# A New Encounter with Alice

Jesse Meijers
Marjolein Schets
Jim Steenbakkers

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TU Eindhoven - Industrial Design
Coach: Jun Hu

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# Chapter 1

# Summary/Abstract

Our project goal was to design and build a room which could fit in the 'Alice Project' [1]or to improve part of the 'Alice Project' . The goal of the project was to create a new form of presence and user experience by turning the visitors sense of reality upside down through the use of modern technology. The rooms built for this project were based on scenes from the book 'Alice's Adventures in Wonderland'[1] . We decided to build a new room. Our room is based on the scene where the tarts of the Queen of Hearts[2] get stolen. The visitor will accidentally perform the theft. The rooms purpose is evoking a feeling of confusion. The room is an infinity mirror room which contradicts the visitor's sense of reality, proportion and boundaries.

[1]An installation based on the novel 'Alice's Adventures in Wonderland' [1] - by the Industrial Design Realities department.

[2]An important character in the book - for more information see *Appendix B.2.*

# Chapter 2

# Introduction

The purpose of 'Alice's Adventures in Wonderland' [1] is conveying the confusion about what life is about, who you are and so on. As a child, you still possess your lively imagination. Boundaries are much thinner and you can more easily switch over to Wonderland as you would to the real world. As a grown-up your boundaries are so thick you can only look through them, but you cannot cross them anymore. Wonderland remains a fantasy. But where do these boundaries lie? Where does fantasy start and reality stop? Who are you?

We are going to try to convey this confusion through an extra section we will be designing for the Alice project.

## 2.1 Discription of the Project

A room with mirror walls which creates the feeling of a never-ending room. When the visitor enters the room and stays there for a moment he will become disoriented. Then the user will see a tart on a table. This will cause the visitor to near the tart, as it is the only object in the entire room. But the visitor will soon notice that he was not supposed to do that. The goal is to play with the awareness of orientation. The link with 'Alice's Adventures in Wonderland' [1] is that the user is prone to steal the tarts of the queen. Next the queen will start yelling at the user, the user will feel trapped. The only way out for the user is to stand up for him/herself by yelling at the queen.

**'Alice's Adventures in Wonderland' [1]**

' 'That depends a good deal on where you want to get to,' said the Cat. 'I don't much care where–' said Alice. 'Then it doesn't matter which way you

go,' said the Cat' [1]

## 2.2 Hypothesis

Before we actually started with the project, we made the following hypothesis:

> If we are able to control technical elements which are easy in use and easy to program, we are able to make the user feel like Alice in the book Alices Adventures in Wonderland[1]

In the conclusion chapter we will answer this hypothesis.

### 2.2.1 Expectations

During our first project, we all expect to learn a lot. We think we will learn a lot about teamwork, communication, design processes, making ideas and concepts and turning them into (an) actual design(s). Further we think our project will provide us with a lot of happenings to reflect on, improve our professionalism of being a designer and give us a first start in our career.

### 2.2.2 Results

We think we will create a design in which we force the user to feel a certain way. We will do this with the use of easy in use and easy to program technology. We will base our design on thorough research.

## 2.3 Project relevance

A project would not be a good project without having a contribution. In other words, why we do this project. The goal of this project is to investigate how we can create an experience for a user; how we can influence the user in such a way that we make the user feel in a way we want him or her to. We researched how we can use technology for these goals; how we can create feelings with technology.

[1] From 'Alice's Adventures in Wonderland' [1], Chapter 6

## 2.4 Outline/Structure

### 2.4.1 Report wise

This report is created in such a way that it can easily be browsed. The red words are links to a particular section of the report. The words describe the section one will go to when they are clicked. Red numbers are references to the footnotes. Green numbers are the references to the bibliography. When the links are clicked, the document will go to the matching section in the report.
On the left side there is also a navigation bar (bookmarks) that provide guidance through the document.

### 2.4.2 Project wise

*Our process and structure of the project can be seen in Appendix L*

# Chapter 3

# 1st Design Cycle

## 3.1 Literature Research

For our project, since it should be based on 'Alice's Adventures in Wonderland'[1], literature research was very important to find out about several elements of the book.
Some of these elements include, the author, the time and period it was written in, the emotions the book evokes and particularly for this book, the elements in culture and ethics.
Some of these elements we put in contrast with modern times to understand and highlight certain differences. Also for interesting research and material that we used, as well as for notes and certain pictures that show our design process, we would like to direct the reader to the *Appendix*.

### 3.1.1 Lewis Caroll

*For a detailed description of Lewis Carroll's life in combination with the characters in the book see Appendix B*

The characters that Carroll used are mostly based on the adults out of its own life, this can really contribute to the theme of the story and should be examined. Lewis Carroll was a great favorer of paradoxes and raising questions to its readers. That is one of the reasons he wants you to disagree with Alice in the book, she believes whatever reasoning the characters have, even though when they make no sense because only parts of their reasoning is true. He likes to create confusion and is a great favorer of psychology .

> 'Throughout his life he took great delight in puzzles and paradoxes and presented them to his child friends and many adult

> ones as well. With the paradoxes, he did not always supply a solution and it gave him enormous pleasure to see great minds struggling to resolve them." Were the logic problems presented in Alice's Adventures in Wonderland meant to be solved, or simply pondered for their philosophical merit' ? [1]

From this we drew the sion that the author wanted the book to be a sort of puzzle too.

#### Characters in the book

During the research on Lewis Carroll, we found out that the book is a reflection of his life, made by a seven year old. What we found interesting is that the characters often resemble persons in Carrolls life.

### 3.1.2 Victorian Era

*General information on the Victorian Era can be found in Appendix A. The themes and motifs from Victorian literature that are apparent in the book can be found in Appendix D.*

To understand the background of the book, it is inevitable to understand about what was going on in the time the book was written. Some themes that are striking during the Victorian era[2]:

- More wealth
- Interest for nature
- Long period of peace

#### Victorian literature

The romantic period was the main period of the Victorian era, during that time there was also a small side-stream the black romantic period.

[1] http://vitorianweb.org

[2] The Victorian era refers to the period in which queen Victoria was reigning the United Kingdom - This is where Caroll lived - See Appendix A.

Themes in romantic period (19th century)

- Women and children in literature
  *Jane Eyre[5], Alice's Adventures in Wonderland[1], Oliver Twist[3]*
- Minority of the society represented
  *Oliver Twist[3]*
- Flight from reality - Fairytales, Exploring - Science Fiction
  *Journey to the centre of the earth[2], Alice's Adventures in Wonderland[1]*
- Nature
- Link to Classical period

Themes in black romantic period (1836-1840)

- Horror, Gothic stories
  *Dracula[6], Frankenstein[7]*
- Madness
  *Fall of the house of Usher[8]*
- Pain and Death
  *Wuthering Heights [4]*

**Conclusion**

In 'Alice's Adventures in Wonderland'[1], the typical themes that occur in the romantic period are represented in a clear way. Alice is a child. In the book, the flight from reality (fairytale), with a lot of surrealism, becomes very obvious. Animals can talk in Wonderland, basically everything is made up according to the imagination Alice has. The innocence of Childhood is very important for the author. Nature and animals are also of importance in the book.

Knowing more about the time period makes one understand better how people at that time would have percepted the book as opposed to people now.

### 3.1.3 Emotions

*Research on colours and emotions, together with the selecting process of the emotions and the analysis of emotions in the book, can be found in Appendix E.*

We focused on the emotions the book evoked for a long time. We looked at this from our own perspective. What emotions did it evoke in us?

We divided the emotions into 4 main categories. These are the emotions that we focused on and started generating ideas with:

- Horror
- Happiness
- Fear and Sadness
- Surprise and Anger

### 3.1.4 Culture and ethics

**Elements in the book**

*For comments and notes see Appendix E, figure E.1.*

**Goals** In the western culture, you keep on developing to reach a goal, but when the goal is reached, you will stop developing or you will adjust your goal/make a new goal. In the book of Alice, Alice has a few goals. The first one she makes is to catch the White Rabbit. Another goal of Alice is to reach the beautiful garden. She continuously sets goals, shrinking, growing, playing croquet etc.. Alice thinks it is strange when things do not have goals, for example during the Caucus Race or the croquet game.

**Death** When this life ends, it will be the end of living. When we look at the theme 'Life as an meaningless puzzle' it says the same as when this life ends, it will be the end of living and life as a meaningless puzzle. If our lives end, everything we have done, can be seen as meaningless. We cannot use the things we have invented/done/built/etc..
In the book Alice does not want to grow up because this is a beginning to the end of this life and thus living.
Getting older is portrayed as very scary.

Fear of the future is portrayed in the book, as Alice cannot answer the Caterpillar who she is, but her name. She can also not say anything about what she wants to become. Alice runs away because this is too confronting for her to think about, as she is still a child.
The flight from reality and the wandering around by Alice also becomes very obvious in the book. People at that time were tired of everyday life and thus sought a way to flee from reality, literature responded to that and forms a very important source. Since the Romanticism literatures role was considered more and more important in society.

**Feminism** Something that came up in the Victorian Era is feminism. This can be found in the book several times. The Queen is for example higher of status than the King, because she makes the decisions when heads go off. A curious thing in the book is that most of the men are mad, but the Queen and the Duchess seem to reason without craziness. This can indicate feminism. The Queen loses her temper very quickly, but compared to the Mad Hatter or the Cheshire Cat, she is as sane as can be. The queen is portrayed as a very strong woman, like queen Victoria (Victorian era). During this time women in the western world really stood up for themselves.

**Superiority** People in western culture see themselves as superior to others. Also to animals. People in western culture also have the tendency to box other people. The pigeon who accuses Alice of being a serpent is also a confusing experience for Alice. Now she doesnt know who she is anymore.
The pigeon calls Alice a Serpent because of her features (the long neck and eating eggs). It might be a reflection on the human ability to box people. Just because somebody looks like, in this case, a serpent doesnt mean she actually is a serpent.
Are humans on top of the animal life? We assume humans are on top of the life cycle. But are we? In 'Alice's Adventures in Wonderland' [1] this assumption is challenged, because she is ordered about by the White rabbit and she follows the advice of the Cheshire Cat and the Caterpillar.

## 3.2 Decisions and Motivation

### 3.2.1 Generating Ideas

*For pictures and information on the idea generating process see Appendix F.*

With all the collected information from researching, we generated ideas. Generating ideas we used different techniques. From brainstorming with words, to sketching, to making moodboards and collages and so on.

### 3.2.2 4 Concepts

*For images of concepts and the process see Appendix F.*

In the end we all chose a concept to develop, so we had 4 concepts. These 4 concepts had to be applicable for our goal.

#### Maze room

A maze which consists of several rooms in which the visitor must activate sensors to open doors and move on to the next part. The goal is to create cultural awareness. This means you become aware of the typical characteristics of the Western Culture such as haste and the urge to try and reach a goal. The link with 'Alice's Adventures in Wonderland' [1] is the scene in the book where she reaches the beautiful gardens.

#### Mirror room

A room with mirror walls which creates the feeling of a never-ending room. When the visitor enters the room and stays there for a moment he will become disoriented. Then images of running card soldiers will be projected onto the mirrors. This will cause the visitor to feel chased and flee out of the chamber. The goal is to play with the awareness of orientation. The link with 'Alice's Adventures in Wonderland' [1] is the chasing of Alice by the card guards.

#### Upside down room

A room in which gravity seems to be completely random. Furniture and other objects are attached to the floor, walls and ceiling. You need to switch on several lights to gain access to the next room(s) of the installation. In this room, your awareness of Assumptions is challenged. You assume that gravity pulls everything towards the ground. The link with 'Alice's Adventures in Wonderland' [1] is the part where Alice falls down the rabbit hole and the scene in the Rabbits House.

**Puzzle room**

A room with puzzle pieces with a mirroring surface scattered around. On the walls are several lockers and clocks which can be moved aside to reveal hidden compartments. There is a small ramp where the puzzle pieces should be placed, above this ramp the question Who are you? is written. When you complete the puzzle, the piece where your face would be reflected by the mirrors is missing, causing you to be aware of yourself (awareness of ethics). The link with 'Alice's Adventures in Wonderland' [1] is the scene with the discussion with the caterpillar.

### 3.2.3 4 to 2 Concepts

*The results of our concept survey and decision making can be found in Appendix G.*

Before the Midterm Exhibition, we wanted to cut our concepts into 2, then at the exhibition, with feedback from the people that would visit us, it was our goal to choose the final concept keeping that feedback in mind.

We had constructed a list of criteria to help us choose the 2 concepts. The criteria were the following:

- Goal
- Feasibility
- Interaction
- Connection to the story
- Connection to research
- Wow-factor

However, with these criteria, we were still not unanimous. We constructed a survey on paper with no images, and let random people, who knew nothing about the project choose whatever room they liked best. The rooms that were eventually chosen were the *Mirror room* and the *Upside down room.*

# Chapter 4

# 2nd Design Cycle

## 4.1 Midterm Exhibition

The Midterm Exhibition is an exposition of protoypes and progress half way during the project. Here the designteams and individual designers get a good opportunity to gather feedback from different designers.

### 4.1.1 Preparation

*For meeting minutes of the Alice-group meetings see Appendix I*

A couple of weeks before the midterm all the "A new encounter with Alice"[1] groups had a meeting in which we discussed the possibilities to work together at the exhibition. After some verbal communication, we took the initiative in creating the official meetings.

The main qualification of the space was that it needed to make the visitor very curious, that the visitor was entering a new world. We wanted to let the user feel what Alice feels in the book. To create this, props and elements of the Alice in Wonderland world were necessary. We used the available items from the existing Alice installation for our setup.

### 4.1.2 Setup

*For pictures of how our space exactly looked see Appendix I.*

We used our prototypes and posters to present our process. For the both the concepts we made a peepshow. To be able to look properly in the box of

the upside down room, we lifted it to a position in which the visitors would be able to see the box clearly. We also placed lights around our table to make sure everything could be viewed and nothing would be overseen.

### 4.1.3 Goals

To create a useful midterm exhibition, we set goals. Our first goal was to find out which of the two concepts had the most potential; which concept the designers would further develop themselves. We decided to create a survey to ask questions to the visitors. At the entrance of the exhibition space the visitors recieved a survey in which they could describe the pros, cons and recommendations on our concepts. Not only did we gather feedback in this way, we also asked the visitors for their preference and recommendations.

### 4.1.4 Results

*For an overview of the results see Appendix I*

All the feedback we got was carefully documented during the exhibition. We used a dummy to write down the verbal feedback. After the midterm we first analyzed and discussed the received comments. Although we got good feedback on both concepts. A lot of visitors liked the abstract and modern idea on which we built the ideas and concepts and a lot of people were impressed by the depth and the feeling of (non-existing) space we created with our mirror room prototype. We decided to go with the opinion of the visitors and chose the Mirror Room as our final concept.

Next we dug deeper into the feedback on the mirror room. One of the comments was to look at all of the different senses. So we made a scheme of the different senses and what we already thought about with all the different senses. After this we looked at every sense separately and brainstormed for new ideas. Our conclusion from this is that we do not want to include smell and taste. They would not create something additional in the concept. We did include the other senses. To give an overview, we made this chart. This also includes the link to the main goal of our concept, to create confusion.

Other feedback we received was that we need to take into account that people with fear of heights might be afraid when they enter our concept and look down into infinity. This is something we would have to test.

Another student mentioned that it would be an addition if you could actually take the tarts out of the mirror. We wanted to research possibilities to achieve this effect. Our results of this research can be found in the next chapter.

## 4.2 Additional Research Technology

*Results and how we exactly retrieved information can be seen in Appendix J*

To enhance our concept we looked at the feedback and concluded that we needed to conduct some additional research. These extra explorations would lead to new possibilities. After this we concluded if we could actually use these possibilities. We will describe the areas we did additional research in. It will contain how and why we did the research.

### 4.2.1 3D

One reccomendation we got was to implement a 3D-webcam in the prototype. This way, the user can experience how it is like to be inside the mirror room (experience the depth) without the need to build a real size chamber. We wanted to understand how we could achieve our own 3D images and if it would actually would enhance the feeling of depth.

Out of the information we found, we made the following description. This way you can create a 3D image. [1] [2]

1. Take one picture of your subject. This will represent the right eye.
2. Move the camera about 6 cm to the left and take another picture. The 6 cm is almost the same length as the difference between your eyes, so you replicate the human vision.
3. Load the pictures onto your personal computer, start the software (i.e. Adobe Photoshop) and open both photos.
4. Put the right image on top of the left image
5. Got to RGB channels of the right photo and uncheck the Red channel.

[1] http://www.wikihow.com/Make-3D-Photos
[2] www.opentutorial.com/Make_ 3d_images

6. Now you have a picture now in which you see a lot of red and blue. Try to align the pictures as perfectly as possible, so you see as less red and blue as possible.

We used the same description to create a 3D video. The only difference was that we shot the left and the right image at the same time. The focusing is a lot harder with a video. This is due the distance of the subjects in a movie. One needs to shoot a movie that has a subject which is not too far away and too close to the camera.

The main subject should be somewhere between 4,5 and 7 meters.[3] If one should adjust the distance between the left and right camera, the distance that the main subject is in changes. If the cameras are placed closer to each other, the distance becomes smaller. Does one place them further from each other, the distance of the main subject increases.

For our final prototype we decided to buy a 3D webcam. This webcam has the cameras placed close to each other and provides better quality then we could provide ourselves.

### 4.2.2 Programming

*The programming code can be seen in Appendix J*

To control the webcam that goes inside the prototype a program was necessary. We want to control the webcam with a mouse or table pen and the camera must be able to look up and down.

#### Necessities

We took the 2 servos. With the servo motors we could make the webcam rotate in various angles, to make sure that it could look like the human face. We linked them together with an arduino and a breadboard to operate a 3D webcam that we would later move around in our prototype to let people at the final exhibition experience the infinity of our prototype.

#### Progress

We made a flowchart to see which steps are needed to create the program. It can be seen in the appendix and shows all the steps that need to be implied

[3] http://www.youtube.com/watch?v=V6Nuafo8wTs

in the program. We eventualy decided, with time and experience taken into account, that we create a program that will move up, down, left and right in a predefined order.

### 4.2.3 Hologram

One of the new ideas after the feedback was to create a hologram cake. When the user tries to try to touch the cake, an alarm would sound and the Queen of Hearts would start to yell. We conducted the additional research in this area to find out if this was possible.

During our research for holographic simulations we found that it is rather difficult and expensive to create a virtual projection of a subject. The idea of a hologram lies within the creation of a virtual image. This image is created by using several lenses. This way you fool your eyes and let them think they see an object, though in fact the subject is not there. The lenses bend the straight lights and let your eyes see the light different then they would without a lens. This theory could create a holographic image (on a piece of special paper), but not an actual hologram and that is not what we need for our concept.[4]

A very suitable sollution would be using a Holomirror 360.[5] A holomirror exists out of two oval mirrors on top of each other, creating an oval form. One of the mirrors has a hole in it. One can put an object in the middle of the mirrors. The light inside the mirrors get reflected in such a way through that hole, that the object appears to be on top of the top mirror, thus creating a hologram.

### 4.2.4 Lasers

One of the new ideas we thought of was to install lasers inside the mirror room when the user touches the cake. The user would then be captured inside a cage made of those lasers. We want to use smoke to let the cage appear out of nothing. We were not able to implement lasers in our first prototype, see recommendations.

[4] http://web.phys.tue.nl/fileadmin/tn/Studievoorlichting/handleiding_holografie_op_school_-_versie_1.pdf

[5] http://www.laser-magic.com/HoloMirror_360.htm

Because we are using mirrors in our design, we need to take into account that they would be reflected into infinity. The cage would not have this problem, the only condition is that the mirrors have to be parallel on each other and the lasers need to make a perfect 90 degree angle with the mirrors.

### 4.2.5 Mirrors

We cannot just put the mirrors into our room. There are some things we needed to think about, things like the materials and the construction. These things are treated in this subchapter.

#### Materials

*The calculation of the costs can be seen in Appendix J*

For further development we decided to take a look at the usage of different materials with the same behavior. Our decision was based mainly on the criteria of price, how can we make the design cheaper. We thought that if the costs are lower, people would be earlier seduced to buy or sponsor the design. We estimated the mirror room cost to be about 4400 Euros.

One of the things we immediately thought about was the mirror foil we used to create the infinity mirror. It would reduce the cost tremendously (to about 300 Euros). We tested if the effect would be the same as actual mirrors.. We first made the foil stick to Vivac[6] and to wood, but they both did not give a good, clear reflection.

Other mirror foil, which is not transparent when a bright light is on the other side, proved to have the same flaws as the transparent mirror foil. The infinity effect we want to create can only be made with clear reflections. Our conclusion was that real mirrors would still have the best effect, even though they are more expensive.

#### Mirror Adjustment

To get the best effect all the mirrors on the wall need to be parallel to each other. The mirrors need to be adjustable in every corner so that we can create the optimal effect. We use two mechanisms to hang a mirror on a beam. If we create these mechanism is such a way that they are slightly

[6] a clear, plastic material that looks like Plexiglas

wider than the beam, we have some room to move them in and manuovre them in the right position. The bright blue objects are the construction mechanisms. These will be put over the beam, so the mirror will hang on the beam and nothing else. The beams can only adjust the right and left side of the mirror. Another solution is needed to be able to adjust the mirror in the top and the bottom (vertical). We implemented vertical beams to support the beams where the mirrors will hang on. If we place some thin material on these beams at the top or the bottom, the mirror will move in a vertical way.

## 4.3 Business

### 4.3.1 Business plan

To make it clear why this is design fits the case, who is our user and why this is a good design we created a business plan. This subchapter describes those subjects. Our catch phrase is as follows:

> *The design is a hexagonal mirror room,based on a scene from 'Alice's Adventures in Wonderland'[1] that creates the experience of confusion by tackling the awareness of place*

#### Why this concept fits the case

In the beginning of our project we made clear to ourselves what we wanted to accomplish in this first project. To do this we needed to explain the project description. We did this as follows:

> 'Our project goal was to design and build a room or object through which we evoke the feelings Alice experiences in the book 'Alices Adventures in Wonderland' [1]. Another feature that we want to deal with are the underlying messages in the book. In other words, we will try to let the user feel and experience what Alice feels and experiences in the book.'

#### Target consumer

Our target group is everybody in the western culture who can properly understand English and has an ability to think things through that he or she experiences and witnesses. To make it more specific, we set the user-age to 18+.

**Consumer insight**

The target group is a very diverse group, but what they have in common is that they live and grew up in (or experienced for a long time) the western culture. The needs of this group is to experience something new, something out of the ordinary. This design offers exactly that. A new and never seen experience.

**Competitive environment**

We offer a very specific design, so we do not really have competition.

**Benefits**

There is a hidden message in our design. We want people to be confused and amazed, not only with what they experience directly, but also in a second and deeper layer. So we offer an experience somebody will never forget. The key in this disorientation.

**"Reasons to believe"**

We offer a very new experience, we extend the success of the existing infinity mirrors by creating a room full of infinity (because of the hexagonal shape of the room and that the ceiling and floor are also made of mirrors). So it is unique and distinguishes itself from other mirror rooms (via infinity and the link to the book of Alice). You are actually in the middle of infinity, so its very real, unlike a cinema and even a theater.

### 4.3.2 Sponsoring

As a project group we do not have a large budget to pay for all the costs. We thought it was a good idea to look for sponsoring. We thought that we could enhance our prototypes with a bigger budget.

The funds we contacted are the TU/e and the Dutch Design Week. Both without a positive result.

To give people a full impression of a mirror room, we contacted a company that had such a room. However, we were not able to lend this, but we found an alternative with using a 3D webcam.

**Conclusion**

Due to the fact that there is no budget available and that we could not lend the room, we cannot build a real sizel room. We had made a plan B, which is to create a small version of the room. Inside, a 3D webcam will be implemented through which one can see the depth of the infinity mirror. The lasers in the prototype are replaced with a spot light that follows the user around. This has almost the same effect, but is a lot cheaper.

## 4.4 Paper Prototyping

*The blueprints and notes can be seen in Appendix H*

There are some notes and blueprints we made, to make it clear how we would built the prototype.

# Chapter 5

# Final Design

## 5.1 Final Concept and Storyboard

*For the storyboard about our Final Concept see Appendix K.1*

Our final concept is the infinity mirror room. The small door gives the impression of entering a very small chamber. The visitor will not be able to estimate the size of the room. Because the room is an infinity mirror, the room will seem far bigger than it seemed from the outside. This triggers confusion and surprise within the visitor.

The room is enlightened by a light which comes from underneath a round table located in the middle of the room. The lighting underneath the table shifts colour from time to time, to change the mood of the room.

Implemented in the table is a Holomirror 360 with a cake inside. The cake is projected above the surface of the table. It looks like there is an ordinary cake sitting on top of the table, but this is just a hologram. If you were to try and touch it, your hand would pass through it. Around it, movement sensors are installed which will notice when someone tries to touch the cake.

When a visitor of the room tries to touch the cake, the movement sensors notice and the light underneath the table instantaneously shifts to red. A grid of red lasers switches on around the visitor and form prison bars around him. If the visitor tries to escape the lasers by stepping aside they will follow him around so he remains imprisoned.

A tape starts playing. The voice of the Queen of Hearts is heard, yelling at the visitor about him trying to steal the cake. She tries to trigger a reaction from the visitor by saying You stole my tart! and asking questions such as What do you have to say for yourself?. If the visitor yells back, the queen will be silenced and the light underneath the table will fade to white. The door of the mirror room will open again and the visitor can leave the room.

## 5.2 Cognitive Process

The goal is for the visitor to find his way in and out of the mirror room.

**Possible execution 1:**

1. The visitor enters the mirror room through the small door with the feeling of entering a small chamber due to the fact that a large room is automatically associated with a standard size or large door.

2. The visitor finds himself in a seemingly endless room due to the infinite reflection in the mirrors. The room seems far bigger than it seemed from the outside. The room is enlightened by a light which comes from underneath a round table located in the middle of the room.

4. The visitor starts to look around the mirror room to explore.

5. The visitor goes to look at the table in the middle of the room. Upon the table he notices the cake hologram. The visitor cannot see that it is just a hologram of the real cake.

6. The visitor walks back to the door. The door is closed, which makes the visitor realize that something should probably be done or happen.

7. The visitor walks around the room, waiting for something to happen.

8. Since nothing happens, the visitor suspects having to trigger a reaction from his environment.

9. The visitor returns to the only object in the mirror room; the table with the cake.

10. The visitor touches the cake, hereby triggering the movement sensors embedded in the table.

11. Laser lights, implemented in the mirror which acts as the ceiling, switch on, locate the visitor and form a prison around him.

12. The visitor is now trapped in between the lasers. He tries to walk out of the light but the lasers follow his movements everywhere.

13. A tape starts playing. The voice of the Queen of Hearts is heard, yelling at the visitor about him trying to steal the cake. She tries to trigger a reaction from the visitor by saying You stole my tart! and asking questions such as What do you have to say for yourself?.

14. The visitor yells back at the Queen.

15. The sound sensor registers a different frequency sound than the frequency of the Queen and gives a signal to the door.

16. The door opens and the visitor can leave the room.

**Possible execution 2:**

1. The visitor enters the mirror room through the small door with the feeling of entering a small chamber due to the fact that a large room is automatically associated with a standard size or large door.

2. The visitor finds himself in a seemingly endless room due to the infinite reflection in the mirrors. The room seems far bigger than it seemed from the outside. The room is enlightened by a light which comes from underneath a round table located in the middle of the room.

3. The visitor starts to look around the mirror room to explore.

4. The visitor goes to look at the table in the middle of the room. Upon the table he notices the cake hologram. The visitor cannot see that it is just a hologram of the real cake.

5. The visitor touches the cake, hereby triggering the movement sensors embedded in the table.

6. Laser lights, implemented in the mirror which acts as the ceiling, switch on, locate the visitor and form a prison around him.

7. The visitor is now trapped in between the lasers. He tries to walk out of the light but the lasers follow his movements everywhere.

8. A tape starts playing. The voice of the Queen of Hearts is heard, yelling at the visitor about him trying to steal the cake. She tries to trigger a reaction from the visitor by saying You stole my tart! and asking questions such as What do you have to say for yourself?.

9. The visitor yells back at the Queen.

10. The sound sensor registers a different frequency sound than the frequency of the Queen and gives a signal to the door.

11. The door opens and the visitor can leave the room.

**Possible execution 3:**

1. The visitor enters the mirror room through the small door with the feeling of entering a small chamber due to the fact that a large room is automatically associated with a standard size or large door.

2. The visitor finds himself in a seemingly endless room due to the infinite reflection in the mirrors. The room seems far bigger than it seemed from the outside. The room is enlightened by a light which comes from underneath a round table located in the middle of the room.

3. The visitor starts to look around the mirror room to explore.

4. The visitor goes to look at the table in the middle of the room. Upon the table he notices the cake hologram. The visitor cannot see that it is just a hologram of the real cake.

5. The visitor touches the cake, hereby triggering the movement sensors embedded in the table.

6. Laser lights, implemented in the mirror which acts as the ceiling, switch on, locate the visitor and form a prison around him.

7. The visitor is now trapped in between the lasers. He tries to walk out of the light but the lasers follow his movements everywhere.

8. A tape starts playing. The voice of the Queen of Hearts is heard, yelling at the visitor about him trying to steal the cake. She tries to trigger a reaction from the visitor by saying You stole my tart! and asking questions such as What do you have to say for yourself?.

9. The visitor remains silent.

10. The Queen stops shouting when the tape finishes.

11. The door opens and the visitor can leave the room.

## 5.3 Final Prototype

*For the illustrations of the prototype see Appendix K.2*

The following description is the explanation of what our final prototype would look like if ...

The outside of our room looks like a wooden box with a small door in the middle of one of the walls. The size of our prototype compared to the size of the real room is on a scale of 1:6. Our scaled down prototype is (length*width*height) 0.417*0.500*0.434 meters. An illustration of this is figure K.2.

Inside of this wooden box is a hexagonally shaped infinity mirror. This means that all of the surfaces inside of this hexagonal are made of mirrors, this includes the walls, the floor and the ceiling of the hexagonal. A square infinity mirror room has less reflections than a hexagonal, which makes it less puzzling to look at. When you would give it even more corners it would become too hard to focus on one of the mirrors at the time. The room would become chaotic and messy. Furthermore; the room had to have an even amount of mirrors because you need two mirrors who are each others

opposites to create an infinity effect . Illustrations of this are figures K.3 and K.4.

Inside of this infinity mirror is a small table of 1 meter high, in which a small cavity is made where a heart-shaped cake lies. Sensors are embedded in this cavity which registers movement within the cavity around this cake. Illustrations of this are figures K.5 and K.6.

A spotlight has been placed in the upper half of one of the walls of the mirror room. When the visitor triggers the movement sensors inside the cavity in the table this spotlight will be switched on and shed light upon the visitor. When the visitor moves, the spotlight will follow him around the room. Illustration of the spotlight are figures K.7 and K.8.

A spotlight is placed in a hole in one of the mirrors. This hole is covered with mirror foil. One side of mirror foil is transparent and can be seen through, the other side acts like a mirror. When you shine a light through the transparent side of the foil, the other (reflecting) side will become transparent to the eye and the visitor will be able to notice the spotlight shedding light on him.

When one of the movement sensors is triggered, a recording of the Queen of Hearts is played. The Queen angrily shouts at the person who triggered the sensors for Trying to steal her tart.. This stops when the visitor yells back, or when the recorded time has passed.

### How to build the mirror room

*For the illustrations of how to build the prototype see Appendix K.3*

It should be possible to transport the infinity mirror room to several places when needed. Therefore it should be possible to break it into manageable pieces.

The wooden frame around the mirror room consists of eight individual parts. We have called these parts the corner parts of the room to explain how the room is built. These corner parts each consist of three wooden panels

with two vertical beams and one horizontal beam. Illustrations of this are figures K.9 and K.10.

The corner parts can be stacked together until they form a cube. Each corner part has four clips, on places a, b, c and d in the image above on the right. These can attach to the adjoining corner parts to form a solid whole. The corner parts are solid themselves, and when all of the corner pieces are clasped together they will no longer budge. Illustrations of this are figures K.12 and K.13.

The four corner parts which form the base, as seen in image K.11, do only has clips on the horizontal panels. Two of the base parts also have a different shape so when you assemble the corner parts they form a door together. This can be seen in image K.14.

At the bottom of the cube, made out of the corner parts, a mirror will be put to serve as the floor. This is a mirror of 3*2.5 meters, cut into two even pieces so they will be easier to transport. The same technique is used for the mirror which will serve as the ceiling.

The wooden bars in the corner parts can be used to hang mirrors onto such as described in Mirrors on page 21.

## 5.4 3D Animation

*For a previeuw of the animation see Appendix K.4*

No evidence or reference material can be found of someone who built an infinity mirror room in which the floor and ceiling are also mirrors but people can still enter it. Therefore we decided to create a 3D simulation. This way we could find out what the effects were. We were unsure about whether it would have an impact upon the visitor or not and wanted to know this before we started to build it.

We wanted the 3D-model to be as realistic as possible to create the most realistic experience for the visitor. For this purpose, we used Blender[1].

A preview of the animation is figure K.15.
The animation can be found here:

http://www.student.tue.nl/Y/m.w.m.schets/Evidence/Mirroranimatie.avi

[1]Blender is a free downloadable program you can locate on the internet. We built a 3D infinity mirror room and animated it so the viewer can look around inside of it. http://www.blender.org

# Chapter 6

# Evaluation

## 6.1 Goal and Question

Previous to holding a user test, we must define the goals they must achieve to see if our prototype is functional. This way we can also find out whether there are some things that need to be improved.

Our goal for our user test are:

The 3D projection should evoke the feeling of standing inside the mirror room.

If these goals are reached, the results should be able to be used to answer the main question, namely;

When the visitor watches the screen with the 3D projection on it, will the 3D images evoke the feeling of standing inside a full-scale infinity mirror room?

## 6.2 Approach

*For the illustrations of the setup see Appendix K.5*

Our setup will be like displayed in fig. K.17. A table, with a wall along each end of the table and our prototype in the middle of these two, will be

displayed on the Final Exhibition. A piece of cloth will cover them all so the visitors cannot see them. A 3D camera will be put into the prototype and will be able to turn around. This camera is linked to a beamer which will project a 3D video of the insides of the prototype onto the wall. This way, visitors can look inside of the mirror room, but they will be unable to see the size of the prototype. They will have to guess the size and write it down on the survey we hand to them.

The point in doing so is that when they guess wrong, the confusion of the mirror room has worked perfectly. If they guess correct, the infinity illusion has proven not to be credible enough.

The questions are as follows:

1. Can you estimate how big the mirror room is? Write your answer below.

2. Were you able to make anything of the 3D video?

3. Was there a difference between the 2D and the 3D version of the room?

4. Do you recognize the link between the room and the book?

# Chapter 7

# Conclusion

In this chapter, we will conclude our project and answer the hypothesis. We made the conclusion from the evaluation that we have done at the Final Exhibition. We processed these results into the following answers.

## 7.1 Results

The answers to the questions we asked are as follows:

### 7.1.1 Can you estimate how big the mirror room is?

Hardly anybody was able to estimate the size of the room. We got very different answers during the Final Exhibition, from 2 x 2 m to 20 x 20 cm. This proves that it confuses people and that the awareness of place is contradicted.

A lot of people also asked us What are those white things in the room?. People meant the prototype table with this white object, but they did not see that it was only one table which was reflected in the mirrors.

### 7.1.2 Were you able to see depth in the 3D video?

It was only possible for visitors to make something out of the 3D images when the camera rotated towards a clear spot where you could look into infinity

inbetween the reflections of the table. This is something we knew in advance. A webcam can only focus in one point (nearby, far away or in between. We deliberately set the focus point of the camera at infinity to emphasize on the depth. When the infinity was in sight, people were able to form a clear picture from the images.

### 7.1.3 Was there a difference between the 2D and the 3D version of the room?

Even though it was hard to focus, most of the people had an extra feeling of depth when they saw the 3D images comparing with the 2D images. People had a better impression of the infinity and what its effect can it can evoke.

### 7.1.4 Do you recognize the link between the book and the room?

The link between the book and the room is not clear to everyone. Some of the people we questioned only understood if we shortly explained how we came up with the concept. The only people who did understand the link had recently read the book, but they were rather scarce.

## 7.2 Have the goals of the concept been reached?

### 7.2.1 Confusion

The feeling of confusion is triggered in our final prototype. Because of the all the reflections inside, people did not know where the camera was looking at inside the room. The fact that people asked us "what those white things were" (which was actually one table reflected many times in the mirrors), implies that they were confused about what the room consisted off. None of the visitors who tried to guess the size of the prototype got it right. This implies their confusion about the size of the room. Therefore, this goal has been reached.

### 7.2.2 Awareness of place

During the exhibition, we asked people how big they thought that the prototype room was. (We projected live-images from the 3D camera with a beamer.) People all estimated differently. The answers were from 2 by 2 meters to 20 by 20 cm. That almost everybody estimates the size of the room wrong, proves that the awareness of place is contradicted with the infinity effect. Therefore, this goal has been reached.

### 7.2.3 Reflection

We spoke to somebody who said: I need to think about this for sometime. We have not been able to make contact with the people we interviewed for the evaluation. Therefore we do not know for sure whether some of the visitors actually spent more thoughts on our concept after they left. We do know that the visitors we talked to all had a certain idea of how the prototype could work and were eager to discuss the possibilities. From this we may conclude that they reflected upon the prototype and concept at least a little.Therefore, this goal has been reached.

### 7.2.4 Link to the book

We discovered that the link to the book Alices Adventures in Wonderland[1] is not clear unless somebody of us shortly explained how we came up with the idea. On a very rare occasion someone visited us who would understand because he or she had only recently read the book. Therefore, this goal has not been reached.

### 7.2.5 Standing up for oneself

This can only be tested if we built the full-size room equipped with all of the technical elements from our final concept. Therefore we do not know

whether the visitor will stand up for himself or not. Therefore, this goal has not. been reached.

## 7.3 Hypothesis verified

If we are able to control technical elements which are easy in use and easy to program, we are able to make the user feel like Alice in the book Alices Adventures in Wonderland[1]

If we reach the goals, this will imply that the user of our concept will successfully undergo the experience of Alice in the book Alices Adventures in Wonderland[1], to the extent of what we were able to test with our prototype.

By using technical elements which were easy to use and easy to program we reached almost all of our goals, with the exception of standing up for oneself. We did not fully reach the goal of creating an obvious link to the book Alices Adventures in Wonderland[1]. The goal of standing up for oneself could not be tested with our prototype. To the user, linking to the book is mainly a way of being able to explain what kind of experience he or she has undergone. The users acknowledged the experience of a new reality. Therefore we can conclude that our hypothesis has been proved to be correct.

## 7.4 Motivation

We chose for the concept of the mirror room because it is the most innovating. The other concepts we chose were easily put aside as fake . The infinity mirror room on the other hand is, as unreal as it may seem when you enter it, completely plausible to exist. This means that when you enter it, you will experience entering a whole new reality.

Another reason for us to choose this concept was the challenge of making the visitor reflect on the room. We wanted the visitor to try to grasp the new reality he had been introduced to. By familiarizing with the room, the user might become at ease and be able to explore its possibilities. Eventually he might even muster up enough bravery to confront the Queen of Hearts. But above all: he will undergo an innovative experience.

## 7.5 Recommendations

We would like to give the following advice:

Ask yourself the question why during each step you take. Why am I doing this? Does it contribute to the goal of the project? Write everything down.

When something has to be perfect, consider taking it to a professional. Nobody can grasp something new to a perfect level and professionals offer certainty. If you send them a polite e-mail you might even get it for free or get a discount.

Besides taking it to a professional, you can also consider buying something instead of making it yourself when the object should be perfect. We did research on how a 3D video or picture could be made and then we proceeded to buy an official 3D-webcam to have perfect results.

We have stated that the spotlight inside of the mirror room will follow the visitor wherever he goes. What we did not discuss is how this were possible. Perhaps by using a floor which is sensitive to pressure? And how can you achieve this when the surface of the floor is a solid mirror?

Using a spotlight inside an infinity mirror can be unpredictable. Because the surface the light is projected upon is a mirror, as well as all the other surfaces, it will be reflected over and over again throughout the entire mirror room.

We have not been able to build a full-scale infinity mirror room due to the enormous costs that would involve. We were unable to get sponsoring by an organization, perhaps because we were not interesting enough. To make you and your product interesting, you should build a prototype to show them what you will mean to them and why they should want to sponsor you.

Do your research in literature. Try to find a search engine for literature on your university or in your nearest public library. Literature is more reliable than internet, when you look something up on the internet you should

try to find multiple websites which support a shared statement or piece of information.

We know how holograms work but we do not know what it costs yet. We know it works on a small scale, the effects of a hologram on a big scale could be researched. You can also do research on how to implement it into the table and about the effects it has on someone. Until you have run a user test you are not sure whether the user will believe it or not.

We wanted to use lasers in our final concept but we did not choose for this due to the costs. Further research could be done on how to move the lasers around and how to make them look like a cage.

We did not get to building an actual mirror room. A new project group for the Alice Project could find out whether it is plausible or not. They can make use of the information we have discovered.

It could be tested whether people are actually confused when the alarm sounds and the Queen of Hearts starts yelling after touching the cake. It could also be tested if they are confused by the fact that the cake is a hologram and cannot be touched besides looking very solid.

It could also be tested whether the link to the book is clear when the room is fully built. An addition to this could be placing the room in the Alice installation. The latter might influence the visitor.

# Appendix A

# Victorian era

General information on the Victorian era:

> 'The Victorian era of the United Kingdom was the period of Queen Victoria's reign from June 1837 until her death on the 22nd of January 1901. The reign was a long period of prosperity for the British people, as profits gained from the overseas British Empire, as well as from industrial improvements at home, allowed an educated middle class to develop. Some scholars extend the beginning of the period - as defined by a variety of sensibilities and political games that have come to be associated with the Victorians - back five years to the passage of the Reform Act 1832.
>
> The era is often characterized as a long period of peace, known as the Pax Britannica, and economic, colonial, and industrial consolidation, temporarily disrupted by the Crimean War, although Britain was at war every year during this time. Towards the end of the century, the policies of New Imperialism led to increasing colonial conflicts and eventually the Anglo-Zanzibar War and the Boer War. Domestically, the agenda was increasingly liberal with a number of shifts in the direction of gradual political reform and the widening of the voting franchise.
>
> Natural history becomes increasingly an "amateur" activity. Particularly in Britain and the United States, this grew into specialist hobbies such as the study of birds, butterflies, seashells

(malacology/conchology), beetles and wildflowers. Amateur collectors and natural history entrepreneurs played an important role in building the large natural history collections of the nineteenth and early twentieth centuries.'[1]

[1] http://en.wikipedia.org/Victorian_era

# Appendix B

# Character Analysis 'Alice's Adventures in Wonderland'[1]

## B.1 Alice

1

### The book

Alice is the main protagonist of the book Alice in wonderland. Alice is portrayed as a quaintly logical girl, sometimes even pedantic. In the first book she is exactly seven years old, but seems to conduct herself like a somewhat older child.

### Origins

Alice was based on Alice Liddell, Lewis Carrolls best (child)friend. The story takes place at Alice Liddells birthday. The fictive Alice is exactly as old as the real Alice was at that moment. Her family met with Carroll in the year 1856. He soon became a very close friend and spent much time with Alice and her sisters. Alice, at the age of 10, asked him to tell them a story. Carroll then told the girls stories about a girl named Alice who fell down a rabbit hole. Alice two sisters also feature in the book, Lorina can be found as the Lorry and Edith is the Eaglet.

[1] http://en.wikipedia.org/wiki/Alice

## B.2 Queen of Hearts

[2]

### The book

The Queen of Hearts, known for her often repeated sentence off with their heads! is the queen of Wonderland. Because of her love of executions, she is feared by many. She also enjoys to play croquet, but then with live hedgehogs as balls and flamingoes as mallets. The Queen of Hearts is often mistaken for the villain of the book, but she is merely one of the obstacles Alice encounters.

### Origins

The Queen of Hearts is a caricature version of Queen Victoria, the queen of England in those years. Carroll made sure that she was recognizable for parents reading the story to their children, but also that the children could not identify her as their queen.

## B.3 Mad Hatter

### The book

In the book the Mad Hatter is the head of the tea party. He continuously blathers strange riddles and makes short personal remarks. He is extremely mad.

### The origins

The Mad Hatter's character was possibly inspired by Theophilus Carter, an eccentric furniture dealer. Carter was supposedly at one time a servitor at Christ Church, one of the University of Oxford's colleges. He invented an alarm clock bed, exhibited at the Great Exhibition of 1851, that tipped sleepers out to wake them up. He later owned a furniture shop, and became known as "the Mad Hatter" from his habit of standing in the door of his shop wearing a top hat. As mad as a hatter refers to the Hatters in Carrolls time. Hatters used mercury with some pelts, it was inevitable to breathe this. Mercury poisoned them. Because of this poisoning the hatters were confused and had problems with speaking. [9]

[2] http://en.wikipedia.org/wiki/Queen_Of_Hearts

## B.4 Cheshire Cat

[3]

### The book

The Cheshire cat is seems to be a regular cat but has been gifted with the stunning ability to speak, grin and disappear. He -or she, for there are no signs of gender in the book- has a habit of asking Alice philosophical questions. He confuses her with witty remarks and disappears at random, leaving only his grin behind. On some occasions he annoys or baffles her, but at other occasions he cheers her up.

### Origins

The Cheshire cats origins are an often discussed subject, some say its based on the quote:

> 'Lo, like a Cheshire cat our court will grin.'[4].

Others state that it was based on a Cheshire sign painter's peculiar way of drawing the lion crest of the Grosvenor family of Concord, Massachusetts on inn and pub signs, which looked to the general populace like a grinning cat, rather than the noble beast it was supposed to be.

[3] http://en.wikipedia.org/wiki/Cheshire_Cat
[4] John Wolcot aka Peter Pindar - *lyric Epistles* - 1792

# Appendix C

# Analysis 'Alice's Adventures in Wonderland'[1]

## C.1 Themes

'Themes are the fundamental and often universal ideas explored in a literary work.

### C.1.1 The Tragic and Inevitable Loss of Childhood Innocence

Throughout the course of Alices Adventures in Wonderland, Alice goes through a variety of absurd physical changes. The discomfort she feels at never being the right size acts as a symbol for the changes that occur during puberty. Alice finds these changes to be traumatic, and feels discomfort, frustration, and sadness when she goes through them. She struggles to maintain a comfortable physical size. In Chapter I, she becomes upset when she keeps finding herself too big or too small to enter the garden. In Chapter V, she loses control over specific body parts when her neck grows to an absurd length. These constant fluctuations represent the way a child may feel as her body grows and changes during puberty.

### C.1.2 Life as a Meaningless Puzzle

In Alices Adventures in Wonderland, Alice encounters a series of puzzles that seem to have no clear solutions, which imitates the ways that life frustrates expectations. Alice expects that the situations she encounters will make a certain kind of sense, but they repeatedly frustrate her ability to figure

out Wonderland. Alice tries to understand the Caucus race, solve the Mad Hatters riddle, and understand the Queens ridiculous croquet game, but to no avail. In every instance, the riddles and challenges presented to Alice have no purpose or answer. Even though Lewis Carroll was a logician, in Alices Adventures in Wonderland he makes a farce out of jokes, riddles, and games of logic. Alice learns that she cannot expect to find logic or meaning in the situations that she encounters, even when they appear to be problems, riddles, or games that would normally have solutions that Alice would be able to figure out. Carroll makes a broader point about the ways that life frustrates expectations and resists interpretation, even when problems seem familiar or solvable.

### C.1.3 Death as a Constant and Underlying Menace

Alice continually finds herself in situations in which she risks death, and while these threats never materialize, they suggest that death lurks just behind the ridiculous events of Alices Adventures in Wonderland as a present and possible outcome. Death appears in Chapter I, when the narrator mentions that Alice would say nothing of falling off of her own house, since it would likely kill her. Alice takes risks that could possibly kill her, but she never considers death as a possible outcome. Over time, she starts to realize that her experiences in Wonderland are far more threatening than they appear to be. As the Queen screams 'Off with its head!' she understands that Wonderland may not merely be a ridiculous realm where expectations are repeatedly frustrated. Death may be a real threat, and Alice starts to understand that the risks she faces may not be ridiculous and absurd after all.

## C.2 Motifs

Motifs are recurring structures, contrasts, or literary devices that can help to develop and inform the texts major themes.

### C.2.1 Dream

Alices Adventures in Wonderland takes place in Alices dream, so that the characters and phenomena of the real world mix with elements of Alices unconscious state. The dream motif explains the abundance of nonsensical and disparate events in the story. As in a dream, the narrative follows the

dreamer as she encounters various episodes in which she attempts to interpret her experiences in relationship to herself and her world. Though Alices experiences lend themselves to meaningful observations, they resist a singular and coherent interpretation.

### C.2.2 Subversion

Alice quickly discovers during her travels that the only reliable aspect of Wonderland that she can count on is that it will frustrate her expectations and challenge her understanding of the natural order of the world. In Wonderland, Alice finds that her lessons no longer mean what she thought, as she botches her multiplication tables and incorrectly recites poems she had memorized while in Wonderland. Even Alices physical dimensions become warped as she grows and shrinks erratically throughout the story. Wonderland frustrates Alices desires to fit her experiences in a logical framework where she can make sense of the relationship between cause and effect.

### C.2.3 Language

Carroll plays with linguistic conventions in Alices Adventures in Wonderland, making use of puns and playing on multiple meanings of words throughout the text. Carroll invents words and expressions and develops new meanings for words. Alices exclamation Curious and curiouser! suggests that both her surroundings and the language she uses to describe them expand beyond expectation and convention. Anything is possible in Wonderland, and Carrolls manipulation of language reflects this sense of unlimited possibility.

#### Curious, Nonsense, and Confusing

Alice uses these words throughout her journey to describe phenomena she has trouble explaining. Though the words are generally interchangeable, she usually assigns curious and confusing to experiences or encounters that she tolerates. She endures is the experiences that are curious or confusing, hoping to gain a clearer picture of how that individual or experience functions in the world. When Alice declares something to be nonsense, as she does with the trial in Chapter XII, she rejects or criticizes the experience or encounter.

## C.3 Symbols

Symbols are objects, characters, figures, or colors used to represent abstract ideas or concepts.

### C.3.1 The Garden

Nearly every object in Alices Adventures in Wonderland functions as a symbol, but nothing clearly represents one particular thing. The symbolic resonances of Wonderland objects are generally contained to the individual episode in which they appear. Often the symbols work together to convey a particular meaning. The garden may symbolize the Garden of Eden, an idyllic space of beauty and innocence that Alice is not permitted to access. On a more abstract level, the garden may simply represent the experience of desire, in that Alice focuses her energy and emotion on trying to attain it. The two symbolic meanings work together to underscore Alices desire to hold onto her feelings of childlike innocence that she must relinquish as she matures.

### C.3.2 The Caterpillars Mushroom

Like the garden, the Caterpillars mushroom also has multiple symbolic meanings. Some readers and critics view the Caterpillar as a sexual threat, its phallic shape a symbol of sexual virility. The Caterpillars mushroom connects to this symbolic meaning. Alice must master the properties of the mushroom to gain control over her fluctuating size, which represents the bodily frustrations that accompany puberty. Others view the mushroom as a psychedelic hallucinogen that compounds Alices surreal and distorted perception of Wonderland.' [1]

[1] http://sparknotes.com/lit/alice/themes.html

# Appendix D

# Emotions

## D.1 Colours and emotion research

### D.1.1 Emotions and colours how do they relate?

[1] [2]

In figure D.1 - 'Positive and negative ratings for each color by healthy volunteers. The percentage of healthy volunteers who rated each color on the 'Color Wheel' as either positive (P) or negative (N) is shown.'[3]

### D.1.2 Conclusion

From figure D.1 and D.2

- Yellow is the color that brings happiness.
- Orange is another color that is people relate with joy.
- Blue is a special color. Dark blue gets negative replies, but light blue is considered to be positive.
- Purple is considered more positive than negative, but it doesnt create happiness.
- Red, green and pink are considered as neutral colors. Green also creates a relaxed feeling.
- Brown and grey are considered negative colors.

[1] paper by PJ Whorwell
[2] http://biomedcentral.com
[3] Carruthers, *BMC Medical Research Methodology*, 2010

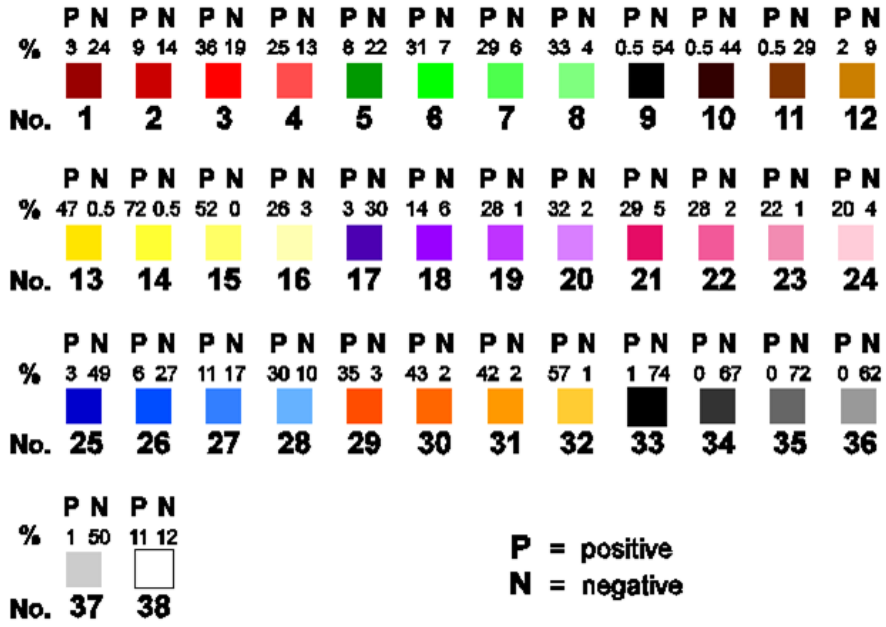


Figure D.1: What colours people associate as positive or negative

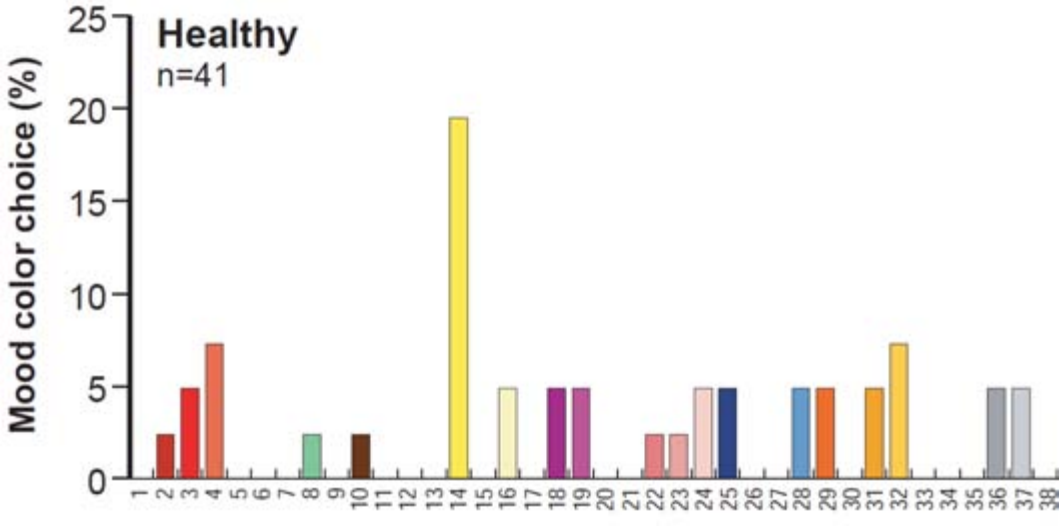


Figure D.2: What colours people choose to describe their mood

## D.2 Emotions in the book

### D.2.1 Surprise and anger

**Situations where Alice is surprised:**

- When she sees the white rabbit.
- When she falls down the rabbit hole.
- When she shrinks and grows.
- When she discovers that animals can talk.
- When she suddenly returns to the real world.

**Situations where Alice is angry:**

- When she is does not understand something.
- When someone makes personal remarks.

### D.2.2 Horror

**Situations where Alice is in horror:**

- When Alice is in court.
- When Alice is alone in the dark forest.
- When Alice is in the maze.

### D.2.3 Happiness

**Situations where Alice is happy**

- When Alice talks about her cat Dinah.
- When Alice is with the Mad Hatter.
- When Alice is playing croquet.
- When Alice sees the White Rabbit.

## D.3 Mindmaps


Figure D.3: Brainstorm session on emotions

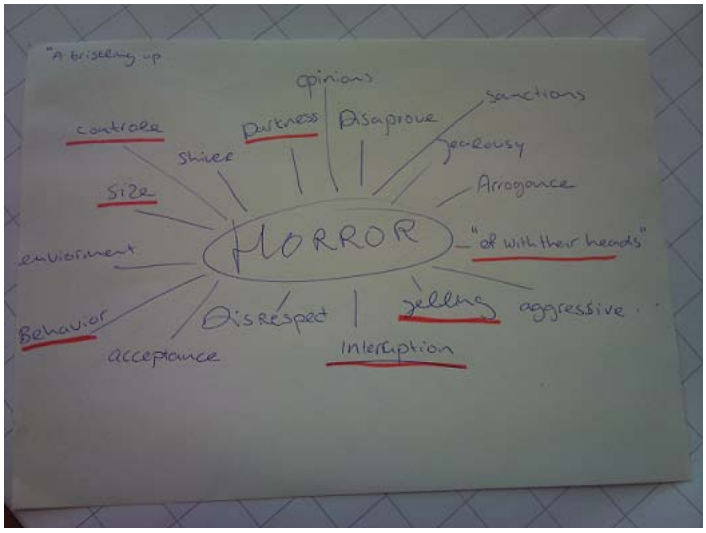


Figure D.4: Brainstorm session on the emotion horror


Figure D.5: Brainstorm session on the emotions fear and sadness

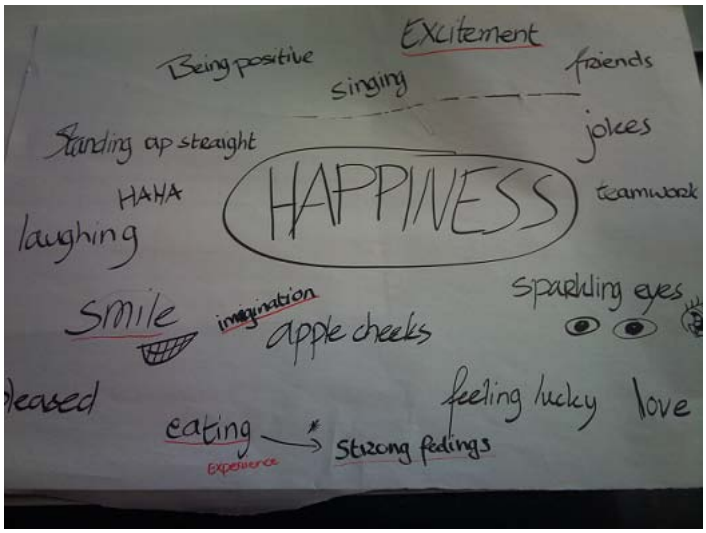


Figure D.6: Brainstorm session on the emotion happiness

# Appendix E

# Culture and ethics

## E.1 Notes book

In the quick notes in figure E.1, certain elements in the book are briefly covered. Also stylistic devices and their function come forward in the notes.

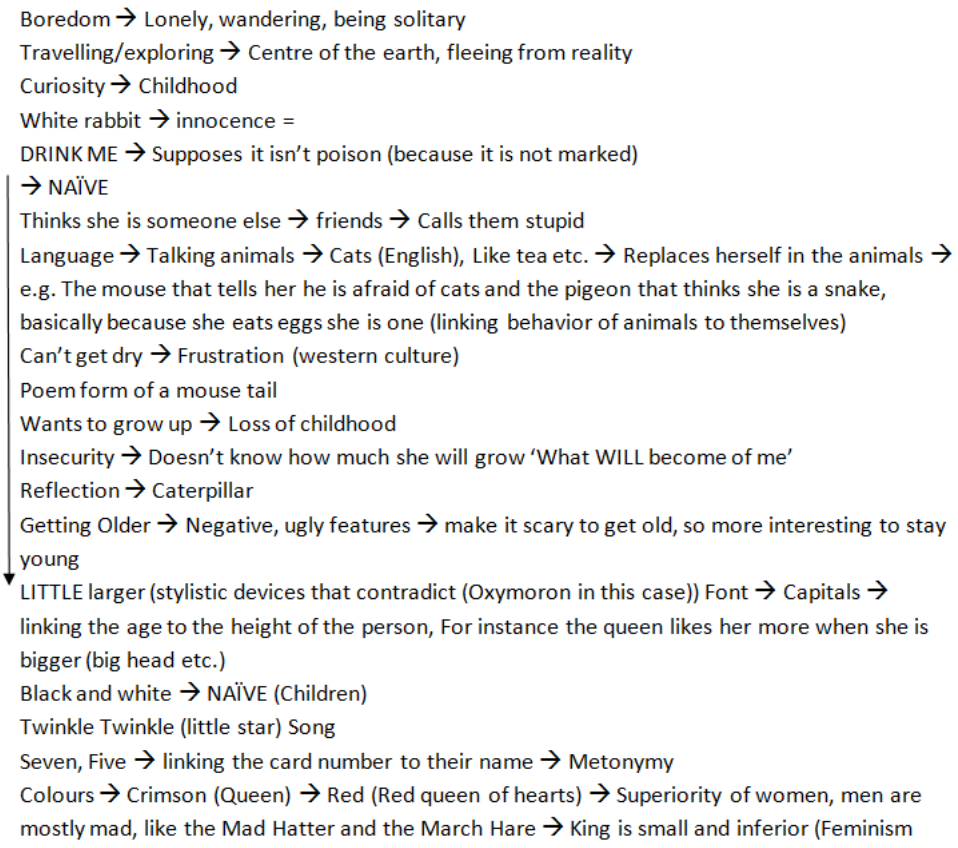


Figure E.1: Quick notes on culture and ethics in the book

# Appendix F

# Idea generation

We generated ideas by using brainstorming techniques.
This is what we did:

- Gap filling - Using cards with words and filling in extra words
- General brainstorming - Linking word web
- Sketching - Drawing Ideas
- Categorizing - Using categories to derive ideas
- Moodboards - To look at what feelings a design would evoke

We held our first specific brainstorm session using sketching and categorizing, as we did with our second session. Before this we used a lot of general brainstorming in the first stages of the project and tried to explore using the gap filling cards as a next step.

## F.1 Mirror room

For the mirror room, we went straight of to test mirrors opposed to each other. Finding out about angles we tried to create our own little infinity mirror room.

## F.2 Puzzle room

For the puzzle room we built a small scale version of how it might look like. We used cardboard for this. Together with some aluminium foil we tried to create the illusion of a mirror.


Figure F.1: First specific idea brainstorm session.

## F.3 Maze room

For the maze room we built a 3D model. This is because we needed a map of the room.

## F.4 Upside down room

For the Upside down room, we first created a moodboard of the feelings that it would evoke.

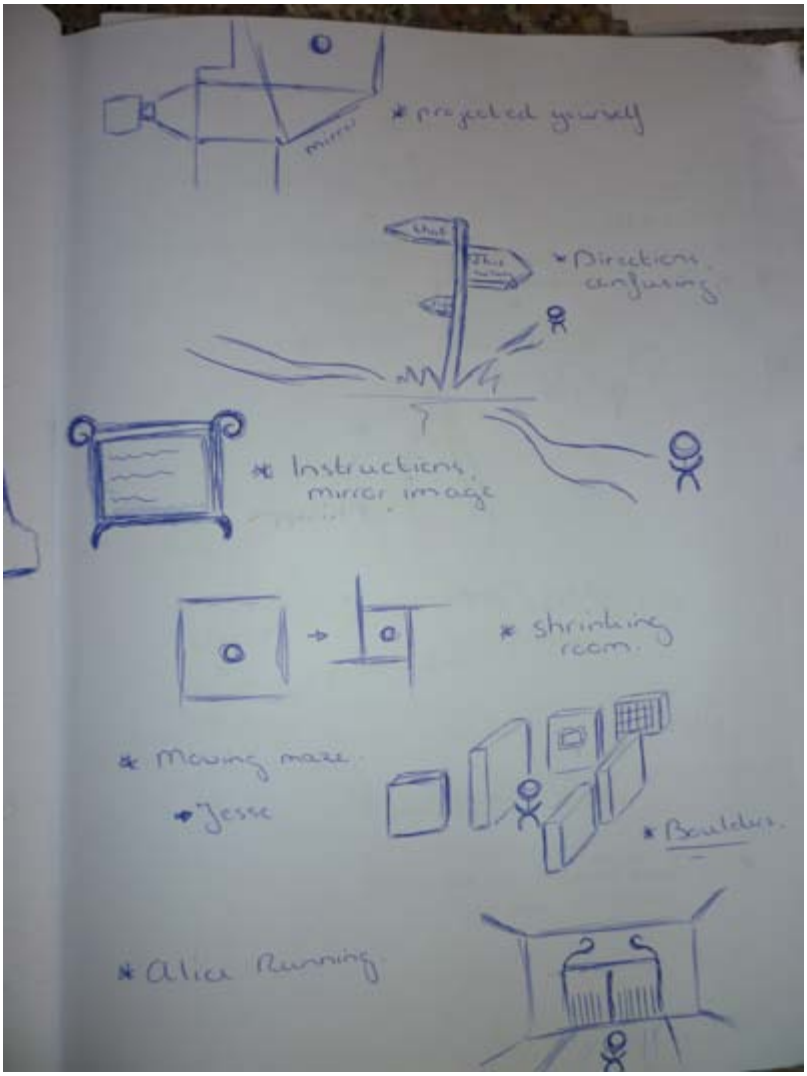


Figure F.2: Second specific idea brainstorm session.

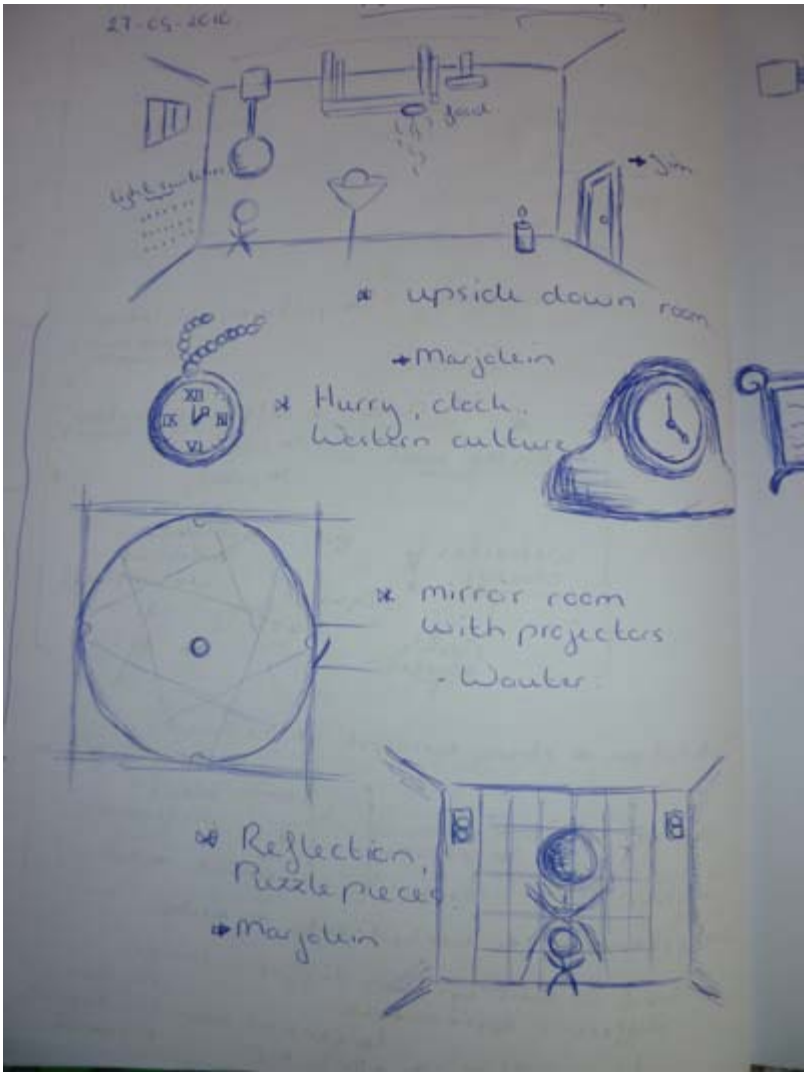


Figure F.3: Second specific idea brainstorm session.

Figure F.4: Picture of first prototype infinity room.

Figure F.5: Scale model of puzzle room.

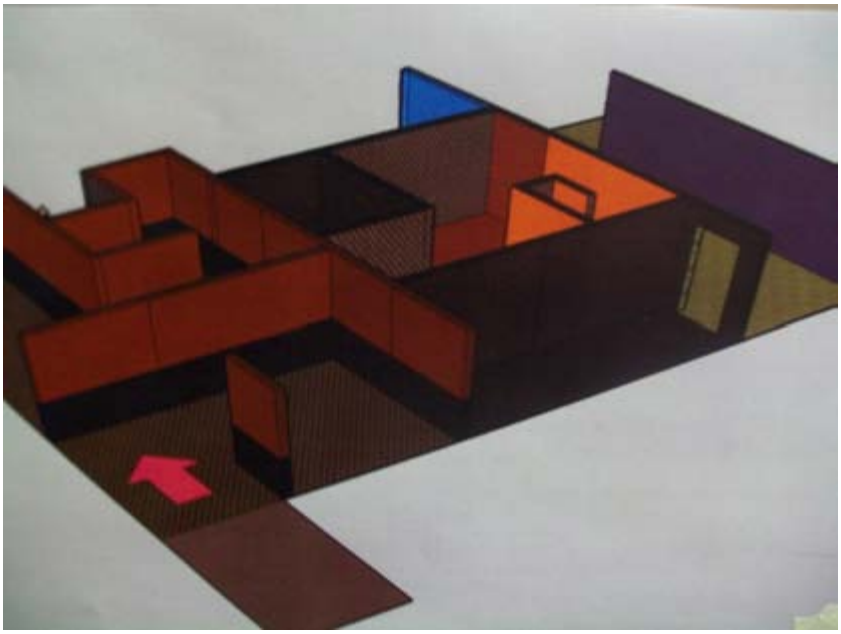

Figure F.6: Map of maze room.

Figure F.7: Moodboard upside down room.

# Appendix G

# Concept choice

## G.1 4 to 2 Concepts

First we looked at the concepts ourselves with the criteria we used as told in the chapter 4 to 2 Concepts. However we could not make the decision ourselves. The points we gave to the concepts were too close to each other, so that is why we decided not to make the decision ourselves.

So what we did was the following:

With the standard text that can be found in the chapter Concepts, we went to people that were unknown with this project and with its meaning. We did this because we did not want the people that would choose the concepts they liked best without any prejudice. We asked them to vote for the concept they liked best. In total we asked 82 people all of different age, different sex and different jobs.
Votes:

- Mirror room - 19 votes
- Puzzle room - 9 votes
- Maze room - 6 votes
- Upside down room - 38 votes

## G.2 Final Concept

We chose our Final Concept during the Midterm Exhibition, results of our testing can be found in *Appendix I*.

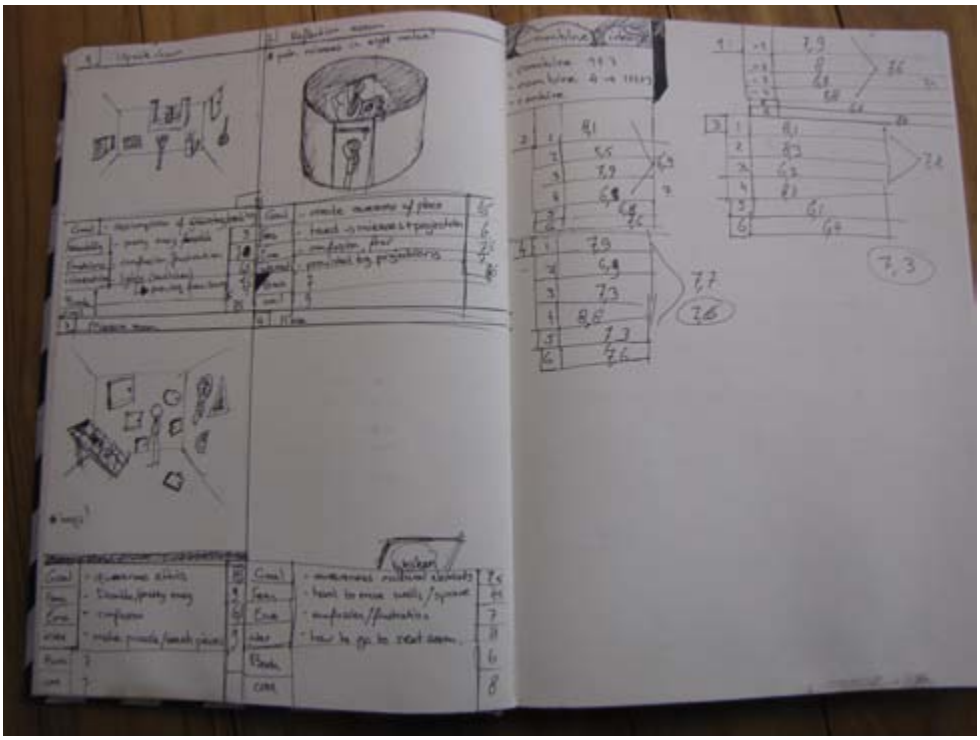

Figure G.1: How our group chose 2 concepts with the criteria

# Appendix H

# Blueprints

## H.1 Prototype design plans

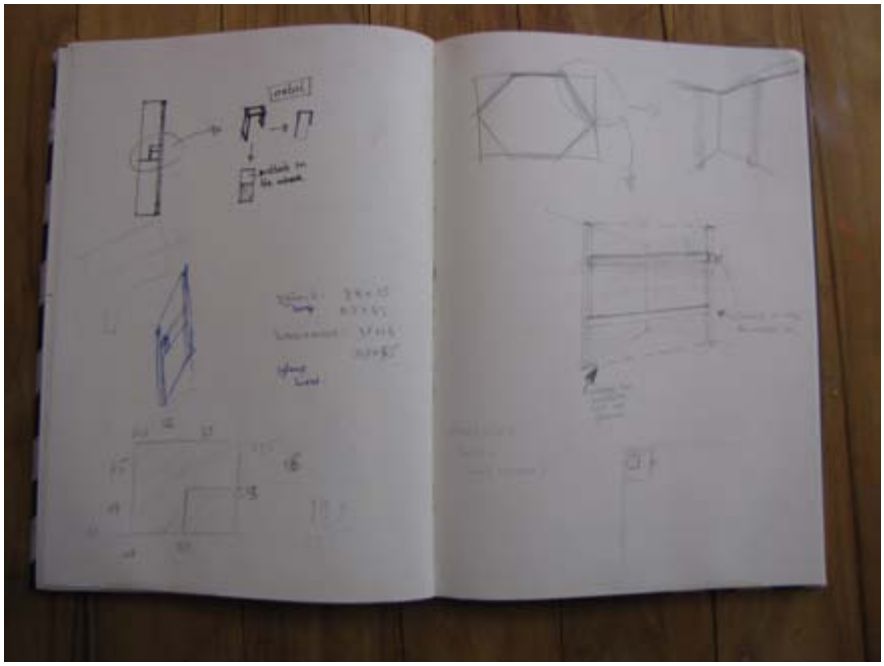

Figure H.1: Quick notes about the prototype development.

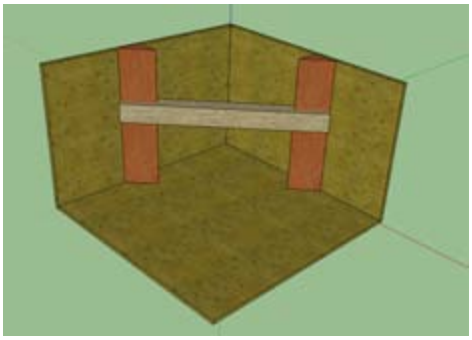

Figure H.2: Frontview of a corner part of the prototype

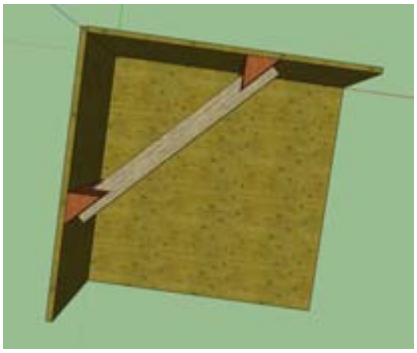

Figure H.3: Topview of a corner part of the prototype

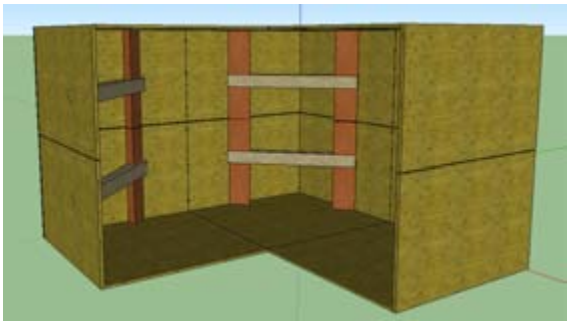

Figure H.4: Partially assembled prototype

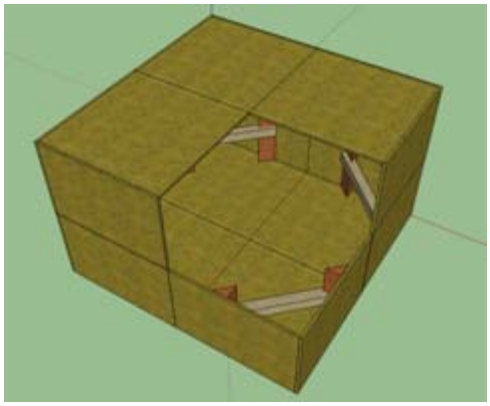

Figure H.5: Partially assembled prototype

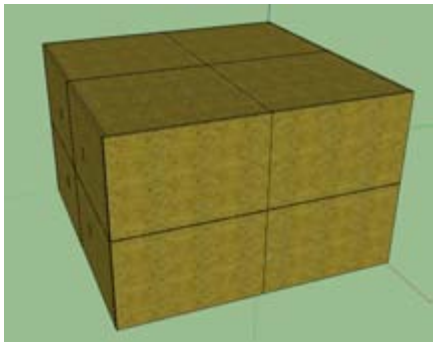

Figure H.6: The fully assembled prototype

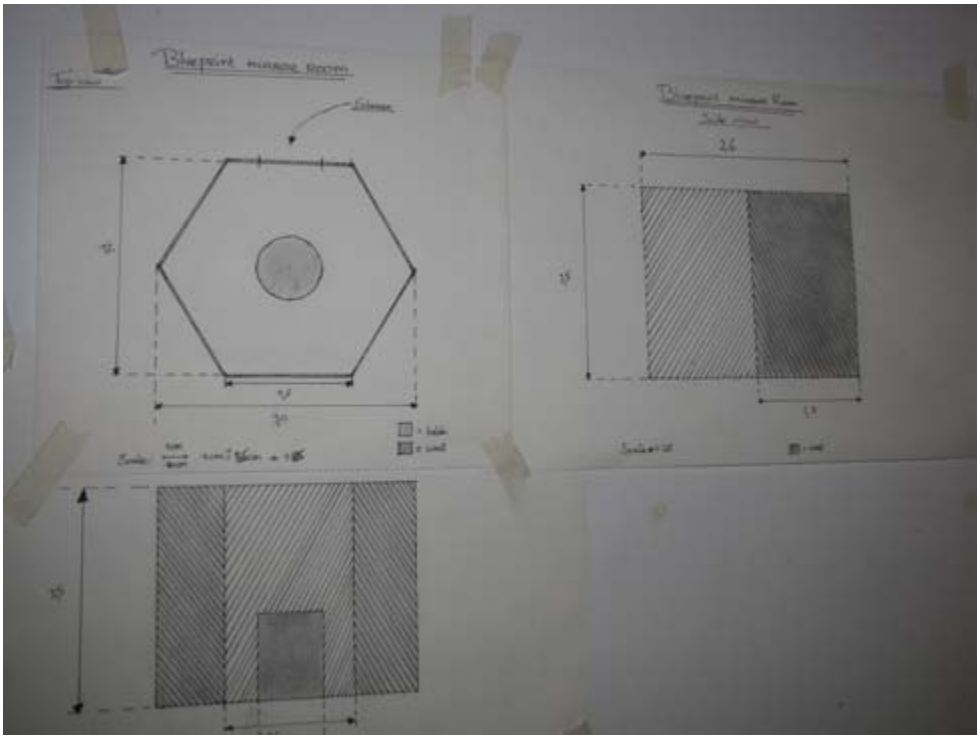

Figure H.7: The initial blueprints, including measurements, of the prototype.

# Appendix I

# Midterm exhibition

## I.1 Meeting Minutes

### I.1.1 First meeting

Present:
Jim: Chairman
Rik: Minute taker
Maritte: Attendee
Jesse: time keeper
Banaz: Attendee
Anne: Attendee

What kind of Ideas are there already.

Group Jun Hu
Everything upside down and make gravity look weird. The reality upside down. Make a chamber with puzzle pieces all over the place which have to be placed on a puzzle board. All pieces are mirrors except the one at the height of your head so you have to draw your own head. Maze idea. Different chambers where you have to make an action which opens a door. The action isnt specified yet.

Group Omar Mubin
The queen of hearts. User is invited to court. The knave of hearts has stole the tarts but did he? The evidence is absurd and the queen constantly wants to kill the knave of hearts.

Group Geert Langereis

Croquet game Goals grow up make your own choices and confusing. they make a hole in the ground platform with 2 balls and 2 holes. One of the balls is a trick and the user has to find out which ball is the good one. Good one makes the queen mad wrong ball makes the queen happy. Mad makes the user make their own choice. Growing up.

Common thing in all the ideas.
The room where everything will take place.

Ideas for the mid term - Room with audio sample.

- Make it a dark place mysterious
- use doors so they have to make an action to see the concepts. To make it difficult to come in.
- a table you have to go underneath so you feel small and when you arrive at the concept you stand up and you grow.
- 3 ways to walk to. With signs on the walls. Maybe also with a narrator.
- Survey to get feedback.
- We have to stay at the tables so we can answer questions
- There has to be a clear route so the crowd can only come from one side.
- Guestbook to gather feedback
- Difficult to enter
- You can make your own choices. how to present etc.
- Can we borrow things from the alice installation??? The stems for example. the grass in the storage room

Who will do what? Planning.
General entrance and general exit

Budget?
Arrange meeting with coordinator
Peter van de Graaf 0653250325
What can he do for us which element are already here lights etc?

Next meeting:
Rik will think about the narrators intro (short)
Banaz will think about the cloths on the walls to make it dark.
jesse will think about the map of our alice machine.
Anne will think about a survey what questions etc?
Maritte will think about how to make everything as clear as possible.

Date 11 oktober 2010 at 09:30

### I.1.2 Second Meeting

Meeting minutes second Alice group meeting 11-10.
9:30-10:00

Jim: Chairman
Rik: Attendee
Maritte: Attendee
Jesse: Minute Taker
Banaz: Attendee
Anne: Attendee

During the discussion a floor plan was chosen:
The tables will be set in on row, so that the visitors sees all the tables when he or she enters the room. Group Jun Hu will be closest to the hallway, then Group Omar Mubin and then Group Geert Langereis

The setup of the plan:
Have an actual entrance, enter a new world: change floor (grass), camouflage cloths, little lighting, the grass props from Alice installation in Corona.
Put in direction arrows

Survey, are people actually going to write in it?
We think they do, so we will see if it works at midterm.

Get own cloth: very hard, markets only sell cloth of 1 x 1 , too small

Lighting: Spots and Living Colours light.

Homework: Go to Alice installation what we can/want to use for the exhibition.

Figure I.1: Our area during the midterm exhibition

Figure I.2: The entrance of the exhibition and Jim handing out the surveys

Figure I.3: The other two Alice groups during the Midterm Exhibition.

Figure I.4: An overview of the visitors and the space.

## I.2 Setup

## I.3 Feedback results

### I.3.1 Elaborated feedback

General:
- Look at the different senses and work back from these; how can we implement them in our concepts?
- Go to the Designhuis during the DDW.
- Ask ourselves whats missing.
- Excursion to the Cave in Amsterdam.
- Down the rabbit hole –¿ chaos.
- infinity room' –¿ Germany
- Game blocks pictures mirror
- Emotions boost colours.
- Visit Escher museum in The Hague.

Comments by Mr. Bakker. (j.d.bakker@tue.nl)
- Look at Enders game  Orsen, Scott card
- Astronomy  mirrors  coatings
- Good presentation  not to much process.
- Do not add to much extras! Overdoing it might work against the overall effect.
- What if youre afraid of heights
- Plan A and plan B

House of W. Rabbit:
- Look at time. Maybe we can use day and night in the concept?
- Use the person itself more. Do not only use the room.
- Use maizena. If you touch it gently it stays soft, but when you hit it hard its as hard as stone.
- Talk to Micheal Cruz. He knows how we can stimulate senses and how we can use this in our concept.
- Use a balloon to bend water. (only you see an object to refer to)

Mirror Room:
- Find a way to take tarts literally out of the mirror. (projection or something?)
- Liked the abstract/modern idea of it, because it is different from the other groups. We not only used the story, but an experience.

- Strijpfest  mirror room (Milano)
- 4 x mirror room. (see next page)

4 infinity mirrors with walls (those which touch each other are made of mirror foil).

The light switches on in one room at the time so you see each the person in the enlightened room, and when the light reaches you youll see nothing but yourself in an infinity mirror.

### I.3.2 Feedback from survey

Rooms:

Votes:
Mirror Room: 10
Upside Down Room: 4

Comments:
Make it a more calm experience.
Mirror room can be dangerous (fear of heights).
Gravity shifts in the room?
Augmented reality effect like the mirrors, but outside instead of an enclosed room.
Surprise me with more optical illusions!
Mirror room looks very smart.
The house would be much more interesting if it wasnt a scale model.
Maybe you can combine the rabbits house with the mirror room.

# Appendix J

# Additional Research

## J.1 Optical Illusions

In our additional research phase, we also looked at optical illusions. We concluded that we would not make use of this in the eventual design.

An optical illusion (also called a visual illusion) is characterized by visually perceived images that differ from objective reality. The information gathered by the eye is processed in the brain to give a percept that does not tally with a physical measurement of the stimulus source. There are three main types: literal optical illusions that create images that are different from the objects that make them, physiological ones that are the effects on the eyes and brain of excessive stimulation of a specific type (brightness, tilt, color, movement), and cognitive illusions where the eye and brain make unconscious inferences. They can also be known as "mind games".

### J.1.1 Physiological Illusions

Physiological illusions: *a scintillating grid illusion. Shape, position, colour, and 3D contrast converge to produce the illusion of black dots at the intersections.*

Physiological illusions, such as the afterimages following bright lights, or adapting stimuli of excessively longer alternating patterns (contingent perceptual aftereffect), are presumed to be the effects on the eyes or brain of excessive stimulation of a specific type - brightness, tilt, color, movement, etc. The theory is that stimuli have individual dedicated neural paths in the early stages of visual processing, and that repetitive stimulation of only one or a few channels causes a physiological imbalance that alters perception.

### J.1.2 Cognitive Illusions

Cognitive illusions are assumed to arise by interaction with assumptions about the world, leading to "unconscious inferences", an idea first suggested in the 19th century by Hermann Helmholtz. Cognitive illusions are commonly divided into ambiguous illusions, distorting illusions, paradox illusions, or fiction illusions.

- Ambiguous illusions *Ambiguous illusions are pictures or objects that elicit a perceptual 'switch' between the alternative interpretations. The Necker cube is a well known example; another instance is the Rubin vase.*

- Distorting illusions *Distorting illusions are characterized by distortions of size, length, or curvature. A striking example is the Caf wall illusion. Another example is the famous Mller-Lyer illusion.*

- Paradox illusions *Paradox illusions are generated by objects that are paradoxical or impossible, such as the Penrose triangle or impossible staircases seen, for example, in M. C. Escher's Ascending and Descending and Waterfall. The triangle is an illusion dependent on a cognitive misunderstanding that adjacent edges must join.*

- Fictional illusions *Fictional illusions are defined as the perception of objects that are genuinely not there to all but a single observer, such as those induced by schizophrenia or a hallucinogen. These are more properly called hallucinations.*

We also looked at the documentary *Horizon Is seeing believing?* made by the BBC, but we could not use any of the elements in there because the illusions used in this program consists out of playing with color and sound which cannot be implemented in our project. They would not be able to emphasize the awareness or add a more confusion feeling.

## J.2 3D results

## J.3 Price estimation

## J.4 Mirror adjustment

Figure J.1: The 3D test image

# Costs

## 'Perfect concept' (Plan A)

**Hexagon**

| Mirrors: | | | **www.spiegelpaleis.nl** |
|---|---|---|---|
| 5 'plain sides' mirrors | | | |
| (1500 x 2500) = | | 5 x 350,- | 1750 |
| 6th side contains: | | | |
| 1500 x 1500 | | | 217,68 |
| 1000 x 375 | 2 times | 2 x47,53 | 95,06 |
| 1000 x 750 | | | 82,20 |
| top +bottom | | | |
| 3000 x 2250 | 2 times | 2 x 817,31 | 1634,62 |
| 3000 x 350 | 2 times | 2 x 126,65 | 253,30 |
| **Total:** | | | **4032,86** |

| **Box** | | | **www.gamma.nl** |
|---|---|---|---|
| wooden plates: | 10 plates (1220 x 2440 mm) = | 10 x 9,95 | 99,50,- |

| Beams: | | | **www.klushandel.nl** |
|---|---|---|---|
| Box itself (includes the back of the infinity mirror door) | | | |
| 3000 x 32 x 50 | | 4 x 4,40 | 17,60 |
| 2600 x 32 x 50 | | 4 x 3,22 | 12,88 |
| To keep the mirrors in place | | | |
| 3000 x 32 x 50 | | 4 x 4,40 | 17.60 |

Figure J.2: The estimation of the costs part 1

| Infinity mirror doors: | | **Vertigo** |
|---|---|---|
| Mdf (2000 x 750) | 3 x 9 | 27,00 |
| Plexiglas (750 x 1000) | 3 x 7,50 | 21,50 |
| LED's | 6 x 29,95 | 179,70 |
| **Total** | | **357,78** |
| **Grand total** | | **4408,64** |

Figure J.3: The estimation of the costs part 2

## Different materials

| | |
|---|---|
| Mirrorfoil: 20 rolls, (3000 x 750 mm) = | 150. |
| Wooden plates(MDF 4mm): 11 plates (1220, 2440 mm) = | 110 |
| Beams: 6 beams (32 x 50 x 3000 mm) = | 26,40 |

Figure J.4: The costs of other materials

Plan A will cost too much many. What can we do to make it cheaper?

| Plan B | Pro's | Con's |
|---|---|---|
| Scale model → | cheap, easy to move, easier to create | experience is less |
| 3D model on computer | experience more intact than scale | takes a lot of time |
| Video? | experience | how? |
| Make concepts smaller | cheaper, easier to create | experience? |
| Use different materials | cheaper | cheap enough? |

## Ranking (what we find the best plan B to the worst plan B)

1. Use different materials
2. Make concept smaller
3. Scale model
4. 3D model
5. Video

Figure J.5: The backup-plans

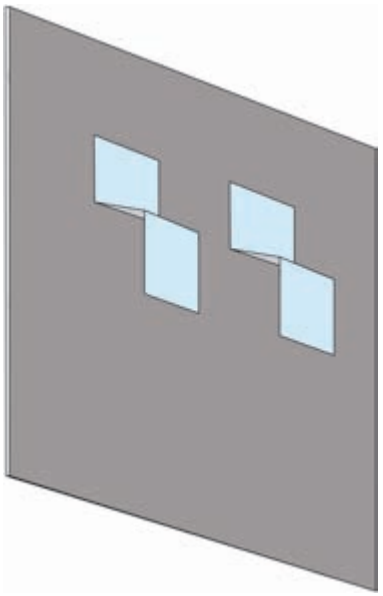

Figure J.6: The constuction on the back of the mirrors

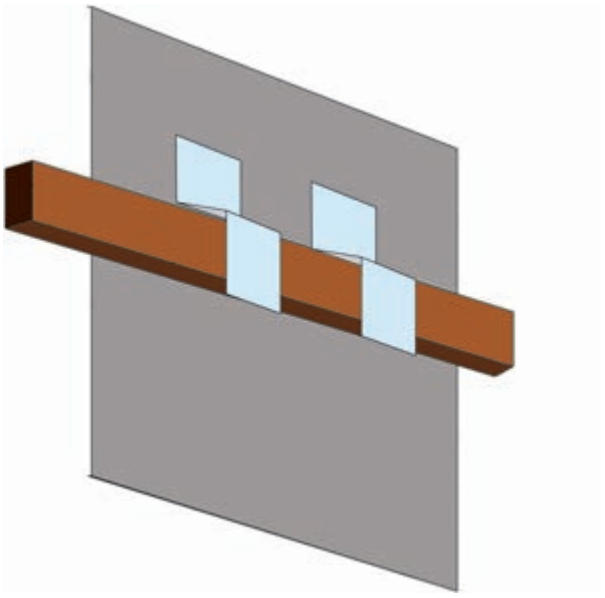

Figure J.7: The construction of the back of the mirrors placed over the beams

# Appendix K

# Prototype Illustrations

## K.1 Final Concept

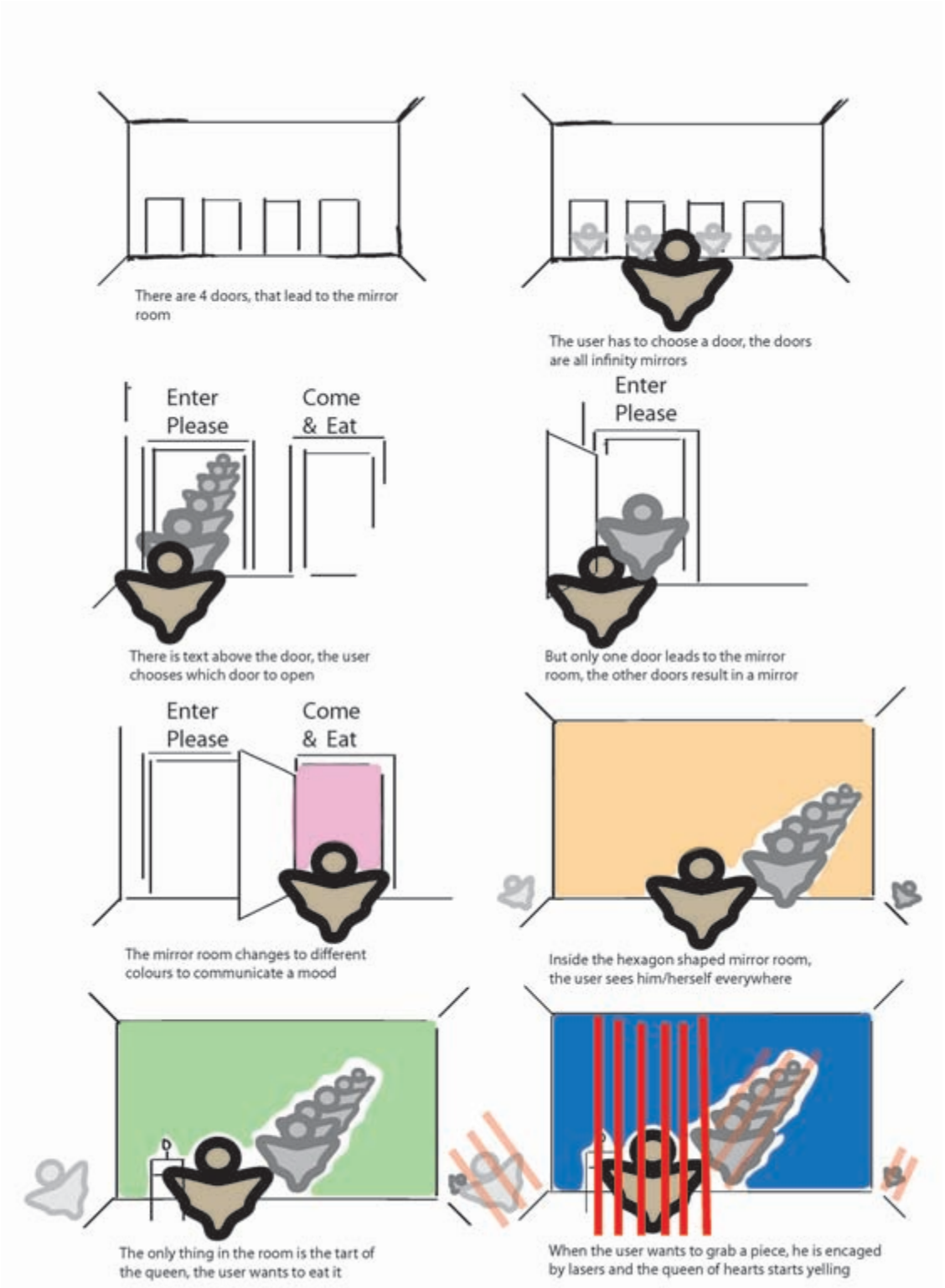




Figure K.1: Storyboard of the final concept.

## K.2 Final Design

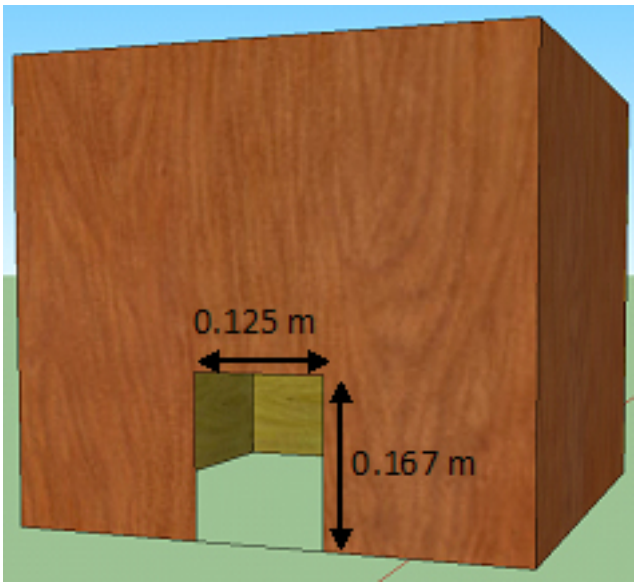


Figure K.2: Illustration of the outside of the room.

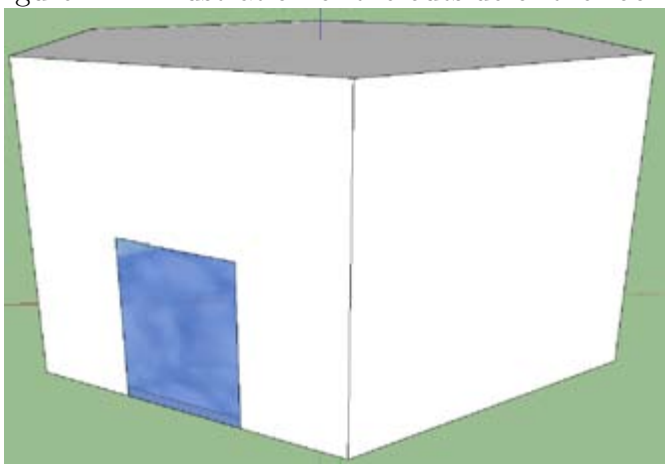

Figure K.3: The infinity mirror hexagon as seen from the outside.

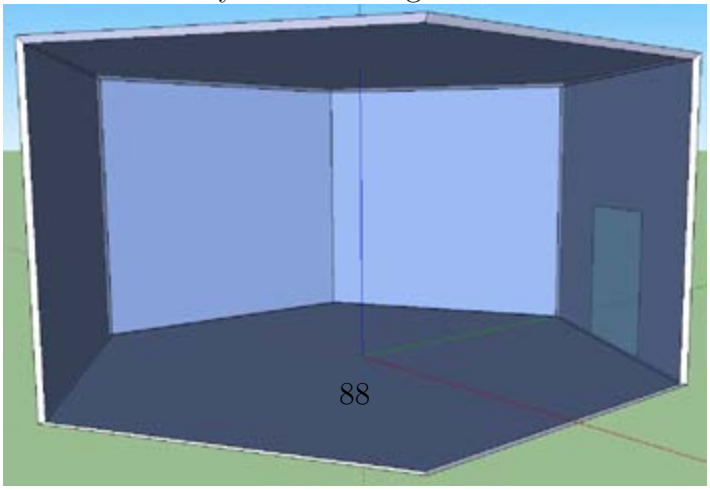



Figure K.4: The infinity mirror hexagon as seen from the outside.

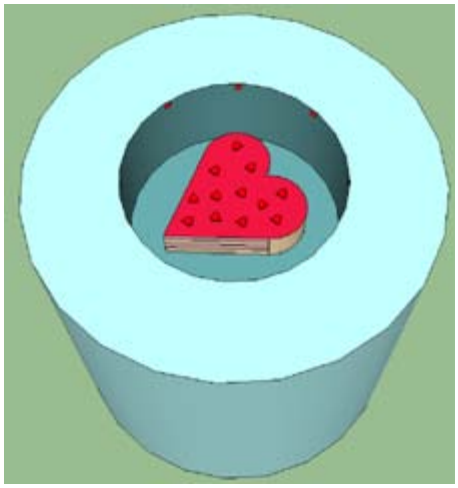

Figure K.5: The table with the cake in the cavity. The red dots are the movement sensors.

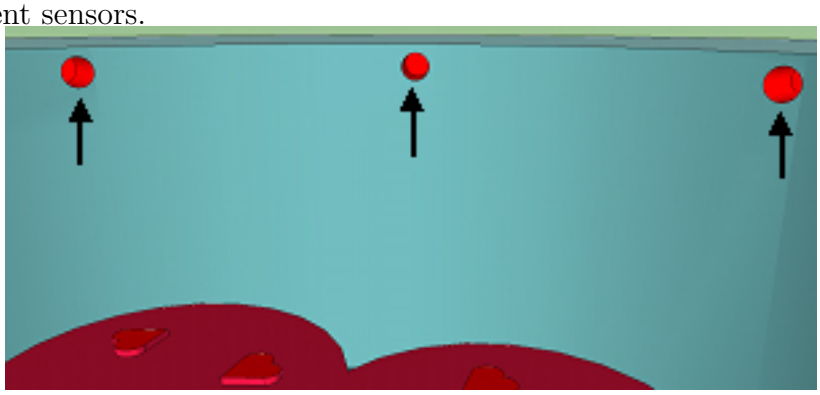

Figure K.6: The red objects marked with an arrow represent the movement sensors inside the table.

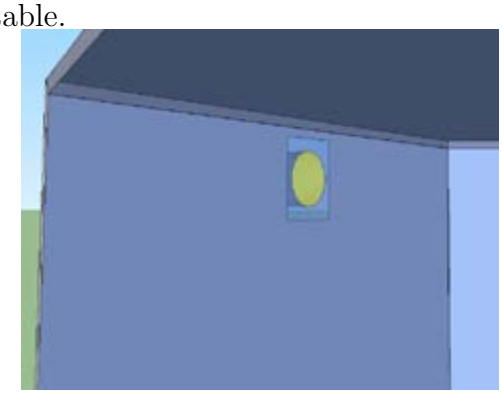

Figure K.7: The spotlight behind one of the mirrors.

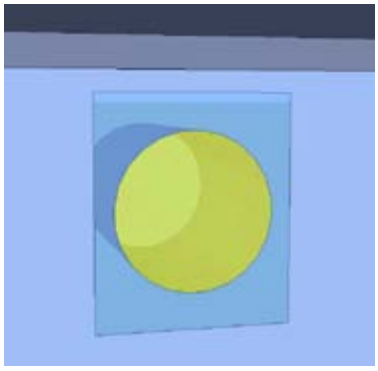

Figure K.8: The spotlight behind one of the mirrors.

## K.3 Building the prototype

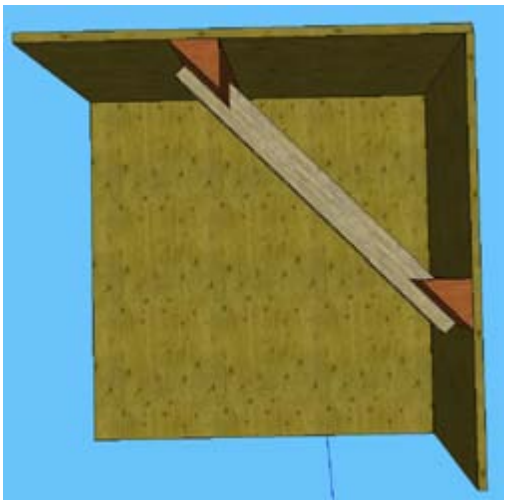

Figure K.9: A corner part as seen from above.

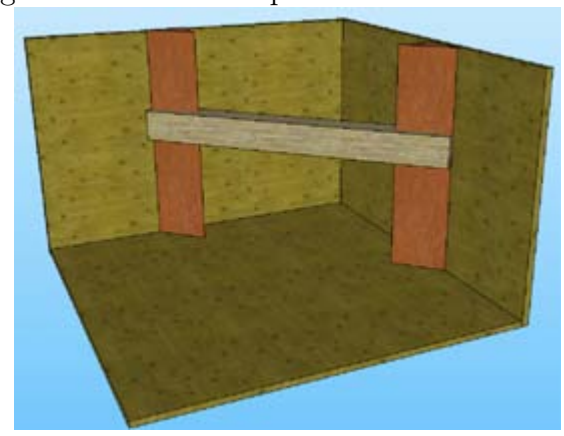

Figure K.10: A corner part as seen from the front.

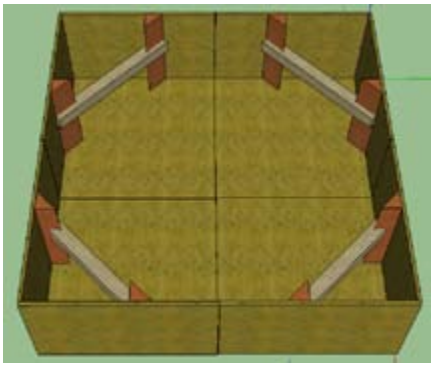

Figure K.11: The base, formed by 4 corner parts.

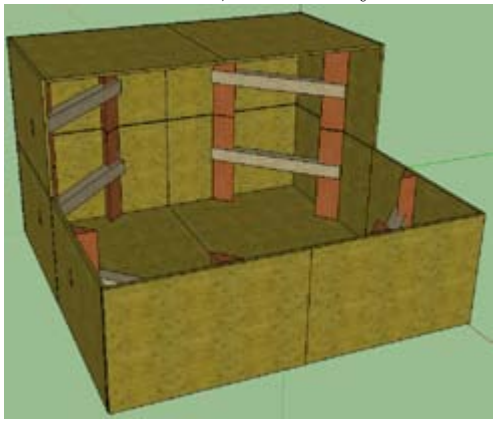

Figure K.12: How the room is built from corner parts.

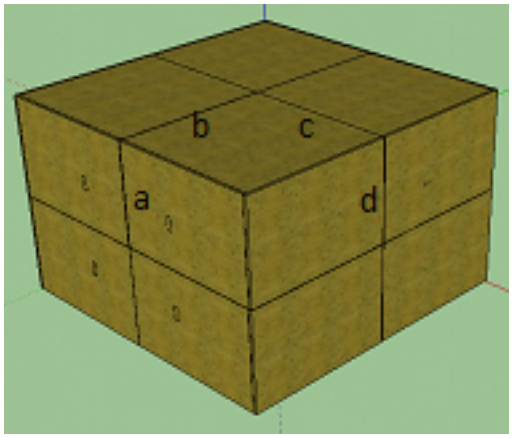


Figure K.13: The complete cube, built from corner parts. a b and c show where the clips are attached to each corner part.

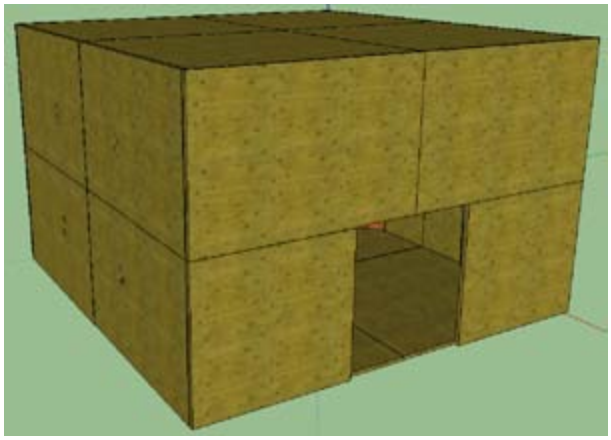

Figure K.14: The full cube, built out of corner parts. This time the door is included in the illustration.

## K.4 3D Animation

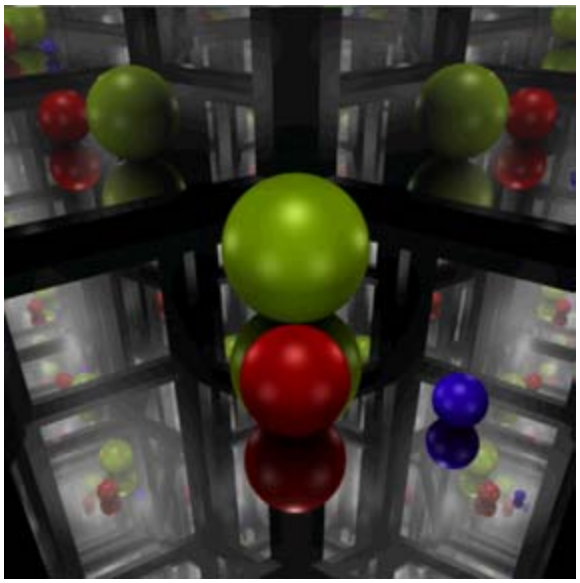

Figure K.15: A screenshot of the 3D animation.

## K.5 Approach

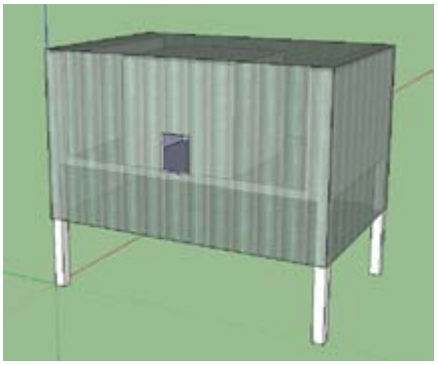

Figure K.16: The setup of our prototype at the Final Exhibition. The hole in the fabric does not exist in reality but is there to show where the entrance of the prototype is.

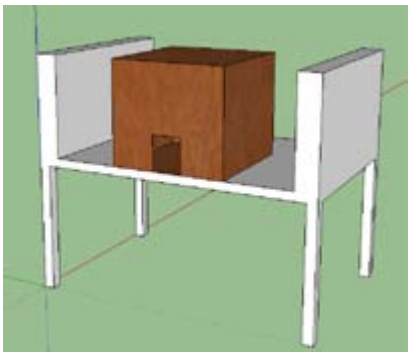

Figure K.17: The setup of the prototype table at the Final Exhibition.

# Appendix L

# Structure

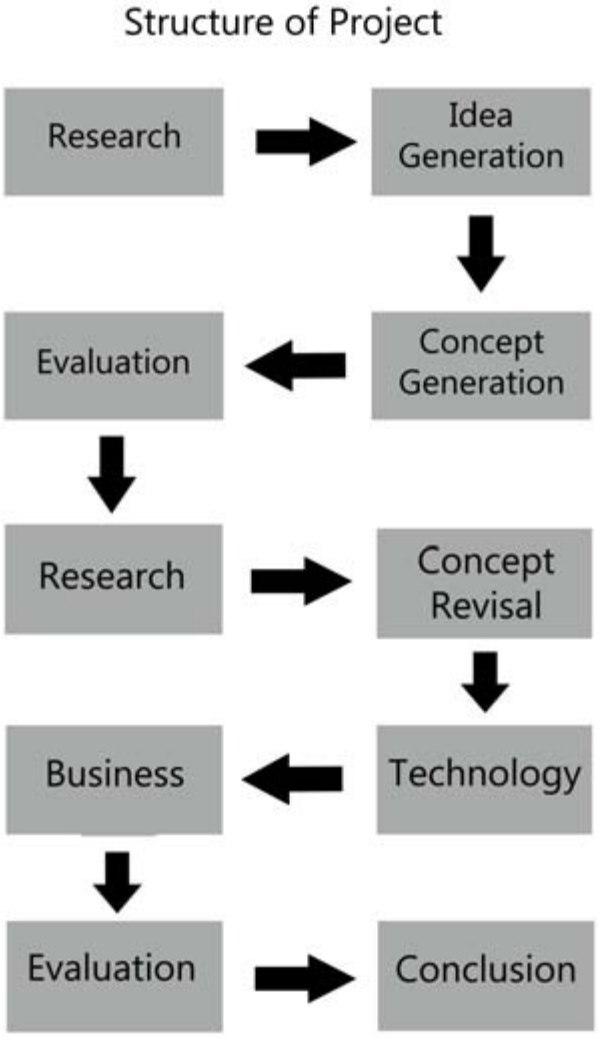


Figure L.1: Structure of the project

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