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Master's Thesis
Academic Year 2014

Surreal Interactive Movie System S.I.M.S: Enhancing Viewer Immersion With Natural Action and Behavior -Based Interactions in Real Space Environments

Graduate School of Media Design,
Keio University

Roosa E. Jokiaho

A Master's Thesis

submitted to Graduate School of Media Design, Keio University

in partial fulfillment of the requirements for the degree of

MASTER of Media Design

Roosa E. Jokiaho

Thesis Committee:

Professor Naohisa Ohta	(Supervisor)
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Abstract of Master's Thesis of Academic Year 2014

Surreal Interactive Movie System S.I.M.S: Enhancing Viewer Immersion With Natural Action and Behavior -Based Interactions in Real Space Environments

Category: Design

Summary

Adding interactive elements into media enjoyment has always been of great interest to mankind, giving birth to all kinds of different forms of media. Regardless of this, through the years the cinema experience has remained as a fairly passive experience. The aim of this research is to design a new approach to interactive cinema, called Surreal Interactive Movie System (S.I.M.S), which takes advantage of the real space where it is shown by mixing reality with its movie content and offers meaningful interactions through natural actions and behaviors. Through the use of these elements the world of the movie is brought into the spatial environment the viewer inhabits, enhancing their immersion. The evaluation of S.I.M.S focuses on viewer enjoyment, if the experience made them feel they are part of the story and the effectiveness of implemented elements. Two prototypes were tested, of which the first was evaluated with the quantitative method, and the second with qualitative methods.

Keywords:

Interactive Cinema, Natural Interaction, Using Real Space, Mixing Content and Reality, Viewer Immersion

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1. Introduction

This section delves into the background and motivation that served as the starting point for the research discussed in this thesis and the goal that it helped shape for it. The structure of contents in this thesis will also be explained in the thesis overview included in this chapter.

1.1. Motivation

To make the enjoyment of any form of media into an active experience interaction is very necessary. Video games, the most active form of mainstream media, use it as their core element and everything else is built around it to make an interesting whole. Having previously studied game development and spent countless hours, days and months learning about the intricacies of video games and their structure, has ensured interaction as something personally viewed as being of great importance. Because of this, getting the opportunity to experience Nomadic Cinema in Tokyo International Film Festival (TIFF)[1] in 2012, provided much inspiration on how interaction could be also used in the field of cinema, which is traditionally a passive unalterable form of media entertainment. While Nomadic Cinema did not allow altering the storyline in any way, it did offer a few different ways on how you could interact with watching the movie, such as triggering and watching a scene on a phone given to you prior to the experience or listening to a character's voice message through the phone as well. These interactions were seen as a good start in an interesting direction, but there is still much more unused potential in how far it could be taken.

[1] "10/26（金）午後 5 時～午後 9 時　六本木ヒルズで開催！NOMADIC CINEMA　～六本木の街を、映画館に変える～," Accessed June 15th 2014, http://2012.tiff-jp.net/news/ja/?p=12141.

This inspiration led to noticing how interaction is increasingly becoming a part in many kinds of media in addition to just video games. It has already surfaced even in literature of which Cathy's Book[2], a book published in 2006 that allowed you to look for clues on Cathy's disappearance outside the pages of the book itself, is a good example. Some steps towards interaction in cinema have been taken, such as the introduction of IMAX, but works that actually do let the viewer alter the story in some way have either become much more game-like or have just not been feasible for implementation in mainstream media entertainment. It is felt though that the desire to affect and alter narratives does exist in the general public, as many times such comments are heard as *"that story should have ended differently"* or *"it shouldn't have been that character who made it"* among other similar remarks during social outings, in social media or even in articles.

1.2. Goal

Much work has already been done in the field of interactive cinema over the years and interest in movies with alterable content has been around from the mid 1900's. The matter has been approached from different perspectives, of which works bordering on virtual reality seem to be most common, where viewers can act and interact in a virtual world in order to progress in a narrative giving them a very similar experience to what you can encounter in a video game. While bringing the viewer into the virtual world is much more common than utilizing the real space in which the content is shown, some endeavors to approach interactive cinema from that perspective also exist. These works use the space in various ways to expand the cinema experience to reach outside of the screen as well, but rarely do they try to bring the

[2] "Cathy's Book," Accessed June 15th 2014, http://www.cathysbook.com/.

world of the narrative into the real spatial environment that the viewer inhabits.

The goal of this paper is to suggest a new approach to interactive cinema that takes advantage of the real space in which it is shown and provides meaningful interactions through natural behaviors and actions. Through the use of these elements the experience would enhance the viewer's immersion into the movie narrative and its world making them feel like they are an essential part of the story. The suggested approach is also meant to be easily adaptable to different kinds of places, thus not requiring any specific venue but instead enabling it to be setup in every day life locations and possibly enjoyed in the midst of every day life.

Ideally in time it could claim its place in the midst of mainstream media and could be enjoyed by everyone, but that is beyond the scope of this thesis.

1.3. Thesis Overview

This paper starts out with explaining in Chapter 1 the background for motivation of this particular research, what the goal of this research is and also an overview of the structure of the whole thesis. In chapter 2 related works are scrutinized from three different perspectives: interaction, use of real space and immersion and of each three examples that are deemed very relevant for this research are presented followed by their shortcomings and potential new ground to be covered. Chapter 3 focuses on the forming of the S.I.M.S concept and then the S.I.M.S design based on the results of a conducted preliminary experiment. This is followed by the design of the first prototype and the final prototype of S.I.M.S and their evaluation and analysis of results in Chapter 4. Chapter 5 brings it all together in the conclusion for discussion of results and possible future work.

2. Literature Review

This section has been divided into three categories that have been deemed as the most important elements for the research done in this thesis. The three categories are *interaction*, *using real space* and *immersion* and each category will cover works that emphasize that particular element.

It is also worth mentioning that the interaction referred to in this paper is physical interaction, in which the participant has to actively interact with a media object. As Manovich[3] explains not all interaction is physical, as all psychological processes triggered by image and text are and should also be considered as interaction. Manovich[4] continues to say that nowadays with the emergence of so-called interactive media, it is a common mistake to consider all interaction to be physical, which is why it is good to clarify that for the purpose of this research the most relevant form of interaction is of the physical kind.

2.1. Interaction

The corner stone of making a movie interactive is by having the narrative be alterable in some way. This is achieved by taking advantage of a database and as Weiberg[5] explains, it allows jumping from one position in the movie to another, thus breaking the linearity of the content. Manovich[6] refers to a very early work, Vertov's "Man with a Movie Camera" from 1929, as the first database film to be made, but while it did utilize a database it was not

[3] Lev Manovich, *The Language of New Media* (California: MIT Press, 2001), accessed May 15th, 2014, http://www.manovich.net/LNM/Manovich.pdf.
[4] Lev Manovich, *The Language of New Media*.
[5] "Beyond Interactive Cinema," Last Modified August 2002, http://keyframe.org/txt/interact/.
[6] Lev Manovich, *The Language of New Media*.

interactive, since the order of the scenes was determined by someone before it reached the viewers.

One of the first applications of this kind of approach that included interaction was the "Aspen Moviemap" produced at MIT in 1978, which allowed you to navigate through video footage of Aspen, Colorado, in a way that it seemed like you were driving through the city by your own desired route[7]. While the "Aspen Moviemap" utilized the database approach and contains movie content, it lacks a narrative. Weiberg[8] claims that the challenge of this approach is to use it in lieu with cinematic narration and not sacrifice the narrative. The use of a database has been used for heavily narrative movie content later, of which a more recent example is the Canadian Film Centre (CFC) Media Lab's "Late Fragment."[9]The film allows the viewer to decide which character's storyline to follow by pressing "Enter" on the remote controller at the appropriate times. The system, however, is not very refined as missing the moment to press the button might result in the viewer having to loop the previously watched scene or scenes. While this kind of system does allow a good basis for interaction, relying purely on it does not make for a very sophisticated interactive cinema experience.

On the other end of the spectrum are interaction-focused works such as "AlphaWolf"[10], which was presented as part of SIGGRAPH 2001. In "AlphaWolf," the participant got to control the actions of a virtual wolf by use of a microphone and a mouse, while the wolf remains in autonomous control of its emotional behavior. The virtual wolves also were capable of building social relationships to each other. Tomlinson et al.[11] observe that this approach of creating a relationship between the participant and the wolves

[7] "Aspen Moviemap," Accessed May 15th, 2014, http://www.naimark.net/projects/aspen.html.
[8] "Beyond Interactive Cinema."
[9] "Late Fragment," Accessed May 15th, 2014, http://latefragment.com/.
[10] Bill Tomlinson et al., "Leashing the AlphaWolves: Mixing User Direction with Autonomous Emotion in a Pack of Semi-Autonomous Virtual Characters" (in Proceedings of the 2002 ACM SIGGRAPH/Eurographics symposium on Computer animation, pp. 7-14. ACM, 2002).
[11] Tomlinson et al., "Leashing the AlphaWolves: Mixing User Direction with Autonomous Emotion in a Pack of Semi-Autonomous Virtual Characters."

played a huge role in enhancing the immersion of the participants in this kind of interactive experience.

Similar kinds of work to "AlphaWolf" have been created in the nineties by media artist Luc Courchesne, who played around with having the viewer engage in conversation with the characters of his work [12]. With his installation, "Landscape One", however, he played with the notion of having a more movie-like structure similar to the database films combined with the stronger interaction. He did this by adding the effect of having the viewer be in the same space as his characters by projecting a 360º park landscape on four wall, making the viewer feel like they were in the park themselves and having them proceed through the park, and consequently proceed through his narrative, by interacting with the characters in his content. As Rastas[13] explains in his article, the viewer could choose from a specific set of lines how to engage a character in conversation either by voice or touch and depending on the choices made the characters might lead you somewhere or leave you abruptly. Without creating a relationship with a character, the viewer is not able to move in the park space, thus making the park not only a place but also filling it with deeper meaning through the way characters move through it as claimed by Gagnon[14].

While interaction-focused works like "AlphaWolf" and "Landscape One" offer very exciting opportunities for building relationships with virtual characters and give good insight on how to make meaningful interactions, they lack in having a deeply narrative content, which from the cinema experience point of view is a very important element in building diegetic immersion.

[12] "Indepth Arts News: 'LAST CHANCE! Luc Courchesne: Landscape One, Interactive video panarama'," Accessed June 2nd, 2014, http://www.absolutearts.com/artsnews/1999/07/13/25602.html.
[13] "Indepth Arts News: 'LAST CHANCE! Luc Courchesne: Landscape One, Interactive video panarama'"
[14] "Luc Courchesne: Paysage n° 1 (Landscape One)," Accessed June 2nd, 2014, http://www.fondation-langlois.org/html/e/page.php?NumPage=127.

2.2. Using Real Space

While the examples discussed in the previous section focused on the interactions above anything else, there have been endeavors to also take advantage of the space in which the narrative is shown, expanding the experience outside of the screen. This kind of approach is generally called expanded cinema.

Činčera's "Kinoautomat [15] " from 1967, which is considered the first interactive film ever made and is the most referred work in research concerning interactive cinema making it one of the most important examples for this research. "Kinoautomat" not only used a database and viewer input, but also strived to expand the cinema experience by adding a live performance element thus making it also one of the earlier attempts on expanded cinema as stated by Hassapopoulou[16]. Two actors would at certain decisive points in the story pause the film and prompt the audience to make a choice by pressing one of two buttons after which the story would proceed according to majority vote. Similar experiences based on majority vote have been made more recently as well, and even "Kinoautomat" itself was restored by Činčera's daughter Alena Cincerova in 2006-2007. As Weiberg[17] points out though, this kind of approach is not economically very feasible, due to not only all the additional footage required but also for the cinemas requiring special equipment to play films like these. Due to these reasons such a trend in interactive cinema experiences has never caught enough fire to become mainstream.

[15] "Kinoautomat," Accessed May 16th, 2014, http://www.kinoautomat.cz/.
[16] Marina Hassapopoulou, "Interactive Cinema from Vending Machine to Database Narrative: The Case of Kinoautomat" *Screening the Past* 10 (2013). Accessed May 16th, 2014, http://www.screeningthepast.com/2013/10/interactive-cinema-from-vending-machine-to-database-narrative-the-case-of-kinoautomat/.
[17] "Beyond Interactive Cinema."

During the same year, in 1967, a different approach to expanded cinema was tried out by the National Film Board of Canada[18] with their Labyrinth Project. "Labyrinth" portrayed a story of confronting the beast within yourself, inspired by the Greek myth of Theseus and Minotaur, by the use multiple screens with varying placements and making the viewer walk from one place to another to experience the whole narrative. With these techniques the viewer was made to engage with the story and experience more actively as noted by Whitney[19], even if the experience contained no physical interactions and the viewer could not affect the story itself. Smith[20] claims that the powerful relationship with the space created by some of the scenes of "Labyrinth" created so strong sensations for the viewers that it was feared to induce dire negative emotions in them, which fortunately was not the case. This approach to cinema was predicted to take the world by storm and therefore one of the creators of "Labyrinth", Kroitor, wanted to develop the multiscreen format further by founding Multiscreen Corporation, but instead in 1979 he shifted his focus and the company ended up becoming IMAX, as mentioned by Smith[21].

IMAX does not incorporate multiple screens like "Labyrinth," but it is good to be aware that it did start out as something supposed to use multi-image technology as Whitney[22] points out. IMAX did not continue down that path either however, but rather focused on playing with the notion of using the human perception as a framing device by using such a sizeable screen that it fills your whole vision and thus enhancing the viewer's immersion. Recuber[23] even goes as far as to saying that all the technology utilized in the 3-D IMAX

[18] "National Film Board of Canada," Accessed May 16th, 2014, https://www.nfb.ca/.
[19] Allison Whitney, "Labyrinth: Cinema, Myth and Nation at Expo 67" (MA diss., McGill University, 1999).
[20] The Labyrinth Project," Accessed May 16th 2014, http://preview.instantcinema.org/expandedcinema/1439.
[21] "The Labyrinth Project.
[22] Whitney, "Labyrinth: Cinema, Myth and Nation at Expo 67."
[23]Tim Recuber, "Immersion Cinema: The Rationalization and Reenchantment of Cinematic Space" *Space and Culture* 10 (2007): 315-330, accessed June 2nd, 2014, doi: 10.1177/1206331207304352.

these days changes the viewer into a cyborg, who is plugged into the film rather than just watching it.

So even though the approach of such important cinematic works as "Kinoautomat" and "Labyrinth" were quite different, they both encompass the main notion of expanded cinema, which according to Smith[24] is to take advantage of and use the spatial environment in which the work is shown. IMAX on the other hand, while it does not literally expand into the space, but still uses the space to its advantage subtly. Also, while all three approaches introduce a way to make the audience actively participate in the cinema experience in some way, the experience still remains somewhat, if not mainly, passive.

2.3. Immersion

Another way of approaching interactive cinema is through immersion. The works focusing on this aspect tend to intermingle with the field of virtual reality or even video games.

Whereas works such as "AlphaWolf" and "Landscape One" provide a good insight on advanced interaction as mentioned before, Nakatsu et al.[25] claim that those kinds of work that focus on building a relationship with a character cannot be considered to be anything alike to an interactive movie due to being short in duration and having no constructed narrative. Through their "Interactive Movie System with Multi-person Participation and Anytime Interaction Capabilities" Nakatsu et al.[26] wanted to bring these strong interaction elements between the audience and characters together

[24] "About Expanded Cinema," Accessed May 16th, 2014, http://preview.instantcinema.org/expandedcinema/.
[25] Ryohei Nakatsu, Naoko Tosa and Takeshi Ochi " Interactive Movie System with Multi-person Participation and Anytime Interaction Capabilities" (paper presented at the 6th ACM International Conference on Multimedia '98, Bristol, England, September 12-16, 1998).
[26] Nakatsu, Tosa and Ochi " Interactive Movie System with Multi-person Participation and Anytime Interaction Capabilities."

with a branching storyline in order to create a very complete interactive movie experience and believed this to be only achievable with the use of virtual reality and by allowing more than one person to participate at a time. For interaction they used voice and emotion and also gesture recognition and allowed interaction to happen at any time. While Nakatsu et al.[27] still considered interactive movies to deviate from video games greatly due to claiming the interactions in video games happen only by pressing buttons, nowadays, brought along by the new era of gaming pioneered by the likes of Nintendo Wii and Microsoft Kinect, a gaming experience can be considered to be very similar as what is provided by the "Interactive Movie System with Multi-person Participation and Anytime Interaction Capabilities."

Going deeper into the field of video games one can find out that, interestingly enough, just as Nakatsu et al.'s[28] "Interactive Movie System with Multi-person Participation and Anytime Interaction Capabilities" is very similar to the gaming experiences that are commonplace presently, the term *"interactive movie"* itself seems to be more commonly associated with video games with strong cinematic content rather than cinematic content with some video game -like interactions as mentioned by Veale[29]. Games such as "Dragon's Lair" (1983), which contained purely animated content instead of the usual sprites, "Star Wars: Rebel Assault" (1993), which showed clips from the actual Star Wars movies in between gameplay and "Heavy Rain" (2010), which is strongly story-driven and very realistic, are considered to be in the category of *"interactive movies."*

If we look at works with a focal point on virtual reality, a good example would be the CAVE system that provides good basis for visualization and

[27] Nakatsu, Tosa and Ochi " Interactive Movie System with Multi-person Participation and Anytime Interaction Capabilities."
[28] Nakatsu, Tosa and Ochi " Interactive Movie System with Multi-person Participation and Anytime Interaction Capabilities."
[29] Kevin Veale, ""Interactive Cinema" Is an Oxymoron, but May Not Always Be" *The International Journal of Computer Game Research* 12 (2012): Issue 1. Accessed May 15th, 2014, http://gamestudies.org/1201/articles/veale.

simulation as stated by Ohno and Kageyama[30]. Through the use of stereo glasses and a three-button device and the tracking process implemented within both objects, you feel as you are in the virtual world created by the CAVE system and can interact with virtual objects with your device. While CAVE is definitely purely a virtual reality system, there is also the AVIE[31] system, which aims to provide interactive immersive narrative experiences that can be experienced by up to 20 viewers at once. These two systems share many common elements such as interaction through a tracking system and a 360º theatre, one being a box and the other a cylinder, there are some differences as well. As explained by Pape[32], the CAVE system allows multiple viewers simultaneously, it works with the principle of having only one active user while the others are passive viewers, whereas the AVIE system seems to permit multiple users to interact as gathered from the description of the system by McGinity et al.[33] These kinds of systems are viewed as excellent tools for simulations and are often used for such.

A different way of enhancing immersion for the viewers could be seen in the "Space Child Adventure: Grand Odyssey,"[34] shown at the EXPO 2005. By the use of Futurecast, the faces of the viewers are captured by a 3D scanner and rendered instantly to be implemented as the faces of the characters in the movie, creating a surreal experience of watching another you playing a part in the story even if the viewers could not actively enter the world of the story themselves.

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[30] Nobuaki Ohno and Akira Kageyama. "Introduction to Virtual Reality Visualization by the CAVE system." in *Advanced Methods for Space Simulations, edited by H. Usui and Y. Omura* (Tokyo: TERRAPUB, 2007), 167-207.
[31] Matthew McGinity, et al. "AVIE: a versatile multi-user stereo 360 interactive VR theatre." (In Proceedings of the 2007 workshop on Emerging displays technologies: images and beyond: the future of displays and interacton, p. 2. ACM, 2007).
[32] "The CAVE : A Virtual Reality Theater." Accessed May 15th, 2014, http://www.evl.uic.edu/pape/CAVE/oldCAVE/.
[33] Matthew McGinity, et al. "AVIE: a versatile multi-user stereo 360 interactive VR theatre."
[34] "Expo 2005 Aichi Japan," Accessed May 20th, 2014, http://www.expo2005.or.jp/ml/en/08/.

2.4. Summary of Issues

As it can be seen from the examples of related works discussed, there has been interest in interactive cinema for a very long time and it has been approached in many different ways. There is still, however, more possibilities and unexplored regions that could be looked into, and that is what this thesis aims to do.

To aid in determine what is currently missing, let's look at interaction and using the space first. Determining the use of space is a simple matter, either the work takes advantage of its surroundings and brings the world of the narrative into the spatial environment the viewer inhabits or it does not and might rather focus on bringing the viewer into the screen by means of virtual reality, but the matter of interaction is more complex. For the focus of this research let's look at interaction on a spectrum starting from controlled interaction, where the viewers are in complete control of the interactions and know exactly how what they are doing is affecting the content, to natural actions and behaviors, where the viewer triggers interactions by behaving normally or by doing every day life actions thus retaining an element of surprise with what the viewer causes to happen and how.

In order to gain a better understanding of previous trends in the field of interactive cinema, the works discussed in this section have been mapped according to their characteristics on two axes: one regarding space that spans from using real space to virtual reality, and the other regarding interaction spanning from controlled interaction to natural interaction. At the cross point of the axes neither usage of space or interaction is implemented, resulting that to be where a normal cinema experience, in other words movie, would be located.

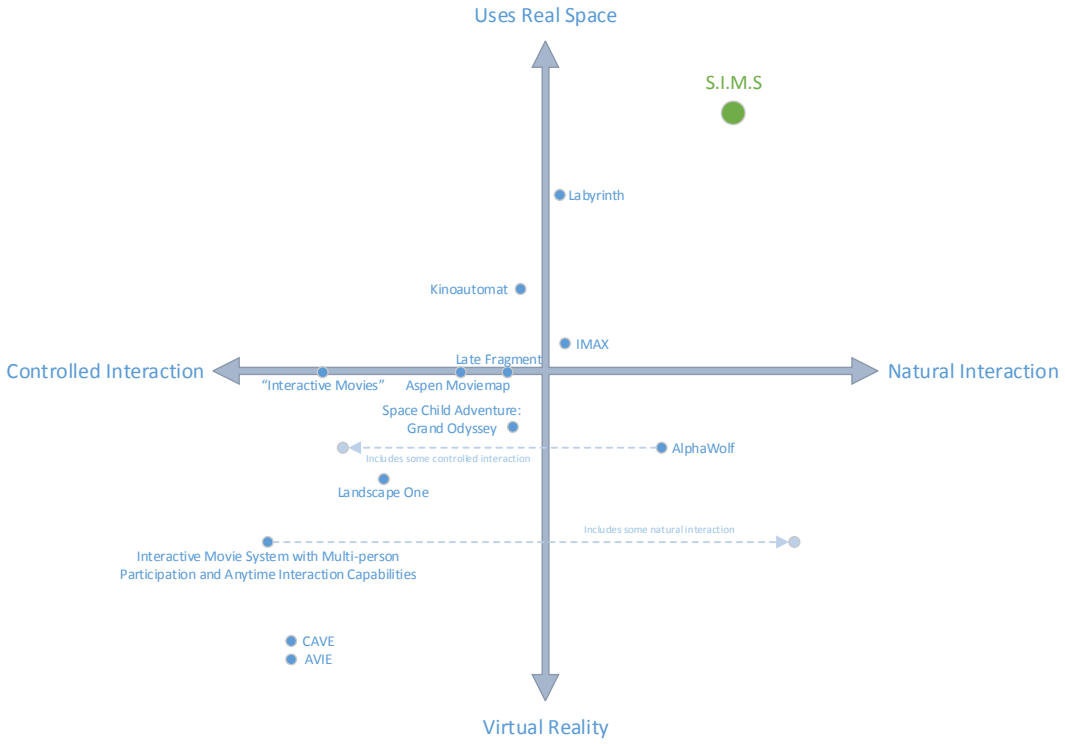

Figure 2.1: Use of space and interaction axis diagram

As can be seen from the above figure, none of the works discussed seem to venture very deep into combining using real space and using natural interactions. This kind of approach of combining the "real" and the "imagined" is called *thirdspace*, a term coined by Edward Soja in 1996 and it is what Recuber[35] envisions as the ideal potential that immersion cinema could reach by taking advantage of physical space. Recuber[36] criticizes current approaches, such as IMAX, for being very passive experiences that only create the illusion of interaction and immersion and claims no one is trying to reach the ideal. While some of the works discussed earlier, namely "Kinoautomat" and "Labyrinth," did expand into physical space in various ways, one of their biggest issues was the fact that both were tied down to

[35] Tim Recuber, "Immersion Cinema: The Rationalization and Reenchantment of Cinematic Space," 315-330.
[36] Tim Recuber, "Immersion Cinema: The Rationalization and Reenchantment of Cinematic Space," 315-330.

specific locations, "Kinoautomat" to cinemas with special equipment and "Labyrinth" to the particular venue it was built for, S.I.M.S is meant as an easily adaptable system that can be used essentially anywhere. S.I.M.S would also like to challenge this issue posed by Recuber concerning the ideal he envisioned, by creating a new kind of experience that mixes reality with the movie content by taking advantage of the space and by utilizing natural interactions related to the movie content and space, thus bringing the interactive cinema towards the so-called *thirdspace*.

While using real space and natural interactions are of great importance in the S.I.M.S approach, the cinematic narrative content should not be neglected. It is with those three fundamental elements that S.I.M.S aims to create a unique experience of immersion for the viewer. To understand in more detail what kind of immersion S.I.M.S aspires to achieve, let's start by looking at the reason for why the term *"interactive movie"* is currently associated with video games rather than cinema. The explanation seems to lie in the common presumption we have of cinema immersion. Veale explains this in a very clear manner:

> *"The experience of cinematic texts is defined, in part, by the audience's lack of ability to alter events unfolding within the film's diegesis. In comparison, the experience of videogames is tied inextricably to the player's investment and involvement within the game's textual diegesis, and within a Heideggerian world-of-concern."* [37]

While, as Veale [38] states, cinematic texts are traditionally viewed as something the audience lacks the ability to alter nor deeply involve themselves in, Taylor[39] points out at that in video games on the other hand,

[37] Kevin Veale, ""Interactive Cinema" Is an Oxymoron, but May Not Always Be."
[38] Kevin Veale, ""Interactive Cinema" Is an Oxymoron, but May Not Always Be."
[39] Laurie N. Taylor, *"Video Games: Perspective, Point-of-View, and Immersion*" (MA diss., University of Florida, 2002).

in addition to acting within the game space (intra-diegetic immersion), require the players to first immerse themselves into the game in the same way as they would to a movie (diegetic immersion). While games are already using both forms of immersion and taking steps to embrace diegetic immersion even more firmly of which "Heavy Rain" is a fine example, cinema should be able to do the same towards absorbing qualities associated with intra-diegetic immersion.

This kind of intra-diegetic immersion can already be seen in virtual reality experiences, such as Nakatsu et al.'s[40] interactive movie system or with the use of CAVE, but it can also happen in real space as is shown to us by the theme park experience. McGuire et al.[41] describes that a theme park is something you experience with all your senses - you become part of that fantasy land, instead of just observing it from the outside, through all the stimuli provided to you by the architecture, the people and the general atmosphere.

One of the aims of this research is to implement the intra-diegetic immersion that Taylor mentions as part of the video game experience into the S.I.M.S interactive cinema experience by means of using real space, natural interactions, while maintaining the diegetic immersion traditionally found in cinema by means of a solid cinematic narrative. In order to achieve this sense of intra-diegetic immersion that requires active participation from the viewer and the illusion of being in the space of the narrative as yourself, some characteristics from the theme park experience will also be adapted to S.I.M.S for it to have the potential to take advantage of real space more effectively, making it possible to categorize its immersion somewhere between earlier approaches to interactive cinema and the video games that

[40] Nakatsu, Tosa and Ochi " Interactive Movie System with Multi-person Participation and Anytime Interaction Capabilities."
[41] "GETTING A SENSE OF THE THEME: Immersion via the senses in Contemporary Theme Parks," Accessed June 5th, 2014, http://www.david-howes.com/senses/theme.pdf.

are considered to be *"interactive movies."* The following figure maps where the immersion provided by S.I.M.S would be envisioned to be.

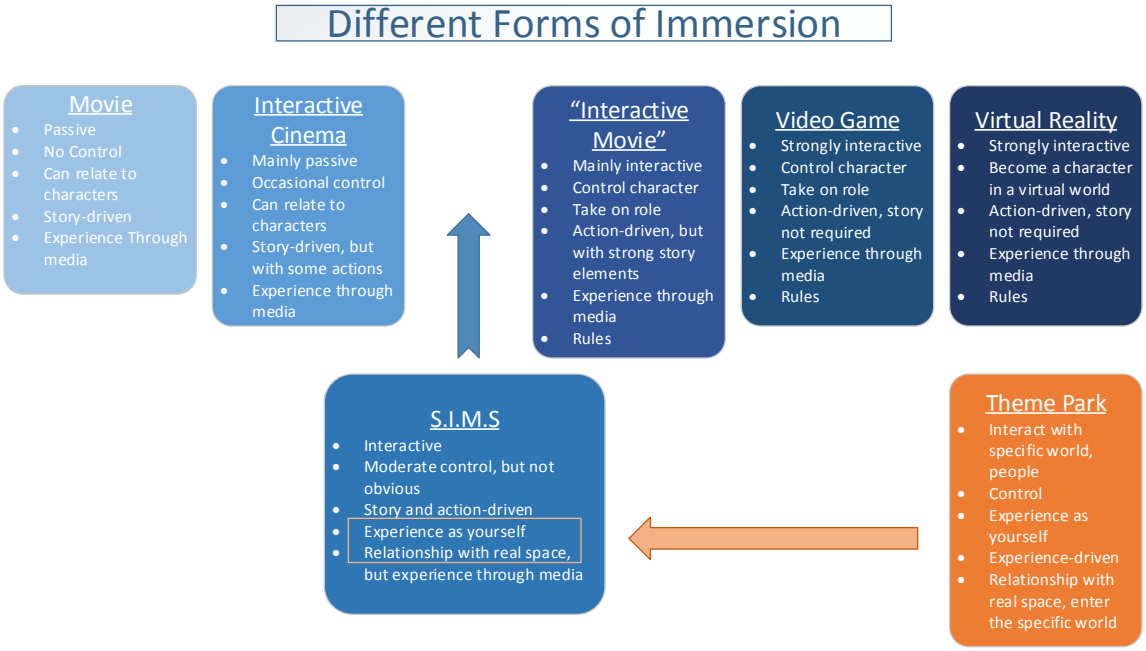

Figure 2.2: Different forms of immersion

As can be seen from the figure on immersion, there is a gap that could be filled between cinema immersion and video game immersion and that is what S.I.M.S aims to do by means of creating a relationship with real space and utilizing interactions in the forms of natural behaviors and actions, which is an approach that the other existing systems have not tried to harness as already shown in the figure on using space and interactions. It is believed that by this approach a new and exciting form of interactive cinema could be achieved.

3. S.I.M.S Concept and Design

Scrutinizing related works and existing literature in the field of interactive cinema led to the forming of the S.I.M.S concept. This section explains said concept and how the following preliminary experiment shaped it into the actual design of S.I.M.S and polished the hypothesis of this thesis.

3.1. The S.I.M.S Concept

The concept of S.I.M.S is to offer an interactive narrative that engages the viewer and blends with the every day life location. This is achieved by the use of a few certain elements corresponding to the S.I.M.S name.

The first important element in realizing the S.I.M.S concept is making the experience *surreal*. This means that there needs to be a relationship with the place where the cinematic narrative is shown, be it through a connection between the topic of the narrative and the place, having the narrative happen in that exact place, or by mixing the content with reality by means of the video content continuing into reality or vice versa. It is also good to mention that S.I.M.S does not require a specific kind of location; it is designed to be able to be setup and enjoyed in every day life places, be it inside or outside.

The second important element that is necessary for the S.I.M.S concept is it being *interactive*. This is achieved by the viewer interacting with objects related to the story or triggering changes in a natural way, through natural behaviors and actions.

The next core element is the *movie*. While much importance is placed on surrealism and interactivity, the quality of the cinematic narrative should not be compromised. It needs to be a coherent storyline that makes sense and proceeds smoothly regardless of it being alterable and contains a branching

narrative. The movie should provide a story that is able to make a compelling whole with the other previously mentioned elements by taking care of the diegetic immersion of the viewer while the surrealism and interactivity offer the intra-diegetic immersion.

Last but not least, there is also the element of the *system* itself. Behind the other three elements mentioned before, there needs to be a system behind them that keeps the whole interactive cinema experience together and running.

With these four elements in place, it is believed that a new kind of interactive cinema experience that immerses the viewers in an exciting and enjoyable way, which they would love to experience again and again, can be attained.

3.2. Preliminary Experiment

First a preliminary experiment was conducted to test the attractiveness and feasibility of the S.I.M.S concept. The findings of the experiment would then be used to help in determining the S.I.M.S design.

3.2.1. Initial Goal

The main purpose of the preliminary test was to determine if creating a relationship with the real space where the movie is shown would be effective in an interactive cinema experience and to test if the system for switching scenes through interaction would work. The preliminary test did not put much emphasis on the content of the story or interaction.

3.2.2. Implementation of Preliminary Experiment

The connection with the every day life place chosen for this experiment, a hallway in school, was created by having the content of the movie filmed at the exact location from the same perspective from which it was to be shown later. This created the surreal effect of having the hallway look exactly as it is in reality on the screen as well.

The interaction in this experiment was based on the number of people watching the story, showing different scenes of the narrative depending on if you were watching it alone or with another person or more. With this kind of interaction, the viewers could just naturally walk into the space of the interactive cinema experience to trigger the movie. In order to achieve this, a Microsoft Kinect was used to count the number of people present in front of it. The Microsoft Kinect was programmed to utilize the J2K-codec to enable highly accurate jumping from a specific frame to another when the specific set interactions occur.

The narrative was a glimpse into the love story of two high school students, showing various stages of their relationship with these three scenes:

- *First Encounter*. The two notice each other for the first time.
- *First Interaction*. The two have an awkward encounter when the girl trips and drops all her stationery on the floor and the boy appears to help her.
- *Kiss*. Lastly, a scene from when their love was already in full bloom and they share a romantic kiss in the hallway.

The topic of the narrative was chosen as thus, because as it was shown in a school hallway it was not impossible for something like this to happen in reality as well adding a magical romantic touch to realistic content.

The experiment was setup to use only one screen placed in the hallway where the footage was shot and a normal projector was used to display the movie. The Microsoft Kinect program did not allow for skipping of scenes while they were playing if an interaction occurred, thus eliminating the possibility of the story getting confusing. The interactions would only be picked up when the movie returned to a default scene. This experiment also did not contain sound. The system setup of the experiment can be seen in the figure below.

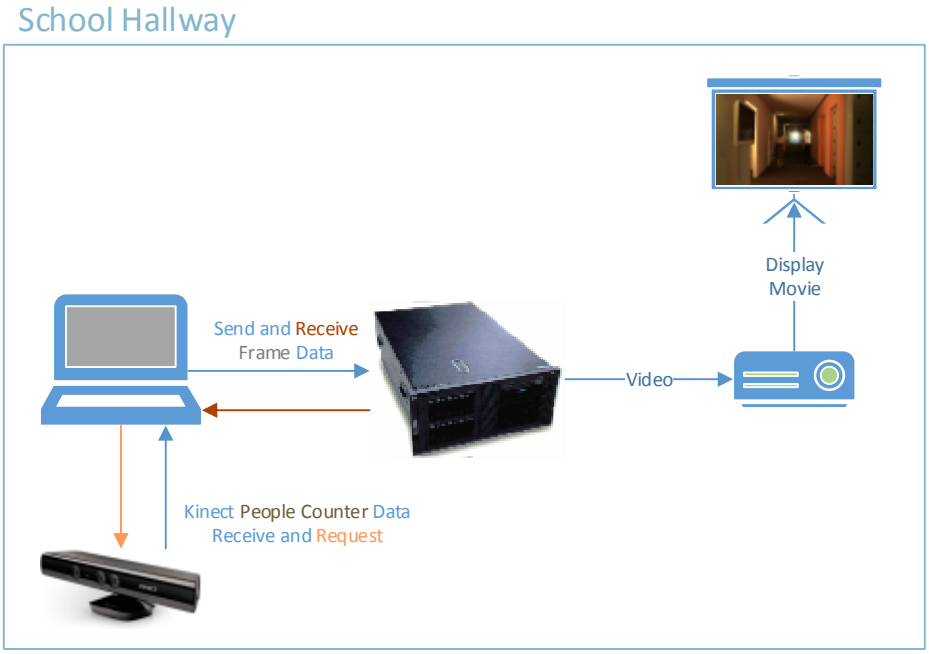

Figure 3.1: Preliminary test system diagram

3.2.3. Results and Problems of Preliminary Experiment

While the preliminary test showed that the system setup worked like it should and that the relationship with the place fascinated the viewers, mainly it worked as a good indicator of what needed improvement. The interaction was very unclear, as there was no relationship between what

affected the changing of scenes and the story. This left the viewers confused as to what they did, how they affected the content and why and made it impossible for them to feel like they were part of the story. The scenes being lengthy also added to the confusion, since the viewers had to wait for triggered scenes to end before a new interaction was registered. Using one screen was also found to be limiting, as having the viewer passively stand in one place for the whole experience restricted interaction possibilities and would require complex technical skills, if something more sophisticated was to be made.

Too much focus was also required in having the viewers located correctly in front of the Microsoft Kinect, as it would not pick up the viewers if they were standing too close to each other. This not only took away a significant amount of subtlety and smoothness from the interaction, but also caused viewers to miss the beginning of the scene they triggered due to their attention being in shuffling about.

Knowing these problems clarified the main new implementations that should be tried out in the first prototype, which were:

- Interactions should be based on clear actions
- The interaction should be relevant to the story
- The interactions should also be more natural
- Scenes should be shorter
- Multiple screens should be used
- Sound should be included

With these adjustments the immersion of the viewer should be enhanced and the interactions should be more exciting for the viewer.

3.3. S.I.M.S Design

The findings from the preliminary experiment led to the design of S.I.M.S. Due to the problems encountered in the experiment the system and experience setup was altered in a few ways.

The S.I.M.S design consists of multiple screens that allow by their placement for the viewer to have a feeling of actively making his or her way through the different parts of the story and also allows for opportunities to use interactions and take advantage of the space in more meaningful ways.

In order to be able to achieve clearer and more natural interactions with the first prototype, collaboration with Omron was initiated for their environmental sensors. These sensors are capable of sensing airflow, light, pressure, radiation, humidity and temperature. From those, pressure, humidity and temperature are difficult to take advantage of due to them being sensed from the overall environment and are thus hard to affect. Because of this, the most attractive sensing capabilities for implementation in S.I.M.S are airflow, light and radiation, as they can be instantly affected easily by the actions viewers take. The other three sensing capabilities could be used if certain general environment related conditions, such as it being a rainy day or a sunny day, would affect the movie content, but for the focus of this research such conditions are of not much relevance. While the Microsoft Kinect could doubtlessly be used to sense similar things as what the environmental sensors are capable of, it is felt that configuring it to do so would be highly complex. Due to that the Omron environmental sensors offer a much feasible solution, as these functions are what the sensors are made to do as a default.

The J2K-codec was also removed from the system setup in order to simplify it, as it was found out that there was no difference in the quality of scene switching when using the J2K-codec for it or doing the switching straight on

the laptop running the code. In fact, using the J2k-codec seemed to make the video playback slightly lagged when prompted to play scenes through the code for the environmental sensors.

The polished design of S.I.M.S ended up being as demonstrated in the following figure.

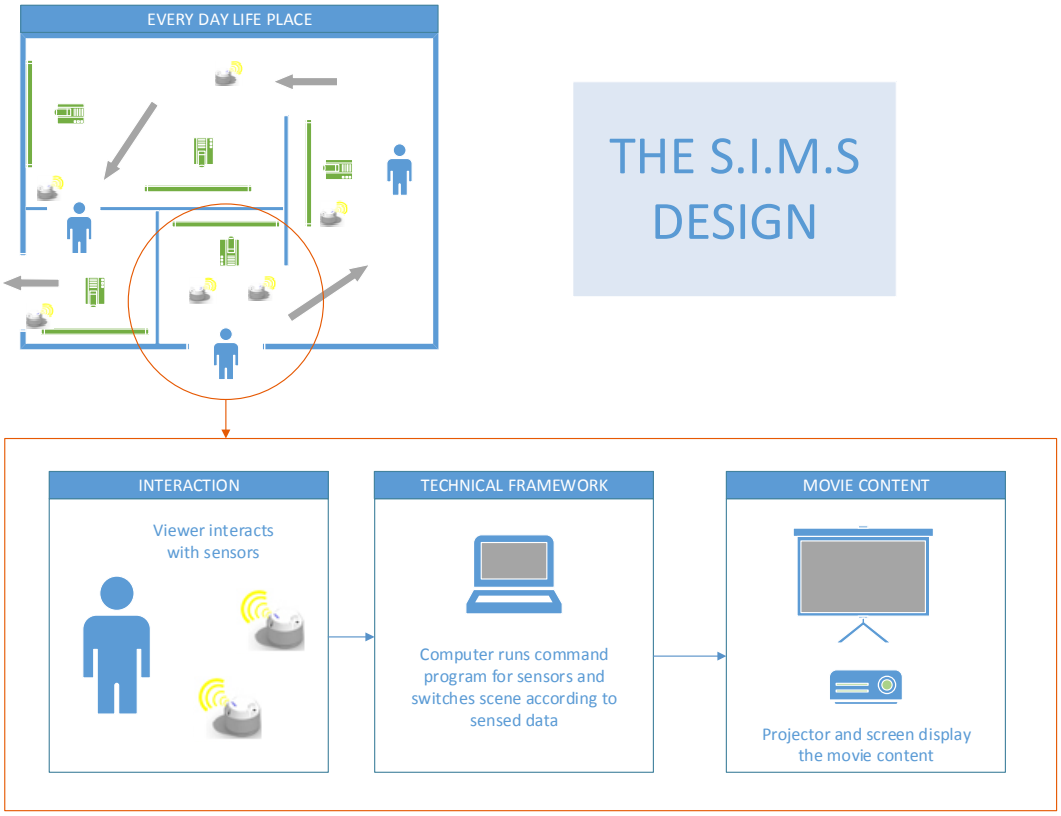

Figure 3.2: Diagram of S.I.M.S design

With this improved design, S.I.M.S is believed to be able to meet the goal of this thesis and offer a unique interactive cinema experience to viewers that enhances their immersion through the means of using an every day life location and taking advantage of what the space has to offer in order to mix reality with the content of the movie and also by using interactions based on the natural actions and behaviors of the viewer that also relate to the content of the movie.

4. S.I.M.S Experiments and Evaluation

In this section the design and evaluation of the two S.I.M.S prototypes are thoroughly discussed. The first prototype was made in accordance with what was found lacking from the preliminary experiment, while the final prototype was created to try out a few possible improvements that arose from the feedback received from the viewers who experienced the first prototype.

4.1. First Prototype: Alice in Wonderland

The first S.I.M.S prototype was tested in the space of a restaurant called Queen Alice, which led to the narrative content to be that of *Alice in Wonderland* for it to create a link with that specific space that could be easily understood by the viewers (see Queen Alice floor plan in A.1.). The first prototype was presented as part of the annual event called KMD Forum.

4.1.1. Design of experience and interactions

The first step in designing the first prototype was to pick suitable scenes from the *Alice in Wonderland* story that not only were of great importance in the story itself and thus were well-known by the public, but also presented good opportunities to implement meaningful interactions. While such scenes as Alice falling down the rabbit hole would have been very difficult to implement, the story presented other scenes such as Alice picking between a cake that says *"eat me"* and a drink that says *"drink me"* that were perfect for

bringing viewers on board to make decisions. After much elaboration, the scenes chosen to be used in the prototype ended up being the following:

- *Alice Follows Rabbit*. Alice follows the rabbit into Wonderland.
- *Eat Me/Drink Me*. Alice needs to choose between a drink that makes her shrink and a cake that makes her into a giant.
- *Tea Party*. A party for celebrating Alice's *"unbirthday"* party.
- *Good Queen/Bad Queen*. Alice encounters either the good white queen or the bad red queen.
- *Cheshire Cat*. The Cheshire Cat presents you with a riddle you need to solve in order to find your way out and leave Wonderland. (Detailed scene descriptions in A.2.)

All the scenes were made to be short and concise to support frequent interaction and help with coping with viewer flow. The exception to this being the *Tea Party* scene, which was a duration of nine minutes, as the content of that scene was not of much relevance for the experience as its only purpose was to loop in the background.

The reason for that was that the *Tea Party* scene served a special purpose. With that scene, the S.I.M.S *surreal* component of creating a relationship with the space was taken further than in the preliminary test by mixing reality with the movie content. The table of the party in the movie content was continued into the real space by placing a real table in front of the screen and a real person would be there to welcome the viewer to their own *"unbirthday"* party.

For the *interactive* component in *Alice in Wonderland* the airflow, radiation and light capabilities of the sensors provided by Omron were used. Using the sensors two main types of interaction were created - direct interaction, in which you will get instant feedback on what your actions caused to happen,

and more sophisticated interaction, in which the effect would only be revealed at a later point in the storyline.

The direct interaction was used for the *Eat Me/Drink Me* and *Cheshire Cat* scenes. In *Eat Me/Drink* Me the viewer is prompted to make the choice for Alice by picking up either the cake or the drink, both of which had a sensor hidden inside. The item picked up by the viewer would sense the radiation of their body heat and change the scene accordingly. In *Cheshire Cat*, the viewer is prompted to answer a riddle by choosing the right answer from a selection of objects. If they pick the right one, the sensor used would be exposed to light and trigger a new scene.

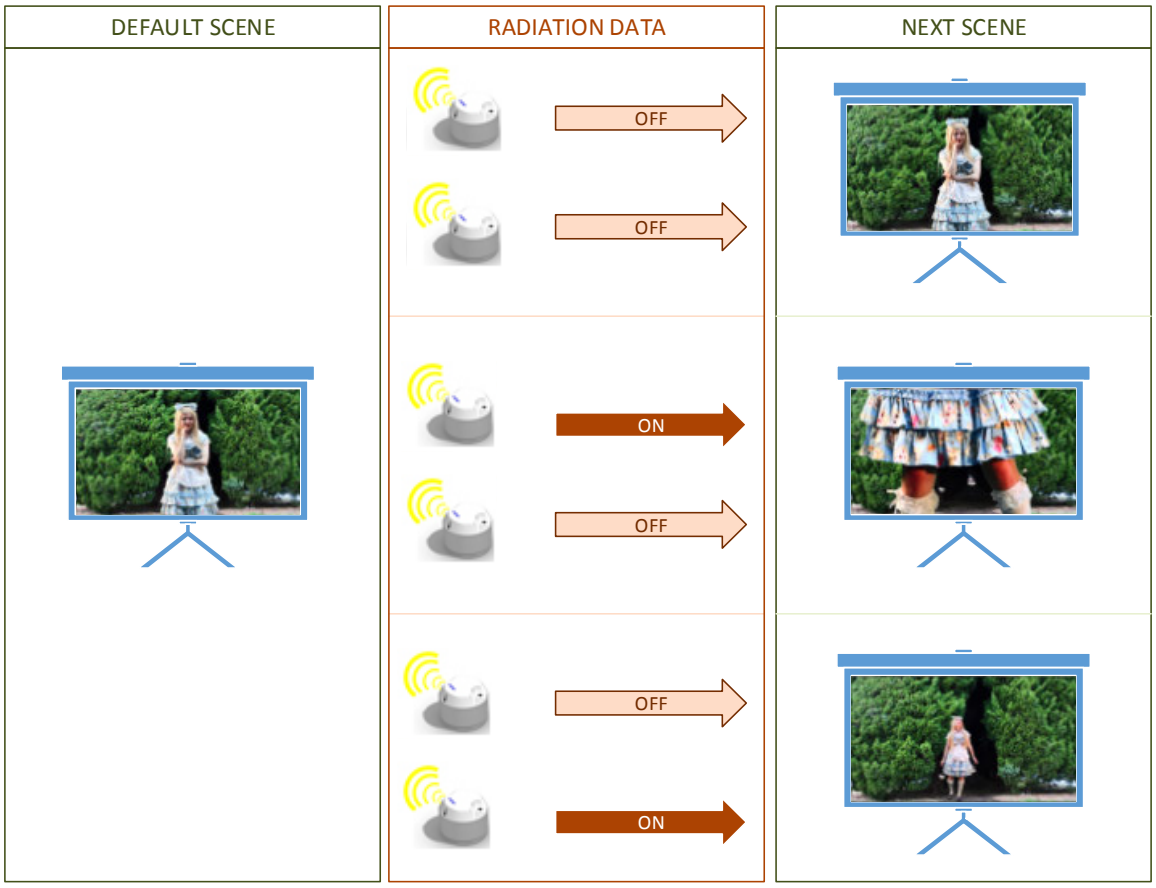

Figure 4.1: Direct interaction in *Eat Me/Drink Me* scene

The sophisticated interaction was tried out with the *Good Queen/Bad Queen* scene. The first sensor for the interaction was already placed in the previous scene, the *Tea Party*, and if the viewer triggered that and then arrived to the place for the queen scenes to trigger the second sensor, the *Good Queen* would start playing. If the viewer, however, failed to trigger the first sensor and only triggered the second one the scene that would start playing was the *Bad Queen*.

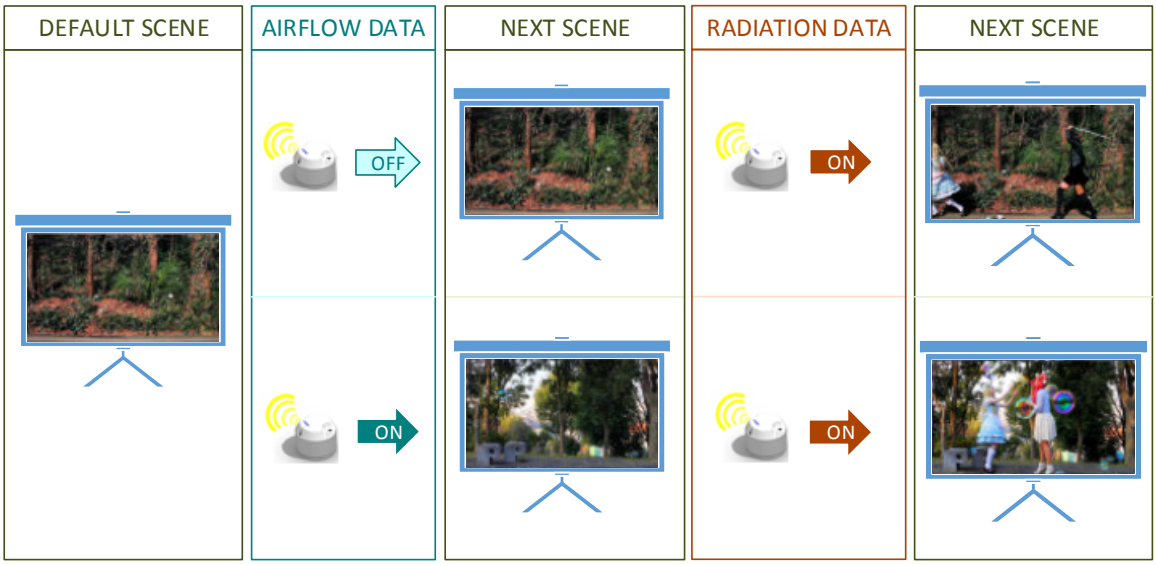

Figure 4.2: Sophisticated interaction in *Good Queen/Bad Queen* scene

In order to make the experience more active and exciting multiple screens were used, one for each scene, and the Queen Alice space was divided with partitions to enable displaying each scene at separate locations. This way the viewers could feel as though they were actually making their way through *Wonderland*. Apart from the *Cheshire Cat* scene where the cat speaks to the viewer, the other scenes only used different music clips as their sound content that partook in creating the dreamlike atmosphere of being in *Wonderland*. The complete system configuration can be seen in the figure below.

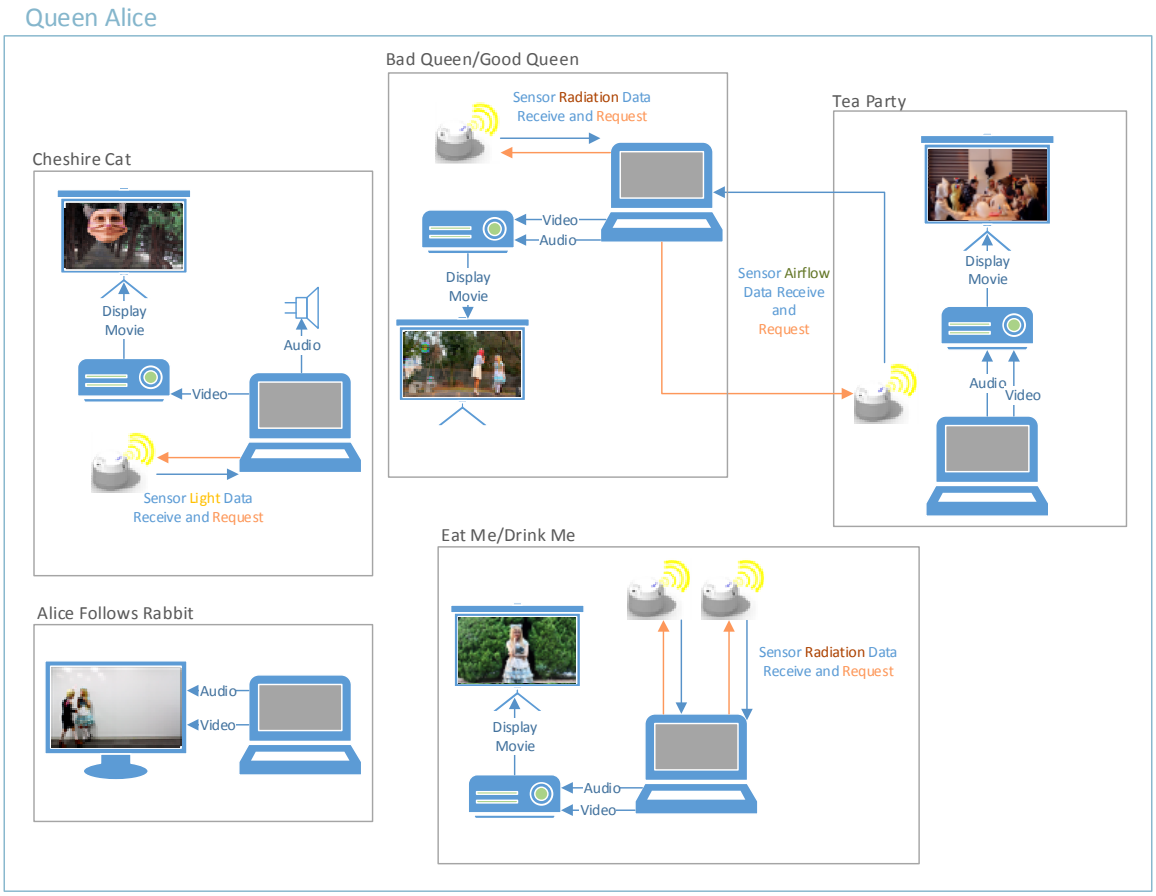

Figure 4.3: *Alice in Wonderland* system diagram

4.1.2. Evaluation of First Prototype

Alice in Wonderland ended up being a great success and attracted many of the visitors of the event to come and give the interactive cinema experience a try (For photos of experience see A.3.). Feedback was received from nearly all of the viewers and showed a great deal of enjoyment value and presented many more interesting findings.

4.1.2.1. Evaluation Aim and Method

The purpose of the first prototype was to discover if implementing the necessary improvements exposed by the failings of the preliminary experiment would make the viewer's experience more enjoyable and if using natural interactions would increase the viewer's immersion into the interactive cinema experience.

As the first prototype was presented as part of an event expected to attract many visitors, the evaluation was conducted with a quantitative method by gathering feedback from the viewers who participated in the experience of *Alice in Wonderland* in the form of a survey (For feedback form see A.4.). After participating in the interactive cinema experience, the viewers were asked to fill out said two-page survey that inquired about their thoughts on the *Alice in Wonderland* experience and then also on their opinion of an ideal interactive cinema experience. Feedback was received from 95 participants and the answers presented very interesting findings that will be discussed in the following section.

4.1.2.2. Results

In general the feedback was much more positive for the first prototype than with the preliminary experiment. Most of the viewers found the experience very enjoyable with the most common rating being 7 and the average rating being 6.9. Many viewers felt that they were a part of the story co-creating it as it went along and that made the experience more exciting and memorable for them. They also tended to stay focused throughout the whole experience, since everything decision they made mattered. Many viewers expressed the best thing for an experience like this, would be to make them feel like they want to try it over and over again to explore all the different outcomes.

Focusing on the *interactive* component, the answers for *"preferred type of interaction"* and *"favorite/least favorite scene"* both reflected the same inclination from the viewers. *"Direct interaction"* was picked as the most preferred interaction and the viewers found the direct interaction of *Eat Me/Drink Me* and the *Cheshire Cat* scenes most enjoyable, because the viewers were able to get instant feedback on what their actions had caused. Viewers also enjoyed the *Cheshire Cat* for the fact that the cat spoke directly to them. Many viewers also expressed interest in wanting to experience interactions through physical reactions, such as heart rate, which also falls into the category of natural interactions.

The sophisticated interaction for the *Good Queen/Bad Queen* scene, however, caused much confusion for the viewers resulting many to pick either the *Tea Party*, where the first sensor for the sophisticated interaction was located, or the *Good Queen/Bad Queen* as their least favorite scene. The viewers greatly disliked not understanding how they had affected the story and why, because there was no clear link between the first interaction and the affected queen scenes. On the question about *"preferred type of interaction"* viewers did claim that they would enjoy such a hidden interaction as long as it was still clear and easy to understand.

Looking at the answers for *"preferred type of interaction"* in general and not only in regards of what was implemented in this prototype brings to light something interesting as well. The answers indicated that the viewers were more inclined to pick options that were based on natural actions and behaviors, as the four top choices were all such natural action and behavior - based interactions. This preference shows that there is desire for the kind of approach to interactive cinema that S.I.M.S is aiming to provide.

In regards to the *surreal* component of S.I.M.S, the results for the *Tea Party* scene showed something very interesting. A bit over a third of all the viewers picked it as their favorite, because they loved the mixture of film with reality for the reason that the part of the party that was happening in real life put

the focus on them. Viewers greatly enjoyed being the main focus of the scene and getting the *"unbirthday"* song sung to them.

Some more interesting findings were gathered, such as the tendency of male viewers to prefer instant and smooth transition of scenes as a result of their actions, while female viewers were more likely to focus on enjoying the story elements. Some viewers also suggested this kind of experience could be a great tool if used for education for children or even for learning about risk management. Some even shared that interactive cinema would ideally be like the *Alice in Wonderland* experience, while others wanted it to be a bit more game-like where they could be the hero. From all the feedback gathered one characteristic for ideal interactive cinema rose above all others - repeatability. Most of the viewers felt that an interactive cinema experience would be ideal when it awakens the desire in them to experience it again and again in order to discover what making different choices would trigger in the content.

Overall, the feedback gathered offered good insight on what viewers liked and what was still worth improving further. New implementations to test would be:

- Increasing repeatability by adding more choices and thus more branches in the story
- Investigating whether clear sophisticated interactions would be found enjoyable by the viewers
- Explore more effective ways to use the environmental sensors

While there was already a lot of improvement from the preliminary test, focusing on these aspects and bettering them for the final prototype should provide an even more immersive and exciting experience for the viewer than what the first prototype was able to offer. Another question that rose from the success of the first prototype was if it was found to be this enjoyable only because the story was one the majority is familiar with. In order to find out if

that was the case and this concept is only effective through such familiarity, the final prototype will feature an original narrative (For feedback data see A.5. and A.6.).

4.2. Final Prototype: The Unseen

The purpose of the final prototype was to explore possible improvements brought to light by the feedback and expressed desires of the viewers who experienced the first prototype. While the first prototype was part of a much bigger event, the final prototype was a small-scale experiment and thus for ease of testing used a classroom as the setting for the experience and story.

4.2.1. Design of experience and interactions

The design of the final prototype was done in a slightly different order than for the first prototype in order to make the process more efficient. While the planning and design of the first prototype started from the notion of the story needing to be *Alice in Wonderland*, the final prototype was approached from the point of view of what kind of interactions were desirable. As the main purpose of the interactions in the final prototype were to increase the choices that the viewer can make and to implement a sophisticated but clear approach, a suitable setting for making many crucial choices was thought to be an original murder mystery, called *The Unseen*, where the fates of characters could literally be in the viewer's hands.

The Unseen only consisted of a few key scenes that set the premise for the murder mystery instead of providing a whole story and experience, due to the main purpose of the prototype being only to test the few particular new implementations that surfaced from the feedback of the first prototype (For planning sketches see A.7.). The scenes included in the final prototype were:

- *Party*. Sets the initial atmosphere of the movie and results in a blackout with the facilitator of the experience going to investigate. Viewer will be prompted to make a decision at the end of it.
- *Detective*. Detective goes to check out a scream and returns to show some security footage she found.
- *Photographer*. Photographer offers to be helpful by showing the pictures he has taken of everyone during the party to help determine all possible suspects.

While these three scenes were the only ones included in the final prototype, it is assumed that if this story would be taken further later, the viewer would embark to find evidence to find the killer and to prove his or her own innocence while making decisions that might make characters fall victim to the killer or be saved.

For the *interactive* component, the clear sophisticated interaction in the final prototype determined how the facilitator of the experience would be murdered during the blackout or if she is murdered at all. When the blackout begins, the viewer is prompted to pick a source of light from three objects: a candlestick, a lantern or a flashlight. Depending on which they choose, the murder will happen differently or in a different place and the detective will make a deduction on which of the three objects might have been the murder weapon. One of the three objects, namely the candlestick, is also the so-called "bad choice" and if the viewer picks that and decides to hold onto it, the murder will clearly be done with said candlestick and the detective will make that deduction, making the viewer guilty without doubt. In case the viewer decides not to touch any of the objects, the host of the party will return alive and the story will not proceed and instead will just end there (For interaction sketches see A.8.).

While the *Alice in Wonderland* experience had all of its interactions happen on an on/off basis, where either the sensors picked up the certain element to be sensed or not, *The Unseen*, tried a new approach of maximizing the effectiveness of one sensor. Thus, only one sensor was used to determine each of the alternatives mentioned above by having the next scene be selected by the level of light picked up by the sensor when the viewer makes their choice. Another sensor was used in lieu with the first one, that would trigger the appropriate *Detective* scene to start playing when the blackout ended and the lights came back on.

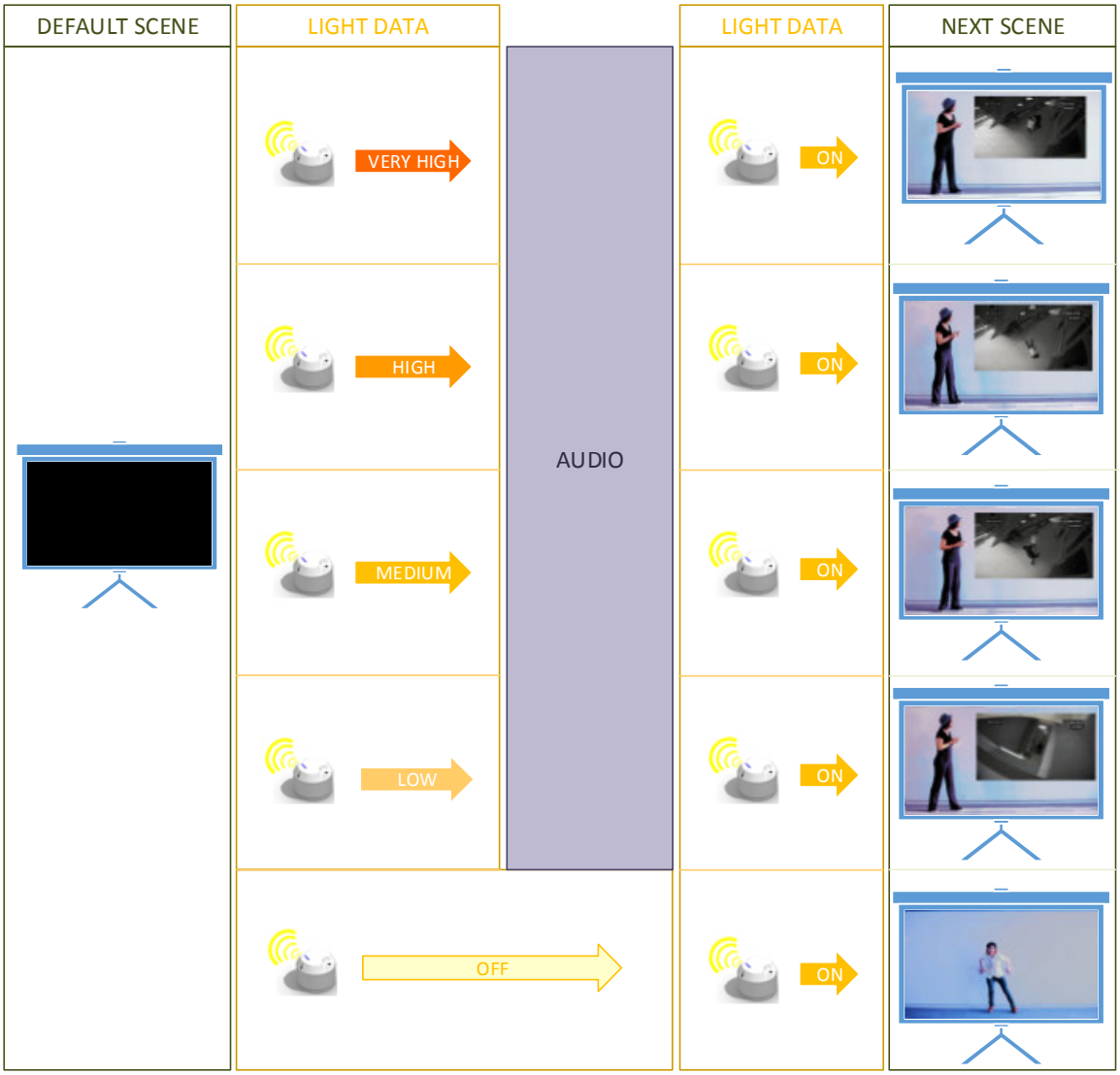

Figure 4.4: Sophisticated interaction in *The Unseen*

A new approach to mixing reality with the content of the movie as the *surreal* component of S.I.M.S was also implemented to *The Unseen* in order to strengthen the resulting immersion. While the scenes were shot in the same place as where the experience happened, *The Unseen* played with the notion of having real things become movie content at a later time in the experience. The facilitator of the experience started out as a real person explaining the purpose of the party and then after the blackout will appear as a character in the movie by getting murdered in the footage shown by the detective. To take this even further, the viewers themselves will be implemented into the movie by having their faces appear in the photographer's pictures of possible suspects. Whereas a similar kind of technique was utilized in one of the related works mentioned before, “Space Child Adventure: Grand Odyssey,”[42] and even in "Nomadic Cinema"[43], which served as a motivation for this particular research, *The Unseen* takes advantage of this approach in a slightly different way by not making the viewer who appears in the movie content into a separate entity from the real viewer, thus keeping the actual viewer feeling like an important character in the experience.

Multiple screens were again used for the final prototype, but this time all of them were placed in the same space instead of creating a path to follow like in *Alice in Wonderland*. The viewer would be prompted to walk around if the story was taken as far as the part where evidence needs to be collected, but setting up the screens in the same space for this part of the story felt like a suitable approach to create the sensation of being in the room with various different characters (more specifically, the characters attending the *Party*) by

[42] "Expo 2005 Aichi Japan," Accessed May 20th, 2014, http://www.expo2005.or.jp/ml/en/08/.
[43] "10/26（金）午後 5 時～午後 9 時　六本木ヒルズで開催！NOMADIC CINEMA　～六本木の街を、映画館に変える～," Accessed June 15th 2014, http://2012.tiff-jp.net/news/ja/?p=12141.

utilizing having a certain character, such as the detective and photographer, take the limelight on screens placed in different sides of the room. It is worth a mention however, that not all screens were used at the same time. Most scenes only utilized one screen at a time apart from the *Party*, which used a screen on all four walls in order to create the effect of the viewer being in the midst of the party. The *Photographer* scene even used such cinematic techniques that made it seem as though he walked from a screen in front of the room into the one on the left side, thus switching screens in the middle of his scene. This was done in hopes of creating the illusion of realistic character movement in the used space. *The Unseen* also focused on character speech and realistic situational sounds for its atmosphere creation rather than music. The comprehensive system diagram can be seen from the figure below.

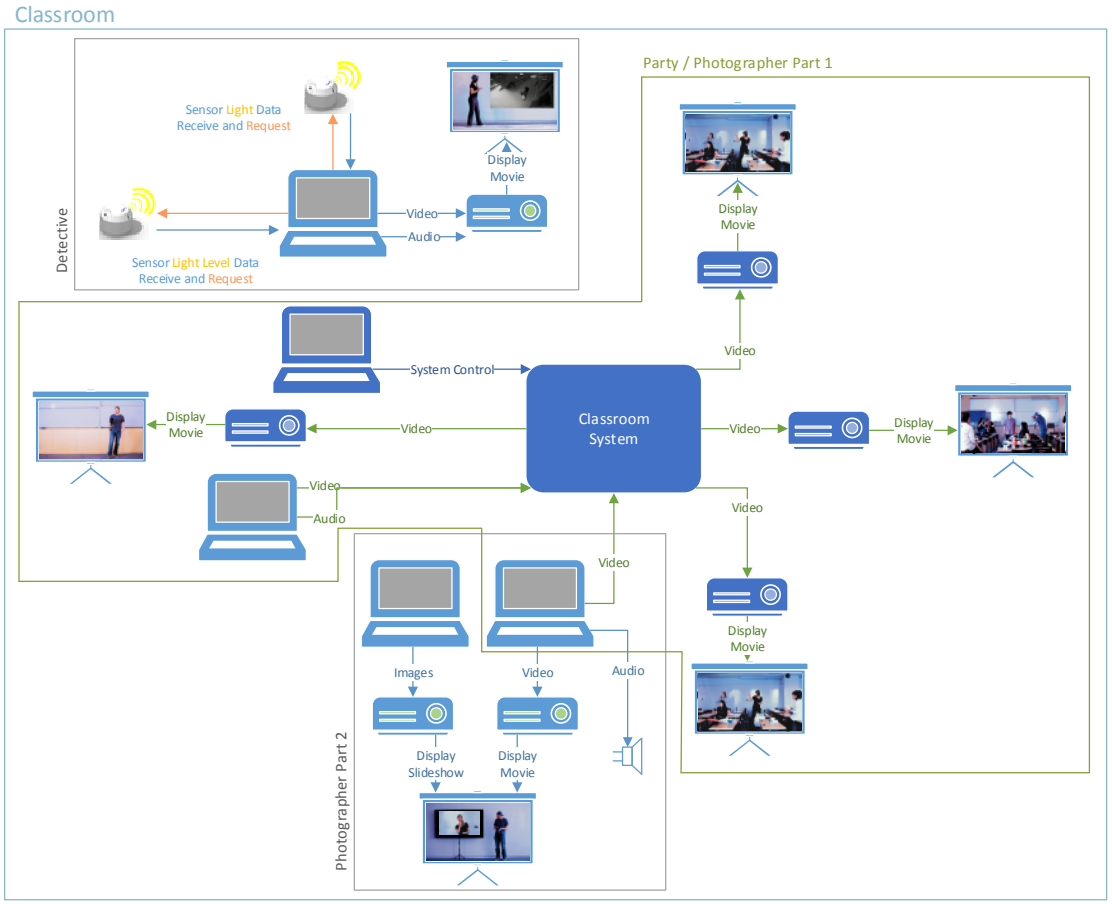

Figure 4.5: *The Unseen* system diagram

4.2.2. Evaluation of Final Prototype

The Unseen provided some very interested results, albeit it being experienced by fewer viewers than *Alice in Wonderland* (For photos of experience see A.9.). It greatly aided in clarifying further what kind of elements are attractive for this kind of interactive cinema experience and what are not.

4.2.2.1. Evaluation Aim and Method

The main purposes of the final prototype test is to find out if repeatability of SIMS experience has been increased with the addition of more choices and more branches in the story, if clear sophisticated interactions are enjoyable to the viewers and if mixing film and reality more enhances the experience and makes it more exciting for the viewers. An additional aim was to investigate the accuracy and reliability of the sensor by utilizing it in a more complex way than just with on/off options, as was done with *Alice in Wonderland*.

As the final prototype was a small-scale experiment, the evaluation for the final prototype test was conducted by using qualitative methods and consisted of viewer observation and viewer interview (For interview questions see A.10.). By observing instant viewer reactions during the experience and conducting a face-to-face interview allowed the gathered feedback to be much more detailed than what was acquired for the first prototype. In the feedback for the first prototype the viewers who found the experience most lacking used very few words in their answers. Avoiding missing out on the crucial constructive feedback such viewers could share also played a part in choosing these qualitative methods for the final prototype.

Seven viewers in the 20-30 age range were asked to experience *The Unseen* and observed and interviewed for feedback. Three of the viewers were chosen

based on having experience in playing video games and watching cinematic narratives, either movies or television shows, in order to investigate if being familiar with two different forms of immersion had an impact on what they thought about the S.I.M.S experience. The other four viewers were general viewers with no particular background with video games or cinematic narratives, out of which two happened to enjoy watching movies and two did not really have an interest for either video games or cinematic narratives. These differences in the viewers brought to light some interesting observations. which will now be discussed in the next section.

4.2.2.2. Results

The feedback received from the viewers of *The Unseen* was very informative in showing which of the new implementations worked and which did not, and seemed to indicate that in general S.I.M.S was still heading in the right direction.

From the perspective of increasing repeatability for the viewers, the comments were mostly positive. Nearly all the viewers expressed they were very curious about the five branches offered by *The Unseen* for their one choice alone, and had the desire to try the experience again and find how to trigger them all.

The feedback received for the *interactive* component of S.I.M.S showed that implementing the sophisticated interaction in a clearer way than in *Alice in Wonderland* still did not make it more desirable by the viewers. A few viewers commented that they would have preferred simpler interaction with instant consequence and found the connection to the next scene hard to follow. A viewer who had experienced the *Alice in Wonderland* prototype as well, explicitly stated that he much preferred interaction such as the one in *Eat Me/Drink Me*. Another viewer offered a helpful suggestion that instead of only having the objects the viewers interact with be related to the next scene,

they should also have an apparent relationship with the scene before it, in this case the *Party* scene. Curiously enough, the two viewers who had the easiest time realizing and understand the connection between the objects used for the interaction and the movie content, were the ones who spend the most time enjoying both movies and video games. On the other end of the spectrum, one of the viewers who did not really spend time among movies or video games, stated that she would like to know before making her choice what the consequence would be without retaining the element of surprise.

The new implementations for the *surreal* component of S.I.MS were successful, as most viewers greatly enjoyed the mixing of movie content with reality by having their own picture included in the shown photographs in the *Photographer* scene. For many it came as a surprise and a few viewers suggested it would be even more effective if their pictures resembled the pictures of the movie characters in terms of the picture being in the same format as the character pictures and them being in a similar situational pose as the characters. Nearly all viewers liked the *Photographer* scene also for the realistic illusion of him walking from one screen to another and some were of favorable opinion of the general technique of having scenes happen at different sides of the room. One of the viewers, who enjoys cinematic narratives and video games, remarked that it would be nice to have the scenes go around the whole room once during the story. Another viewer, one who did not watch movies or play video games, did not like characters appearing in the scenes since that felt too movie-like and would have preferred to only be shown the security camera footage, which fit better into the real world.

The *Party* scene was found to be confusing this time, possibly because it did not happen as intimately as in *Alice in Wonderland*. It was hard for some of the viewers to grasp that they were actually part of the party themselves, which in turn affected how involved they felt with the rest of the story as well. This could be observed to also be caused by the *Party* being the opening scene

of *The Unseen* experience, making the one in *Alice in Wonderland* more successful due to being in the middle of the experience and the viewers already knowing by then what kind of things to expect. Some viewers mentioned though, that the confusion added authenticity to the "blackout" since they could not be sure if there really was a technical problem or if it was a part of the experience.

From the story aspect, using an original story instead of a familiar setting such as *Alice in Wonderland* did not lessen viewer enjoyment. The viewers seemed to greatly enjoy the setting of a murder mystery and it made them feel excited and provided suspense. Most viewers were eager about experiencing an interrogation scene if the story would continue, where they would get to deduce who the killer is and prove their own innocence. A few viewers suggested it would be nice to do this experience with a friend and have both them and their friend be possible killers in the story plot. One of the viewers even stated that not being aware of the setting ahead of time makes the experience much more enjoyable for him.

Taking advantage of the sensors according to sensed data levels did not work as reliably as hoped. It proved to be difficult to keep the level of light constant for the specific choices that the viewers decided to make, resulting in the selected next scene not always being the one intended. It is felt though that this could be improved, if more time was spent in testing out how to make triggering certain amounts of data more accurate.

Overall, the feedback was very encouraging and constructive. It supported the feedback received from *Alice in Wonderland* reconfirming the notion of direct interactions as being the most favored by the viewers and provided new ideas for possible further development. The observations made of the viewers reacting to the scenes, especially the murder footage and the photographer's pictures, strengthened the assumption that the experience offered by S.I.M.S immerses its viewers in a greatly enjoyable way (For interview notes see A.11.).

4.3. Analysis of Results

Both the *Alice in Wonderland* prototype and *The Unseen* prototype provided much valuable insight on what viewers preferred. Through the feedback of both prototypes it is evident that S.I.M.S has been able to provide an enjoyable experience to the viewers.

Through polishing the elements included in the experience starting from the preliminary experiment, it can be seen that viewer immersion has been enhanced by using natural action and behavior -based interactions and taking advantage of real space, as both in *Alice in Wonderland* and *The Unseen* the viewers have felt as though they are part of the story. While each prototype has pinpointed more things to improve and thus the experience is still far from its full potential, it is safe to deduce that the S.I.M.S approach has reached its aim and has succeeded in giving the viewers of both prototypes a new and exciting immersive experience.

Throughout all the attempts to improve sophisticated interactions, simple and direct interactions remain as the most preferred and fun interaction method for the viewers. There should always be a direct consequence to everything the viewers need to do in order to minimize confusion and maximize enjoyment. Thus, while it might still be worth to use sophisticated interactions in some way, it should be implemented with two layers: there should be an instant consequence to the viewer's action, in addition to the to something being affected at a later part of the story. If some form of sophisticated interaction is used, be it thusly or in some other way, the relationship of the consequence to the interaction has to be made extremely clear. While there was an attempt to clarify the relationship between the viewer's choice and the effect of the sophisticated interaction in the story content shown at a later part in *The Unseen*, it was still not clear enough to have the viewers understand the connection without fail.

While applying the environmental sensors on an on/off basis for the interactions provided the exact wanted results in *Alice in Wonderland*, using them more efficiently, as attempted in *The Unseen*, has proven to be a challenge and is something that could be looked into in more detail. If the data levels could be controlled accurately it would provide great opportunity for creating a very intricate branching narratives.

Using a real person as part of a scene in the S.I.M.S experience has shown mixed results, the *Tea Party* in *Alice in Wonderland* receiving much praise while the *Party* of *The Unseen* was rather seen as confusing instead. This indicates that approaching the mixture of reality with movie content from this perspective is a double-edged sword and depending on how it is used, it can work to the advantage of the experience or against it. This is an aspect that requires much polishing to be able to use it in an efficient way. Additional ways of using real space should be explored and the most effective characteristics of the implementation of this technique should be pinpointed in order to better take advantage of it in regards to enhancing viewer immersion and also to eliminate the possibility of confusion.

On the whole, the feedback of both prototypes has confirmed that S.I.M.S has succeeded in its aim and there is a gap in the field of interactive cinema that it can fill. The S.I.M.S approach and design show promise and can provide viewers with a greatly enjoyable experience, but while the purpose of this research has been fulfilled, there is still a lot of work to be done before it reaches its full potential.

5. Conclusion

Alice in Wonderland and *The Unseen* have shown that S.I.M.S has been successful in its approach and design. Viewers have found the experiences to be greatly enjoyable and exciting and have felt like they were part of the story on both occasions due to having to make story-altering decisions and being able to actively participate in scenes when reality was mixed with the movie content. These results confirm that viewer immersion is enhanced through the use of interactions based on natural actions and behaviors and utilizing real space, thus proving the claim of this thesis. However, there are still things that could be improved and investigated in order to make it a better experience. This section touches upon the limitations and possible design improvements for S.I.M.S and what kind of things could be done in the future.

5.1. Discussion

The feedback for *Alice in Wonderland* offered a solid basis for what was enjoyable and what needed improvement, but while the more detailed feedback for *The Unseen* was very helpful it was also limited due to the small number of viewers. It would be beneficial to have more viewers test it in order to see the possible variation of opinions between different kinds of viewers, such as the ones who spend time immersing themselves in cinematic narratives and video games and those who do not. The age group for the testing of *The Unseen* was also very narrow, so it would be interesting to see how older or younger viewers would have reacted to it.

The S.I.M.S design is also still far from being ideal. The current setup is unnecessarily clustered and complex. It could be greatly improved by having

one computer and program running and controlling all of the interactions from various parts of the interactive cinema experience instead of a separate computer and program maintaining those duties for each relevant scene independently. Having one program in charge of all the interactions in the experience would provide the opportunity of having a more complex and sophisticated structure for triggering different scenes. If it could detect the choices you made earlier in the experience and keep track of them, the pattern of earlier choices could be used to trigger specific scenes later on.

Another part of the design that could be greatly improved upon is how to accurately capture specific level ranges of sensed data with the Omron sensors. As was found out with the final prototype, utilizing different ranges of captured data can be a bit unreliable. Solving this issue would make it possible to efficiently increase story branches while lowering the necessary number of sensors to trigger them. Using one sensor to capture more than one data type simultaneously to trigger different scenes should also be attempted. The two prototypes did not provide feasible grounds for such a trial as no meaningful object or reason for the use and triggering of different data types was not conceived during planning process.

Investigating what the most effective number of screens for this kind of experience was outside the scope of this research, but should be looked into in order to improve the S.I.M.S design even further. The results of the two prototypes did not give any indication to whether a walkthrough approach or having everything in the same space would be more preferred by the viewers, so currently it is not clear if this design aspect is of importance from the viewer's perspective.

5.2. Future Work

It is felt that there is still a lot of work to be done in this field with this concept. S.I.M.S could be taken much further by not only relying on the environmental sensors, but by taking advantage of a mixture of different methods and devices to produce an abundance of different kinds of interactions to make the experience more exciting and challenging. Utilizing interactions based on the viewer's physical reactions is definitely something that should be delved into, as that was something that the general public found to be a very appealing thought as discovered in the feedback received from the first S.I.M.S prototype.

An interesting possibility could be utilizing technology such as Google Glass for this kind of interactive cinema experience. Using location-based triggers characters and scenes could pop up at your location, thus mixing what you are actually seeing through your Google Glass (the place) with movie content (the characters). This would greatly increase the adaptability and simplicity of the concept, by making all projection equipment unnecessary.

Finding the right balance in mixing reality with movie content is also something that should be looked into. It can be a powerful enhancer of immersion, but can also have a negative consequence if overused. More intriguing ways of achieving this kind of surreal effect should also be investigated as there are more ways to bring the world of the narrative into reality than what was tried out with S.I.M.S.

All in all, the prototypes have shown that there are viewers interested in this kind of experience in abundance out there, the experience itself just needs to be perfected and brought to them.

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I thank all the visitors of the KMD Forum who took the time to experience *Alice in Wonderland* and give me valuable feedback, and I thank the lovely people who spared some time from their busy lives to test out *The Unseen* and share their opinions.

I thank Mariam for being there for me for everything this past year, sharing all the ups and downs with her has made everything immensely more

bearable. I also thank Ken for letting me take out all my frustrations on him and not loving me any less for it.

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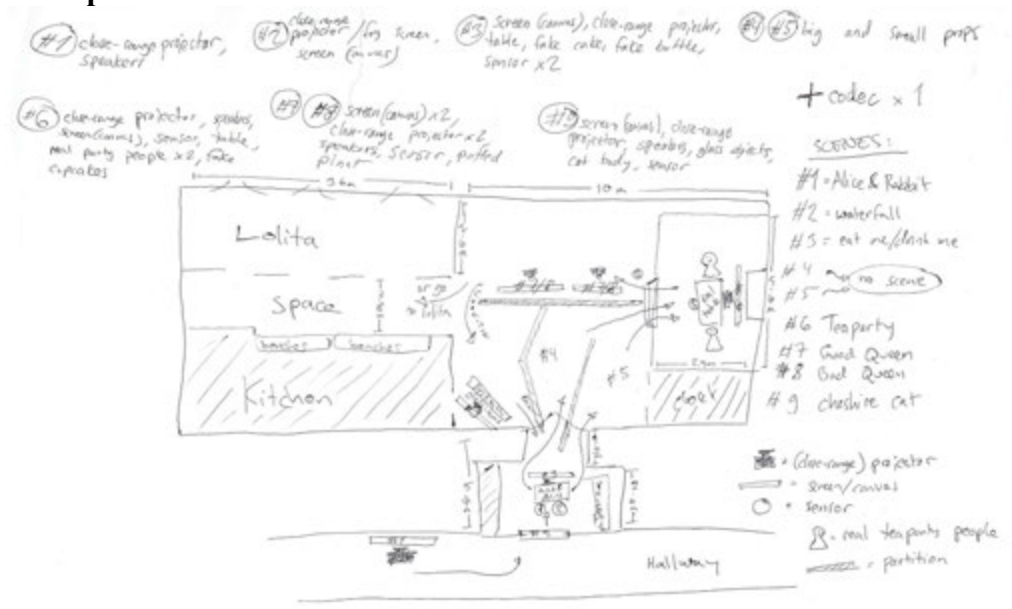
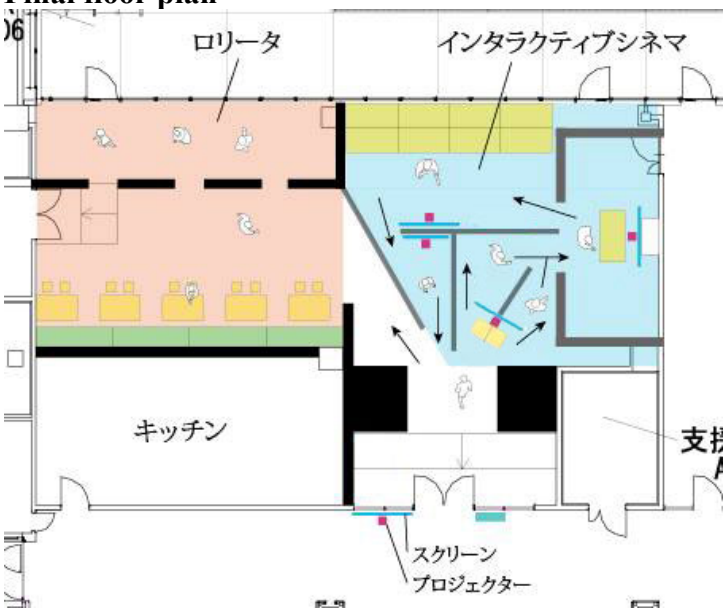
Appendix

A.1. Queen Alice floor plan

Floor plan sketch

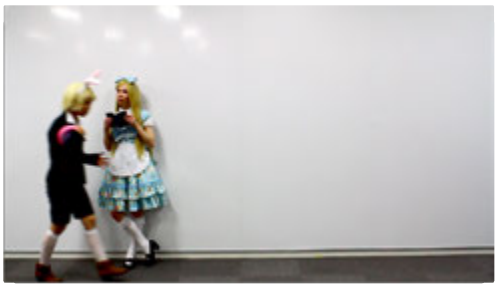


Final floor plan

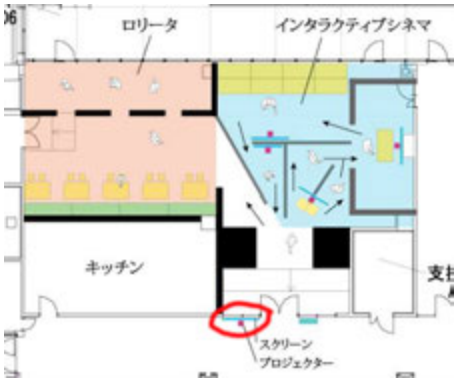


A.2. Alice in Wonderland Detailed Scene Descriptions

Scene 1 (Alice and Rabbit)

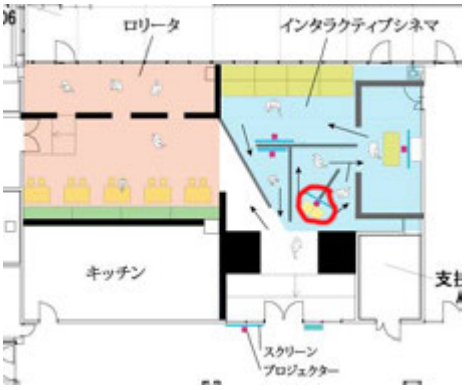


- There are no sensors involved in this scene.
- Users will watch Alice chase the rabbit into Queen Alice.
  - This will beckon users into the space and encourage them to enter the space.

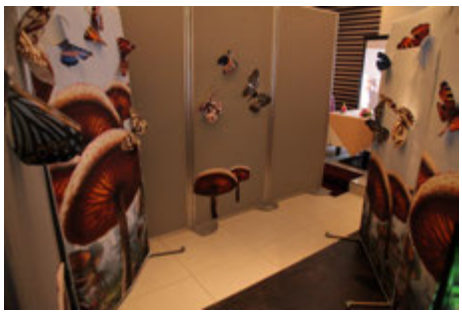


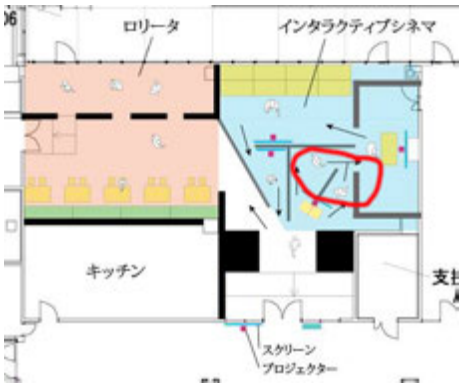
Scene 2 (Eat/Drink)

- There are two sensors required for this scene.
  - 1 will be placed in a cake (eat me)
    - When users pick up eat me, a scene of Alice growing larger is triggered to play, and users are directed to the TINY WORLD hallway on the LEFT SIDE.
  - 1 will be placed in a beverage (drink me)
    - When users pick up drink me, a scene of Alice growing smaller is triggered to play, and users are directed to the LARGE WORLD hallway on the RIGHT SIDE.



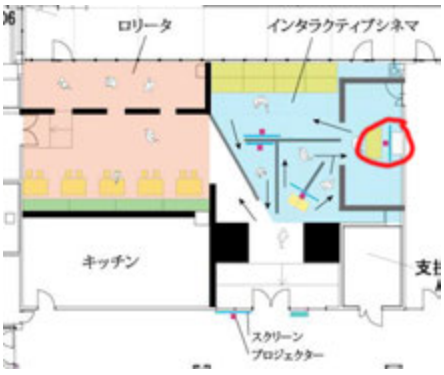
Scene 3/4 (Large World/Tiny World)





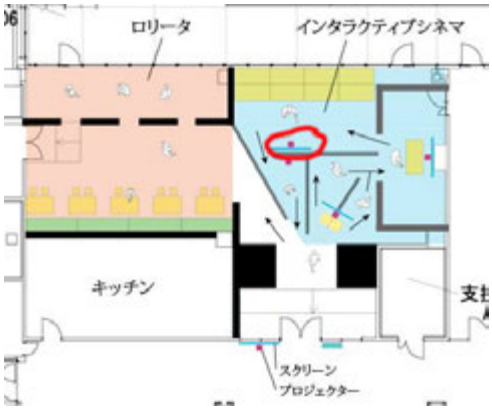
- NO SCREENS PROJECTORS OR SENSORS ARE REQUIRED FOR THIS SCENE.
- The illusion of being small is created in the LARGE WORLD by props placed in the hallway. The props will be very small. This will show the user that they have been turned into a giant by their choice in the previous room.
- The illusion of being large is created in the TINY WORLD by props placed in the hallway. The props will be very large. This will show the user that they have been turned into a tiny person by their choice in the previous room.

Scene 5 (Tea Party)



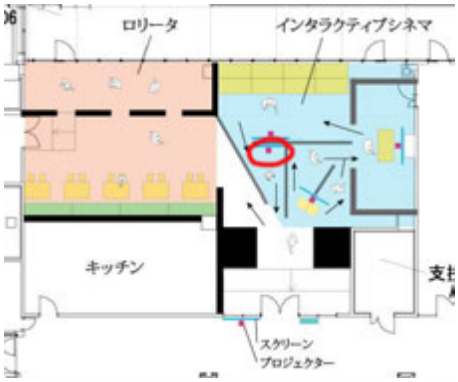
- Users will enter a world where half of the scene takes place in the screen, and the other half takes place in the real world. This illusion is created by playing a video of a tea party on the screen, and placing a table with a real tea party in the real world.
- A sensor will be placed in a fake cupcake. Users will trigger the sensor by blowing the “candle” out on the fake cupcake. There is only one cupcake with a sensor in it. Some of the cupcakes have no sensors! The users will not be aware of the difference, because the cupcakes will all look the same. The result of choosing a cupcake will not be immediately apparent.
- Users will trigger a second sensor by entering the next scene. This is a radiation sensor.
  - If users trigger the cupcake with the sensor AND the radiation sensor, they will trigger the GOOD QUEEN scene.
  - If the users trigger the radiation sensor BUT NO cupcake sensor, they will trigger the BAD QUEEN scene.

Scene 6 (Good Queen/Bad Queen)



- The sensors used in the previous scene will trigger one of two options to play.
  - If users trigger the cupcake with the sensor AND the radiation sensor, they will trigger the GOOD QUEEN scene.
    - In this scene, Alice and the GOOD QUEEN play with bubbles. Users are encouraged to follow Alice off screen to the next area.
  - If the users trigger the radiation sensor BUT NO cupcake sensor, they will trigger the BAD QUEEN scene.
    - In this scene, Alice is chased off screen by the BAD QUEEN. Users are encouraged to follow Alice to the next area.

Scene 7 (Cheshire Cat)



- In this scene, the cat tells a riddle: “Through this door did young Alice pass, you can not drink from this type of glass.” The answer is: “A looking glass/a mirror.” This is a clever play on words in English. This is because the story of Alice is very famous and is called “Through the Looking Glass” in English.
  - Users must choose from a selection of “glasses” on the table. If they lift the looking glass and expose the sensor to light, they will trigger the GOOD ENDING with the cat congratulating them (the cat will say “PURRRRfect.” This is a clever cat pun!)

A.3. Photos from During the Alice Experience

Eat Me/Drink Me

Tea Party

Good Queen

Cheshire Cat

A.4. Alice Feedback Form

Part One

Age		occupation	
Gender	☐ M ☐F ☐other	Nationality	

When watching movies, have you ever wished the ending had been different? If so, how?

.....

Part Two

01. Did you find the Alice in Wonderland interactive cinema experience to be enjoyable?

	1	2	3	4	5	6	7	8	9	10	
Boring	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Fantastic!

02. What was your favorite scene in Alice in Wonderland?

- ☐ Alice follows bunny
- ☐ Eat me / Drink me
- ☐ Tea party
- ☐ Queens
- ☐ Cheshire cat

03. Why is that your favorite scene?

.....

.....

04. What was your least favorite scene in Alice in Wonderland?

- ☐ Alice follows bunny
- ☐ Eat me / Drink me
- ☐ Tea party
- ☐ Queens
- ☐ Cheshire cat

05. Why is that your least favorite scene? How would you improve it?

Part Three

06. What does being able to interact with the story bring to your experience? Why do you think so?

07. What kind of interaction would you like to experience? Please pick 3.

- ☐ Based on your actions
- ☐ Speaking to or being spoken to by a character
- ☐ Completely hidden, but still clear it was initiated by you
- ☐ Completely hidden, but unclear how you influenced it
- ☐ Based on physical reactions (e.g. heart rate)
- ☐ Prompted to make a choice from a list of options (e.g. like in visual novels)
- ☐ More subtle/indirect decision making
- ☐ Based on if you go alone or in a group
- ☐ *others*

  Please write:

08. What is interactive cinema ideally in your opinion?

09. What do you think about mixing film and reality?

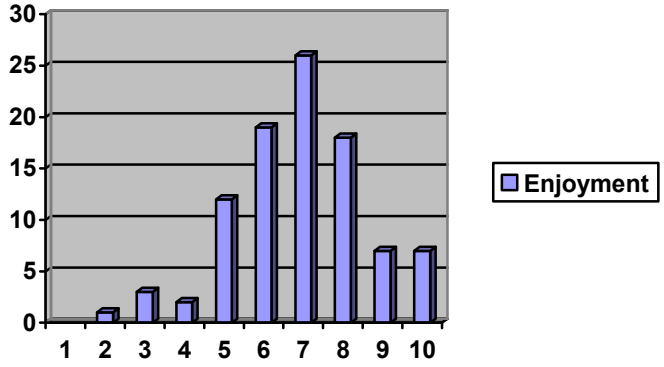
Any other related feedback you would like to give?

A.5. List Gathered from Alice Feedback

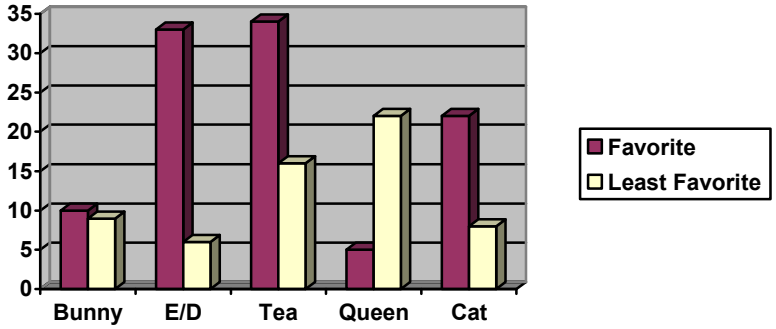
GOOD	BAD
Interaction interesting	Predictable (Alice&Bunny)
Fantastic to be part of storytelling	Can't feel direct effect of the sequence (Queen)
Triggers learning and emotion	Didn't get it (Teaparty)
Can immediately see reaction to own action	Connection between previous scene confusing (Queen)
Interesting	Wanted characters to sing to me (Teaparty)
Makes you feel like part of the story	Not needed for understanding of the story (Queen)
Activeness	Not clear what was happening
People funny and nice	So typical for this type of fancy story so wasn't surprised (Queen)
Interactive cinema ideally like this	Didn't know how own choice affected story (Queen)
Interaction between screen and objects was closest (Cat)	Ok but want more (Eat/Drink)
Stay interested/focused on story whole time	Needs more NPC players
Gives a lot to enjoy	Didn't see good ending (Queen)
Nice knowing you get a unique experience depending on what you choose	Interaction should not sacrifice story
Cool idea	Not intuitive enough (Eat/Drink)
More memorable and enjoyable	No hint for right or wrong (Tea+Queen)
Strange	No clues (Teaparty)
Puzzle to solve (cat)	No effect after blowing candle (Teaparty)
Engagement	Didn't know exactly what triggered (Teaparty)
Engages people more	Confusing (Queen)
Quite interesting	Should be able to eat and drink (Eat/Drink)
Focus transferred on viewer, felt involved (Teaparty)	Want more scenes next time!
Felt involved and challenged (cat)	Didn't understand influence (Queen)
Feeling of co-creating	
Felt like became character in the story	
Good idea	
Fun	
Intelligent and uses multimedia well (Cat)	
More interesting and emotionally engaging than normal movie	
Not a replacement for traditional movie, but new kind of entertainment	
More engaging	
More fun	
Feels like can affect result	
You are on the right path!	
Lots of smart dialogue	
Choices make curious	
Companion for characters	
Being part of the story	
Everything is mixed with reality, high time for movies as well!	
Two ways, creates desire to try again (Eat/Drink)	
Felt like was in the movie	
Interesting	
Cool	

A.6. Statistics from Feedback

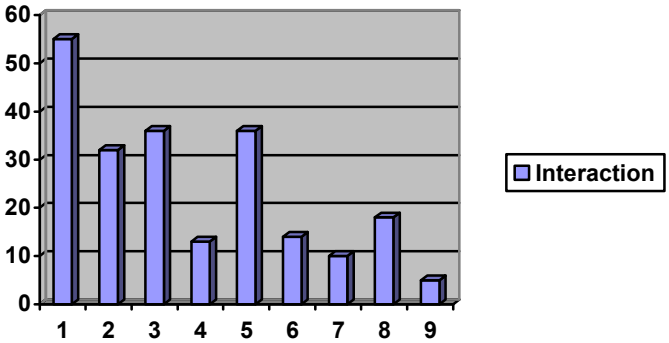
Viewer Enjoyment Ratings (1 being worst and 10 being best)



The Favorite and Least Favorite Scenes of the Viewers



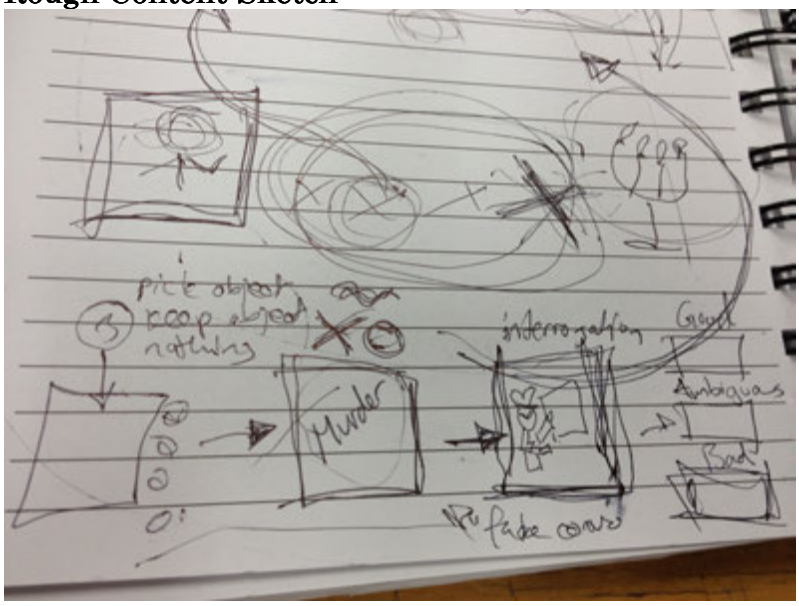
Preferred Types of Interaction (could choose 3)



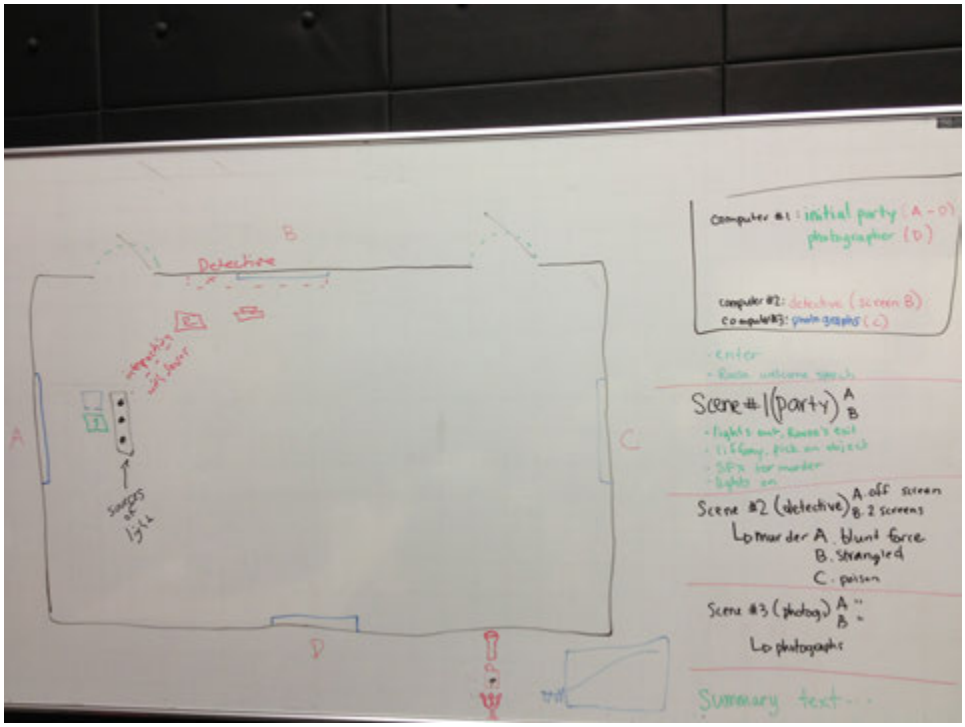
1. Based on your actions
2. Speaking to or being spoken to by a character
3. Completely hidden, but still clear it was initiated by you
4. Completely hidden, but unclear how you influenced it
5. Based on physical reactions (e.g. heart rate)
6. Prompted to make a choice from a list of options (e.g. like in visual novels)
7. More subtle/indirect decision making
8. Based on if you go alone or in a group
9. Other ("mixture of modalities and challenges," "have a hint and think of how to solve")

A.7. Plans for The Unseen

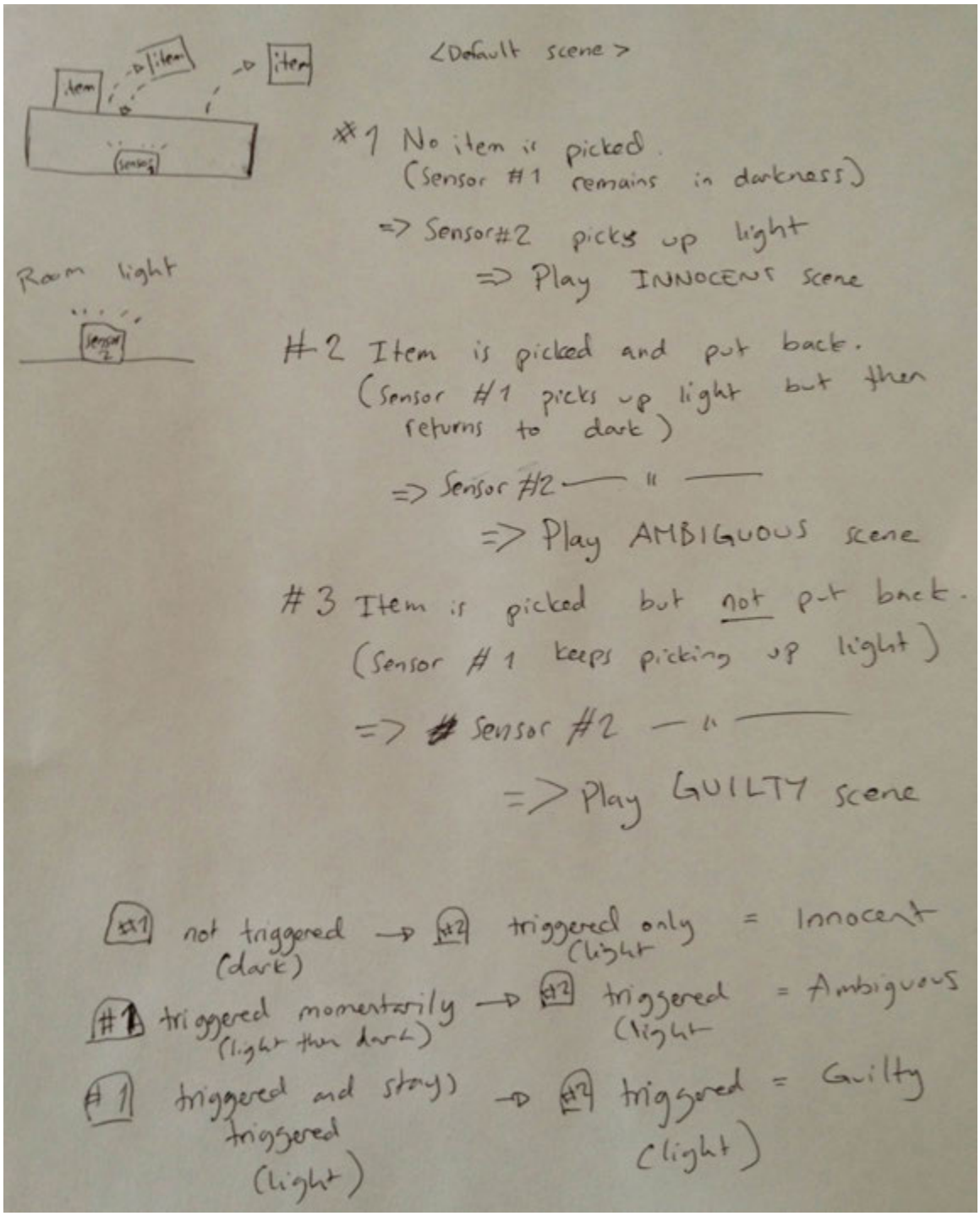
Rough Content Sketch

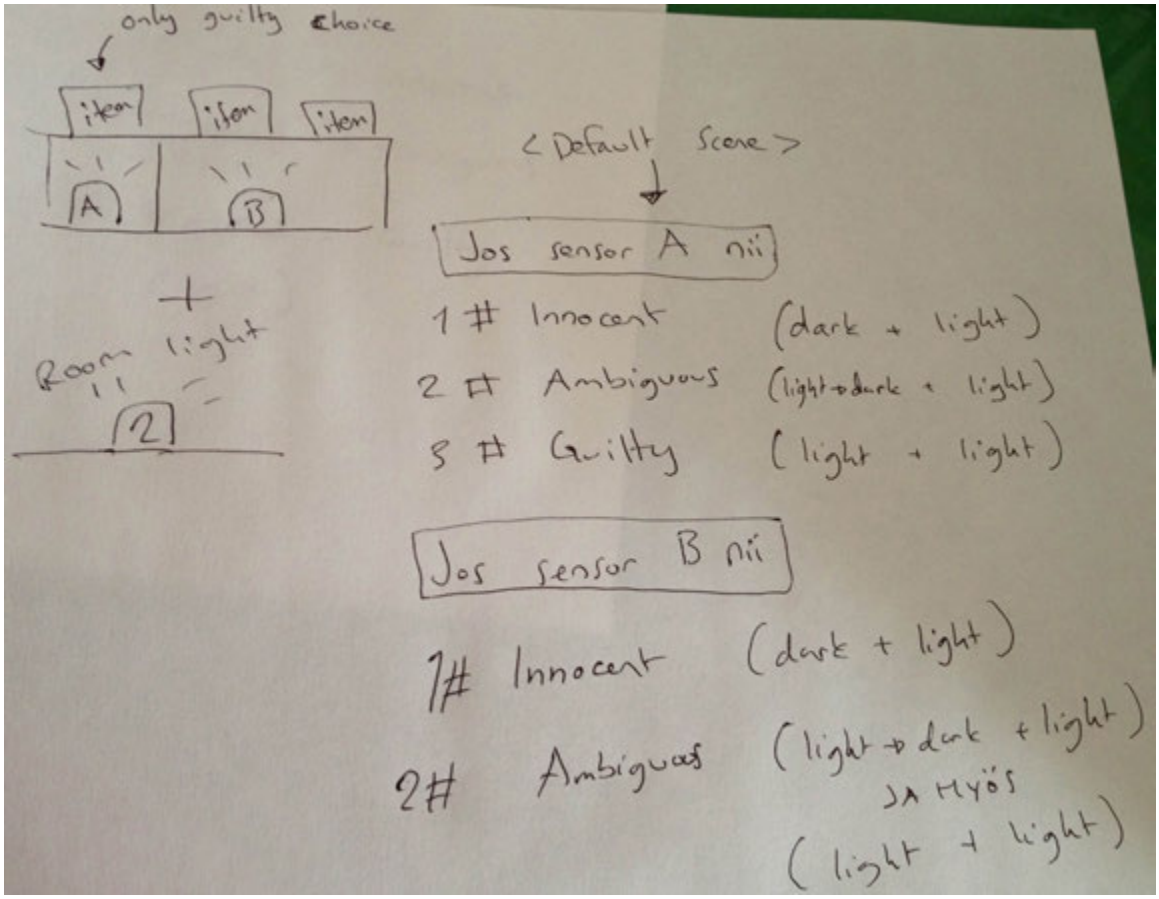


First Floor Plan



A.8. Interaction sketches for The Unseen




only guilty choice
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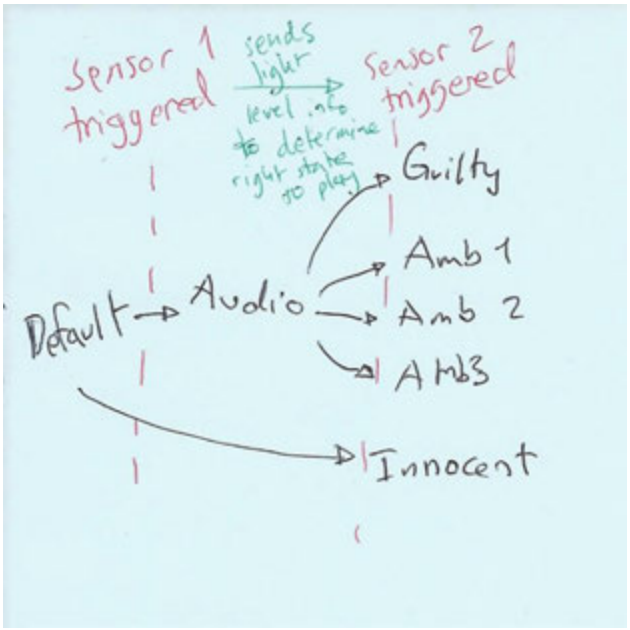
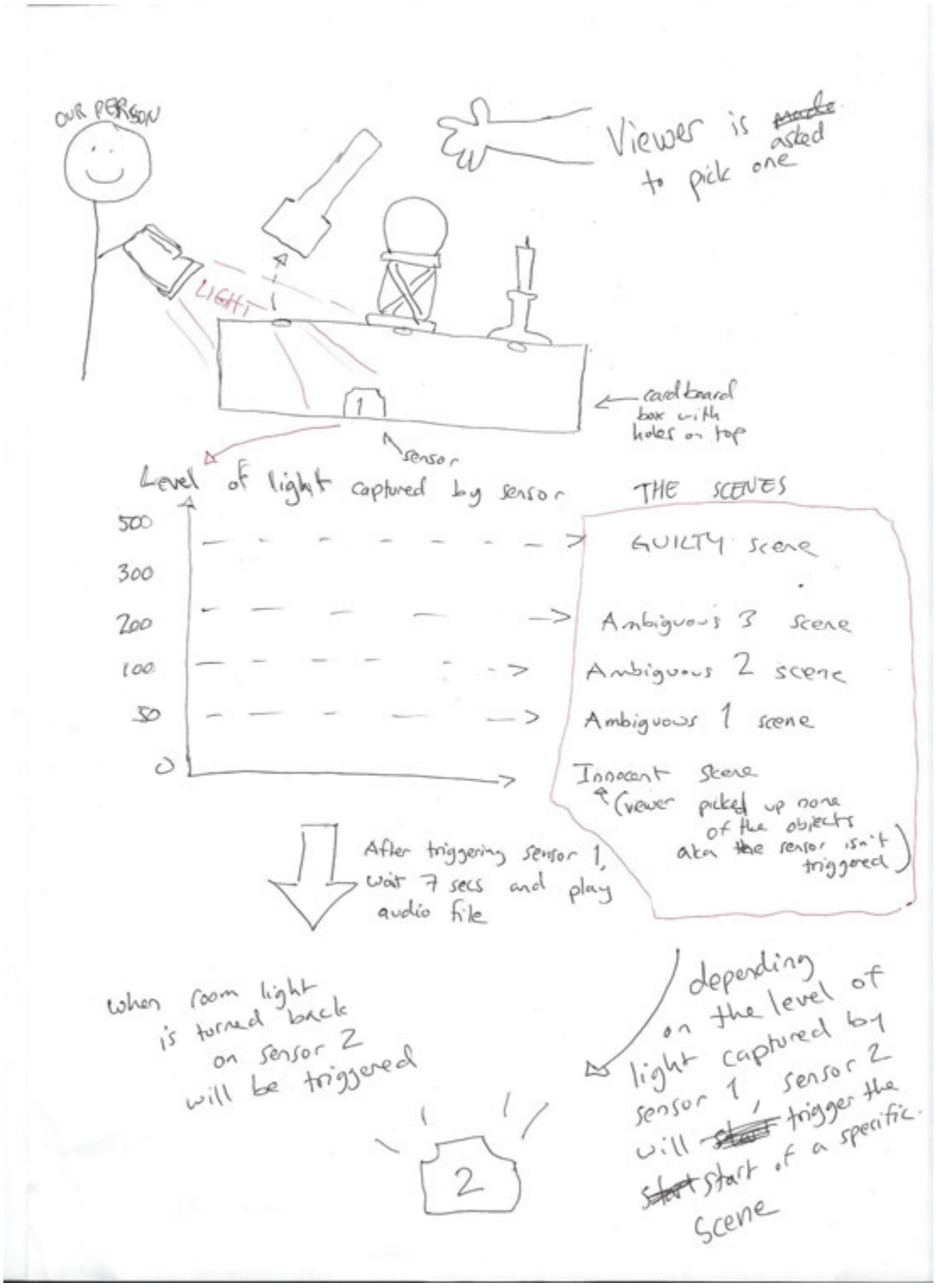
1 # Innocent (dark + light)
2 # Ambiguous (light → dark + light)
3 # Guilty (light + light)
Jos sensor B nii
1# Innocent (dark + light)
2# Ambiguous (light → dark + light
JA MYÖS
(light + light)


Sensor 1 triggered
sends light level info to determine right state to play
Sensor 2 triggered
Guilty
Amb 1
Amb 2
Amb3
Default
Audio
Innocent


OUR PERSON
Viewer is ~~made~~ asked to pick one
LIGHT
1
cardboard box with holes on top
sensor
Level of light captured by sensor
THE SCENES
500
300
200
100
50
0
GUILTY scene
Ambiguous 3 scene
Ambiguous 2 scene
Ambiguous 1 scene
Innocent scene
(viewer picked up none of the objects aka the sensor isn't triggered)
After triggering sensor 1, wait 7 secs and play audio file
when room light is turned back on sensor 2 will be triggered
2
depending on the level of light captured by sensor 1, sensor 2 will ~~start~~ trigger the ~~start~~ start of a specific scene

A.9. Viewers Experiencing The Unseen

A.10. The Unseen Interview Questions

General Information

Name		**Occupation**	
Gender	□ M □F □other	**Age**	
Nationality			

Do you watch a lot of movies?

Do you play video games?

Feedback questions

01. What did you think about the whole murder mystery experience? How did it make you feel?

02. Did any specific scene make you feel a certain way? Or any particular element? Why?

- □ Initial Party
- □ Scream
- □ Detective
- □ Photographer

03. What did you think about the interactions?

04. How did it feel to influence a character's fate with your choice?

05. There are five different outcomes depending on your choice. How does knowing this make you feel?

06. What do you think about mixing film and reality?

07. What did you think about interacting with objects related to the story?

08. What did you think about seeing yourself within the photographer's pictures?

09. If the story continued, what kind of things would you like included in the experience?

10. Any other related feedback you would like to give?

A.11. Notes from The Unseen Viewer Interviews

Viewers who enjoy watching cinematic narratives and playing video games

Viewer #1: student, male, 30 yrs old, German
Viewer #2: student, female, 24 yrs old, Ethiopian
Viewer #3: student, female, 24 yrs old, American

Feedback questions

01. What did you think about the whole murder mystery experience? How did it make you feel?

Viewer #1: *I liked it, promising. 3 Locations and leading to next made curios (Photographer part). Expected to be scared from behind. Whole time felt something will happen to me. If new place and dark, more effective.*

Viewer #2: *Was actually shocked. What's going on! So much fun! No tables would be better -> just movie related props.*

Viewer #3: *Didn't know if the beginning was part of it. Liked the idea of being involved in a closed room mystery. Own picture yay!*

02. Did any specific scene make you feel a certain way? Or any particular element? Why?

Viewer #1: *Detective footage.*

Viewer #2: *Inserted into the action, object relevant!*

Viewer #3: *Detective. Couldn't see murder weapon clearly -> but oh I had the lantern! Kind of like a "Clue" movie.*

03. What did you think about the interactions?

Viewer #1: *Hard to catch.*

Viewer #2: *Candlestick most interesting! When props can communicate with video, strong effect. (tables away!)*

Viewer #3: *I liked the flashlight/lantern/candlelight setting, but #1 was my picture! Would like to see clearer all the people who are in the party. Felt more like background rather than characters in possible murder plot.*

04. How did it feel to influence a character's fate with your choice?

Viewer #1: *No feeling, didn't get influence.*

Viewer #2: *Liked it. What would happen if I made different choice? -> "Clue" kind of experience cool. Would be nice to have this with two variables. First do this and then something else later. Might be cool with more people -> you did it, no you did etc.*

Viewer #3: *It's cool! Heard scream and thought made wrong choice!*

05. There are five different outcomes depending on your choice. How does knowing this make you feel?

Viewer #1: *Curious.*

Viewer #2: *Makes me want to do all 5! Reset! I want to see what happens if I pick more than one.*

Viewer #3: *How those extra 2? How 5 in total? Mysterious! Want to try it 5 times!*

06. What do you think about mixing film and reality?

Viewer #1: *Personally not a big fan, don't trust 4D cinema and don't like deep books, movies -> all a problem.*

Viewer #2: *Always wish it would happen. Wants to be in on the good stuff in movies. Being a character cool!*

Viewer #3: *It's fun!*

07. What did you think about interacting with objects related to the story?

Viewer #1: *Makes interesting. Max 2-3 time thing though.*

Viewer #2: *Liked that objects were all related to light (does anyone have candlesticks anymore though? We do at home but still).*

Viewer #3: *Makes it feel more like theater or an amusement park ride! Nice not to be passive.*

08. What did you think about seeing yourself within the photographer's pictures?

Viewer #1: *A surprise, be careful with format. Maybe prepare mask on Photoshop. Maybe would feel more involved if own picture not last but in the middle.*

Viewer #2: *Good, liked it. If I was in a "state" like everyone else in the pictures it would make me feel like I was being watched.*

Viewer #3: *Surprising! I'm going to be pointed out as the murderer.*

09. If the story continued, what kind of things would you like included in the experience?

Viewer #1: *Video screen switch should go completely around room once. Simple choice (like Eat Me/Drink Me in Alice experience, or simple decision of left or right). It being related to the movie needs to be clear -> otherwise impact gets lost.*

Viewer #2: *That second layer with props. If someone from video became real, walks out of the screen!*

Viewer #3: *More profiles of possible killers! Just one real person here now, me! More story! Part 2 come! Consequences!*

10. Any other related feedback you would like to give?

Viewer #1*: How long would the whole thing be? Would be nice to see in a different location.*

Viewer #2: *Can you make a whole movie? Would redefine movie experience. Go in small groups etc. Infusion of game and movie.*

Viewer #3: *Beginning was good, thought lights going off was real technical difficulty. Party was too short.*

Viewers who enjoy watching cinematic narratives

Viewer #4: student, male, 28 yrs old, German
Viewer #5: student, female, 26 yrs old, Indonesian

Feedback questions

01. What did you think about the whole murder mystery experience? How did it make you feel?

Viewer #4: *Was excited, if personal interaction made difference. Didn't know what part of experience and what system failure.*

Viewer #5: *Mysterious, scary. Was scared and curious.*

02. Did any specific scene make you feel a certain way? Or any particular element? Why?

Viewer #4: *Photographer. Following movement was nice. Didn't feel first scene involved me. If characters had turned around and said hi or someone was talking to me would be good.*

Viewer #5: *Detective made curious. Wanted to know who was murderer.*

03. What did you think about the interactions?

Viewer #4: *Took a moment to realize what the objects are. Other person's extra flashlight confusing. No direct reaction.*

Viewer #5: *Didn't know what to do with object. Was I supposed to keep it? Put it back?*

04. How did it feel to influence a character's fate with your choice?

Viewer #4: *I was murderer! Didn't know first what was happening.*

Viewer #5: *Keep on thinking what is the outcome of particular objects.*

05. There are five different outcomes depending on your choice. How does knowing this make you feel?

Viewer #4: *I wonder what the triggers are, why 5 out of 3 -> curious.*

Viewer #5: *Interesting.*

06. What do you think about mixing film and reality?

Viewer #4: *Excited. Scary too -> that's why confused -> should not be aware of setting, otherwise unnatural reactions (like you know it's a movie). The Game with Michael Douglas is the reason why I am a big fan.*

Viewer #5: *Interesting, power to change outcome.*

07. What did you think about interacting with objects related to the story?

Viewer #4: *More fun if could bring anything -> system could allow to be a part of it like the picture.*

Viewer #5: *Interesting, usually only on screen. More tangible. More real.*

08. What did you think about seeing yourself within the photographer's pictures?

Viewer #4: *Fun when included so fast. Could be recorded on the way to the movie and with some effect merged into the movie.*

Viewer #5: *Feel like I was in the movie, didn't think I would be in digital form myself.*

09. If the story continued, what kind of things would you like included in the experience?

Viewer #4: *I would be pointing the finger at who it was. Maybe would find the killed person again. Could make guesses according to CCTV.*

Viewer #5: *More similar choices, pizza (people in party eat pizza)!*

10. Any other related feedback you would like to give?

Viewer #4: *Idea of murder nice, could be tested with simpler interaction -> maybe something abstract. Light going out could be a positive thing. More decisions!*

Viewer #5: *Have to see whole version, this is short. Ask questions from audience (interrogation).*

Viewers who do not particularly watch cinematic narratives or play video games

Viewer #6: student, female, 23 yrs old, Chinese
Viewer #7: student, female, 24 yrs old, Palestinian

Feedback questions

01. What did you think about the whole murder mystery experience? How did it make you feel?

Viewer #6: *Light on/off good. Felt scary (not scary later because wasn't coherent). Video behind would be good. Should just show CCTV and no person on screen. If louder sound for scream (like 3 speakers surrounding me) it would make me want to find out where it came from.*

Viewer #7: *I liked the photographer walking from one screen to another -> felt real.*

02. Did any specific scene make you feel a certain way? Or any particular element? Why?

Viewer #6: *Initial party. The lights. Like shown in movie.*

Viewer #7: *Photographer. Following him. Felt he physically walked to the other screen. Tripped me out.*

03. What did you think about the interactions?

Viewer #6: *It's fine. Better without other person's flashlight.*

Viewer #7: *A bit slow. Should be party related objects.*

04. How did it feel to influence a character's fate with your choice?

Viewer #6: *Feels like it already happened so not own fault.*

Viewer #7: *Too much responsibility, it's their life!*

05. There are five different outcomes depending on your choice. How does knowing this make you feel?

Viewer #6: *Nothing. I want to know the effect before hand (like I get told that my choice affects how my friend dies).*

Viewer #7: *Cool! I want to do this 5 times!*

06. What do you think about mixing film and reality?

Viewer #6: *It's good. Entertainment already does this very well. Interacting with person in movie -> can't tell difference between this and entertainment.*

Viewer #7: *Was kind of cool, can see the connection -> would be better if more people at party -> who's in on it, who's playing, who's a prop.*

07. What did you think about interacting with objects related to the story?

Viewer #6: *Good, gives way to engage in movie and affect it.*

Viewer #7: *Good. For these objects there could have been indication of them being for an emergency. Physically touching objects cool. Don't like it when something like just phones are used.*

08. What did you think about seeing yourself within the photographer's pictures?

Viewer #6: *When you take photo in front of me, knew it would show up later.*

Viewer #7: *Got tripped out. Why was I suspected? Realized was part of party myself when saw own picture.*

09. If the story continued, what kind of things would you like included in the experience?

Viewer #6: *Suspects in front of me and have a talk. People show up in front of you. See if anything strange -> talk about what they were doing during the murder.*

Viewer #7: *More security footage. Cool if could see with friend and one of us is killer.*

10. Any other related feedback you would like to give?

Viewer #6: *Fun. Needs lots of effort for improvement.*

Viewer #7: *What does the candle do?*