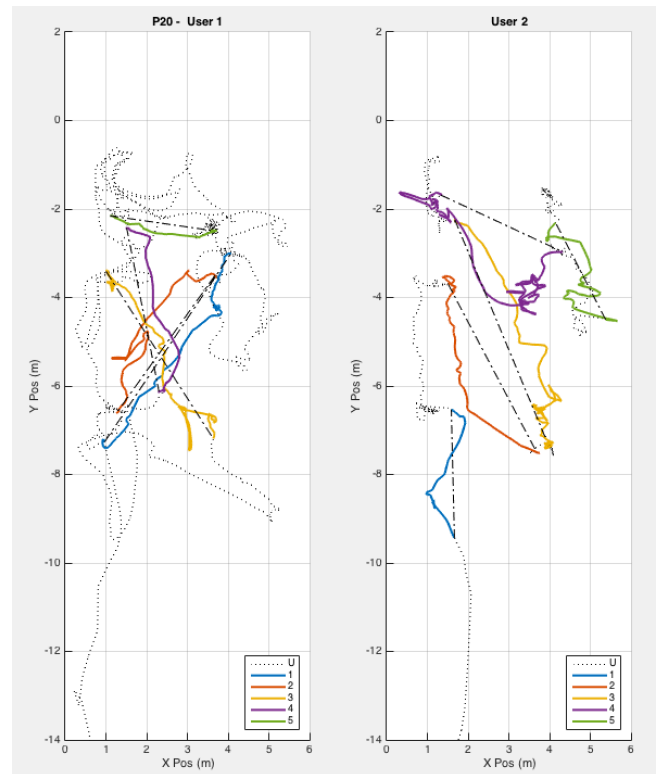


Figure 4. Paths for P20U1 and P20U2 in the performance. Both are able to navigate successfully between the scenes (coloured lines) but they explore in different ways. U1 moves freely (dotted line) whereas U2 barely moves when reaching a scene.

For some participants however, the audio and haptic stimuli were not working in harmony – some participants seemed to be experiencing them in isolation. We noted that some participants were more aware of the audio narration, whereas others were more focused on the tactile sensations. There was also a division between those who had *consciously* decided to focus on one sensory experience and those who had *subconsciously* made that choice.

Despite the constant narrative arc being played to participants through their headphones, for some people the narration passed them by due to either the experience as a whole (“*something more sort of primal takes over than paying attention to the narrative*” (P6U3)) or because they were more focused on what they were touching (“*I was having tactile overload and I realised I hadn't listened to anything*” (P8U3)). Yet this was not necessarily a negative experience for them “*I think it was so interesting to do that that I think maybe I didn't attach myself to the story as much as I should've done*” (P18U2). This was a sentiment expressed by several participants – that in focusing on exploration with their hands, the narration through their headphones had become just sounds in the background.

In those instances, the participants were not making *conscious* decisions to shift their attention from the audio to the tactile experience, that act appeared more *subconscious*. However, for some participants, a more conscious decision was made *“I feel like I understand what the audio is telling me now so I’m just going to park that for a second and pay attention to something else”* (P6U3). Here the participant made an active decision to stop paying attention to the audio they were hearing, rather than accidentally letting it fade to the background as others had. Conversely, some gave the audio experience more of their attention whether they were aware of it (*“I just went back and just stood there for quite a while, just waiting until the story finishes, just not to miss something”* (P8U1)) or not (*“I think I retreated in just listening to an interesting story”* (P14U3)).

When reflecting on this apparent inability to focus on two different streams of sensory information, some participants felt they had learned an important lesson about their own lives. After the recorded interview, two museum employees expressed shock at how difficult it was to listen whilst touching and feeling objects. They realised that when explaining touchable objects to visitors with visual impairments that they may need to stay quiet at times so that the person exploring the object could have a chance to touch and listen separately.

DISCUSSION

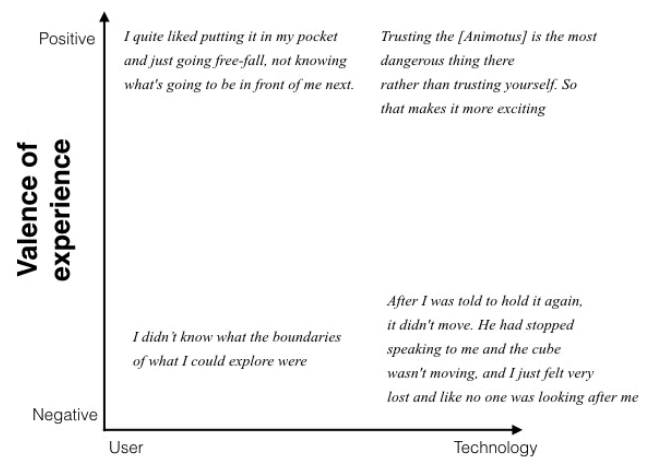
Our findings have shown how technology can have a role in mediating the taking and giving of control in immersive theatre productions. We particularly discussed control in three distinct aspects of such a production – during moving around or navigation, while exploring and in dividing the attention between the senses.

As discussed in [2], the experience left the audience with mixed reactions: some were able to take the potentially negative sensations and turn them into positive, novel experiences whereas for others they remained less enjoyable. Further, these emotions were elicited both when the user and the technology had control. Figure 5 explores these spectrums and presents examples of each scenario.

In terms of control in navigation it appears that for many of the sighted participants who felt uncomfortable in the space because they had lost a sense that they were used to relying upon, they were highly reliant upon the device and welcomed the fact it took control over their navigation, and were thus annoyed when it did not provide the strict guidance that it promised. Others however, resented the lack of agency they had over their own movements. A sense of exploration is key in immersive theatre settings [25]. Despite offering the same level of guidance to all participants, the Animotus appeared to be able to both facilitate and inhibit this sense.

Participants similarly had mixed reactions to the amount of control during exploration during the performance. The transitions between using technology, and relying on self-

guidance presented both opportunities, and causes for concern for participants. These transitional moments did not solely involve the physical process of switching technology, but represented a shift in control over one’s own personal journey. For some, this was a welcome shift: they wanted the freedom to explore this novel space without constraint. However, for others these transitions of control were disconcerting: either they were unable to fully transition from obeying to exploration, or they felt unnerved when the control that they expected was not there to support them. Uncertainty when using technology has been noted in previous immersive experiences [5] and is sometimes seen as a positive. Alston comments on this ambiguity as a negative aspect of immersive theatre however, stating that the imbalance of experience in such circumstances *“exacerbates inequalities”* [2]. Whereas technology had the opportunity here to create equivalent but not replicated experiences for all audience members, it was still possible for inequalities to arise.



Location of control

Figure 5. Example reactions to the differing levels of control, audience members experienced both positive and negative reactions to both levels of control.

These transitions of control also need to be carefully choreographed in order to ensure that these “seamful” moments [8] are positive or worthwhile experiences for the participant. In some instances, the control shift was welcomed, whereas for others this transition needed to be better defined and smoother in order for the participants to remain fully engaged in the experience around them.

The findings during this research suggest an interesting artistic use of control transitions with technology: it is possible that these transitions could be used consciously to create other narrative effects. For example, the sudden lack of control can create a feeling of loneliness, or a transition to a highly controlled state might evoke feelings of oppression and captivity. This work suggests that similar sensations that are created by actors in immersive theatre works can also be evoked by technology. That the Animotus at once appeared trustworthy and then

occasionally stopped guiding its user created a similar level of broken trust as found in Ontroerend Goed's *Internal* (as reported in [2]) where performers elicit information from trusting audience members only to then broadcast this information to the group without explicit permission.

This research also highlighted that participants' control of attention on technology in immersive theatre settings can be problematic. Whether they are aware of it or not, participants may ignore certain sensory inputs in favour of others. This raises potential issues for future use of technology in this context: in multi-modal experiences, participants may need assistance in focusing on elements considered important by directors. If, for example, a key part of the narrative was being conveyed by audio technology, other haptic or visual technology may need to cease for the duration. However, if there is no such narrative constraint on a piece, the participants' tendency to exclude some sensory information may just add to the personalised experience that each participant receives during an immersive theatre performance: they can create and control their own individual narrative path.

Alternating between giving the participants freedom and taking control therefore can have a powerful effect upon their experience. The removal of control can be a positive experience for participants in immersive theatre – allowing them the chance to completely trust in a piece of technology that apparently knows better than they do, which can lead to a novel and exciting experience and can allow relationships with technology that would not occur in the real world.

Yet this sensation comes as part of a contract between the participants and those creating the performance. The participants relinquish control over their own journeys and in return expect a level of care. Whereas an apparently malfunctioning piece of technology can often be dealt with with little emotional toll by users in other situations, in an immersive theatre performance such an instance becomes a more worrying proposition. Any confusion in how the technology should be used, or any sign that the technology may be broken can instill concern and a sense of vulnerability in the participants. This could be used to dramatic effect, but in situations when that is not the intended outcome, the technology (and its creators) have a responsibility to convey a sense of certainty to the users.

This research has also highlighted the careful balance that needs to be achieved when presenting multimodal experiences to participants. A rich sensory environment can create a rich immersive experience for those walking through it, but does not guarantee that they will engage fully with every aspect of it. This may not be problematic, however when a particular message or interaction is particularly key for the performance, control may need to be taken from the participants to guide their attention.

We have shown that technology can help in creating an exciting, immersive experience, and what is more can be

done without the aid of visual stimuli which is commonly the case in similar performances. In addition to this, we have highlighted an area of interest for creative teams aiming to use technology as a key part of future performances. It is important to ask questions about control in the performance. Can lessons be learned from the multitude of ways we use technology for navigation – should participants be given the choice between handing over full control or simply using technology as an assistant? How much do the participants in a performance need to know about the boundaries when exploring? Do participants need guidance in picking out the most important elements in a multisensory interaction?

This research has highlighted the dramatic role of technology in these settings. Every decision that is made can have a significant impact upon the narrative of the performance. Technology is not simply easy or difficult to use, successful or unsuccessful, but can be controlling, helpful, thrilling, ignored, overbearing, supportive, uplifting; all of which can ultimately contribute to the way participants experience immersive theatre.

CONCLUSION

This exploration of technology in an immersive theatre setting has shown how important it is to consider where control lies in a performance. Whereas experiences that involve live actors have the opportunity to adapt and reassure audience members as necessary, for technology with a pre-set range of interactivity, such adaption is not possible. Alternating control in immersive theatre performances between the participants and the technology around them has the ability to add dramatically to the experience – leaving people feeling empowered or alone. But when such an experience is not required, it is important that creative teams carefully choreograph the interactions, or else the participants may either retreat into themselves, thus missing key elements of the event, or may rebel against it, causing potential issues for others.

This area is an exciting stage for technology – audiences become participants and can explore surreal and novel new worlds in more embodied ways than traditional theatre experiences. In order to ensure the ideal immersive experience, creative teams need to take control over control.

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