

The Richness of tea

Final Bachelor Project
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ABSTRACT



Richness of tea

The Richness of tea project is about forming a bridge between the person with dementia and the visitor which engages the looping of a patient, while at the same time being accessible for visitors of a care home.

To gain more knowledge a visitation to a care home was arranged. During the visitation a Chinese tea ritual was performed.

The master elective 'Social Innovation' was used as a kick-start of the project. Through role playing and Low-Fi prototyping a first concept was formed.

Feedback on this concept was received through the feedback sessions at the Rioteers workshop and the discussion group of the 'Innovate Dementia' group of the GGZe.

The feedback was integrated in the first prototype that was made for the Sensuous Dementia exhibition. According to the feedback during this exhibition, the concept needed to

be simplified.

The final concept is the design of table with a turnable platform and a lamp in the middle. The lamp guides the attention of the user through the four elements with light. By turning the platform, the focus area becomes closer and smaller. LED-strips in every four elements on the table lights up when the caregiver or the person with dementia (almost) touches the element. This attracts the attention back to the table.

A tea ritual was chosen to stimulate the various senses of the people with dementia. This has positive influences on the behaviour of the users.

The user test at a care home showed positive outcomes of the effectiveness of the project. Footage of the user test was observed to analyse the outcomes.

This project is part of a Research project on 'Social Innovation' of Caroline Hummels and Ambra Trotto.

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Introduction



Final Bachelor Project

Due to the reason that my internship semester was a successful semester, continuing the collaboration with my internship company during my Final Bachelor Project was a great opportunity for me. That is why an own FBP project was chosen. Throughout the internship semester, experience with designing for responsive environments was gained. This interest in responsive environments combined with the challenge of working on it in a individual project, brought me to the project topic 'Responsive Environment - Living Culture'.

Master elective

The studio director of my internship company, Ambra Trotto, was kicking off a project on dementia and social innovation together with Caroline Hummels. The kick-off of this project was the 'Design for Social Innovation' elective given by Caroline Hummels. Although this is an elective for master students only, joining this elective was possible, but without getting any ECT's. However, the elective gave my project a head start.

Direction

The direction of the FBP was not crystal clear at the start. It was shaped throughout the elective. This was mainly due to the fact that the elective itself did not have a clear direction at the start.

However, a specific angle was already set. Instead of using memory as a starting point, acting in the here and now was the approach. To give the project a refreshing outcome, the goal was to see dementia as a 'blessing' rather than a disease. Therefore thinking in possibilities, rather than in limitations was needed.

EXPLORATION

Start master elective

Form & Interaction

The goal of the kick-off of the 'Social Innovation' elective was to introduce and change our perspectives on dementia. For the first exercise groups had to make a fictitious product with random materials. Each group had to interact with the product of the other group without receiving any instructions. The way the groups misinterpreted the products of other groups was a good comparison to how people with dementia interpret everyday objects. This immediately set the right tone for the following design process. Intuitive design is very contextual and does not apply for people with dementia.

Embodiment

The second exercise introduced the concept of 'looping' through role playing. Looping is the act of repetitive motion or actions. This can be either a positive or a negative loop.¹ For the exercise the group divided roles in three. One was the person with dementia who was looping, one the caregiver

interfering the loop and the other the camera man recording the whole act. By playing the caregiver insights were gained in how to approach a loop and how to get someone out of it. Patience was key in this exercise. After experimenting with different approaches, mirroring came out as the best way to connect with the looping person. Once connected, slowly changing the loop into a positive body language made the looping person break free from the loop.



Fictive objects exercise

- For people with dementia the general concept of logic does not exist. Intuitive design is based on existing knowledge. Dementia is a decline in cognitive function and with that a decline in intuition.
- Moreover, the slower thinking of people with dementia acquires patience.
- Communication is easier established when 'opening up' the body position of the person with dementia.

First person perspective

Direction elective

The elective was renewed for this semester. As a consequence, the content of the elective was not very clear or deviated from the planning. Moreover, the different people involved also gave a different meaning to each exercise and the final goal. This made the start of the elective a bit chaotic and the contribution of each exercise to the final goal not very clear.

For this reason the interpretation for the final exhibition changed throughout the elective.

At first the general idea was to design an experience and to make an interactive system with which the visitors could experience how it is to have dementia. Later on it became clear that the goal was to design a system which could be implemented in the home environment and is focused on the sensory experience of the people with dementia.

Alzheimer experience

The website <http://www.alzheimerexperience.nl> was the most important source, when gaining knowledge about dementia. The website consists of videos of scenarios. These scenarios can be viewed from different perspectives. The main perspectives are the person with dementia, the partner, a family member, the caregiver and the doctor. While watching the video it is possible to switch to the different perspectives. These videos gave great insights on the experiences of the person of dementia and the responses of the family member. Moreover, the doctor describes clearly what happens and why.

EXPLORATION

Exercises

The next exercise was to design a first perspective experience. Inspired by the Alzheimer Experience website, my group decided to make first perspective videos of experiences of people with dementia. After executing the exercise individually, the group worked on one video together. For this video the use of fictive objects was implemented to strengthen the experience.

Making the videos created insights on the various aspects and details of the experience of the person with dementia. These were aspects, like misperception, decreased motor skills and hallucinations.²

- Throughout the exercise the interpretation of the final goal changed
- The Alzheimer Experience gave great insights on the whole experience of dementia
- The first perspective exercises created understanding of the multiple aspects of dementia.



First person perspective

User group

Besides using the Alzheimer Experience website to create as much understanding of dementia as possible, papers were consulted to gain more knowledge on the physical and mental impact of dementia.

Dementia

The functioning of the brain of people with dementia is affected due to the disease. The user group experiences a decrease in mental health in a way it decreases cognitive function. This expresses itself in decreased motor skills, misperception, illusions, misidentification and sensory confusion.³

This makes people with dementia a challenging user group. Due to the reduction in language skills, communicating with people with dementia verbally is difficult and almost impossible if they are in a further stage. In order to test the design observation and input from the caregivers are needed.

The misperception and misidentification of

the world around them creates a difficult design challenge. Designs that are normally seen as intuitive can trigger a completely different reaction when experienced by people with dementia. They behave and interact unexpected.

- **People with dementia is a challenging user group**
- **The user group has a reduction in cognitive skills. This expresses itself in decreased motor skills, misperception, illusions, misidentification and decreased language skills.**

IDEATION

Tea ritual

Visit care home

Due to the reason that the greater part of group did not have any or much personal experience with the specific user group, a visit to a care home was planned. Together with group member Martijn Imhoff and his grandfather a visitation to a family member with dementia took place at 'Hof van Bethanië' in Mierlo.

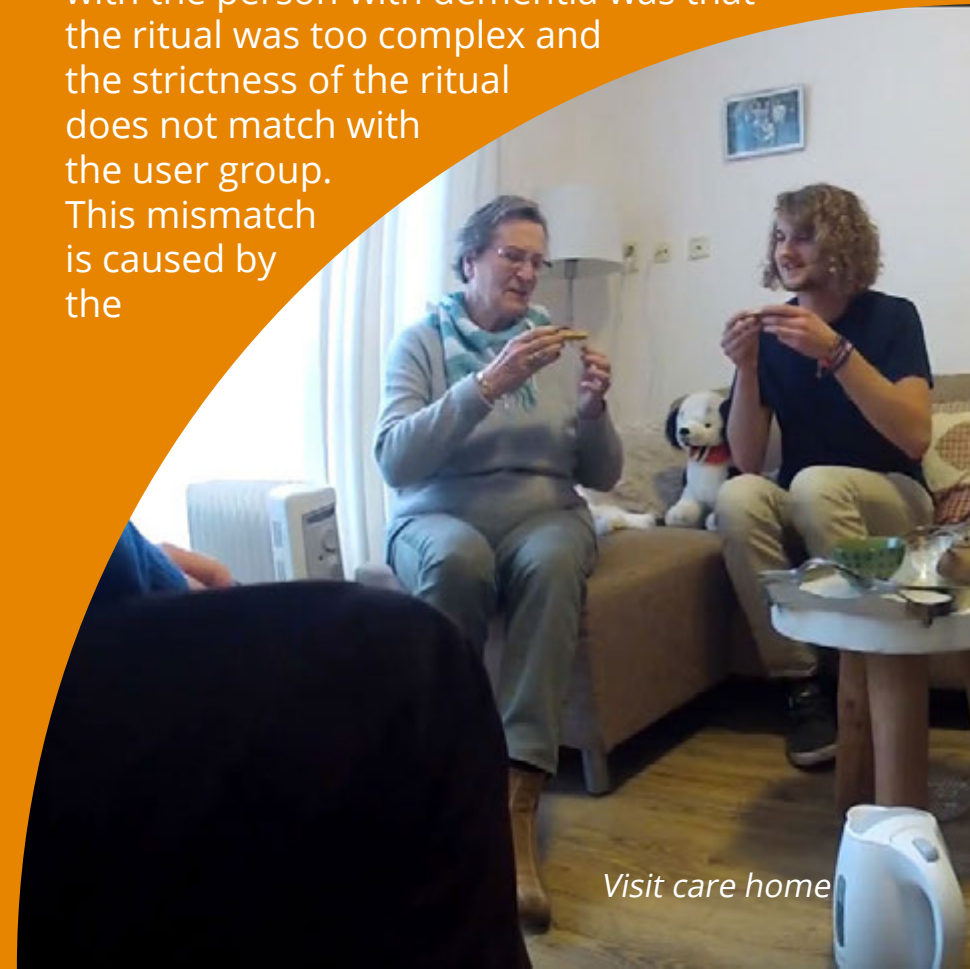
There was no prototype developed yet. However, to be able to receive a greater amount of input an activity to observe was needed. Drinking tea is an activity with a low threshold. Having a Chinese girl in the team led to the decision to perform a Chinese tea ritual with the person of dementia.

Although being involved in the Chinese tea ritual with the person with dementia already have us a lot of insights on her response and behaviour, analysing the recordings of the GoPro showed more subtle characteristic in behaviour.

The most interesting findings were the difficulties with verbal communication, the misidentification of objects, illusions and how easily the person with dementia was distracted.

Low-Fi prototyping

The overall conclusion of the Chinese tea ritual with the person with dementia was that the ritual was too complex and the strictness of the ritual does not match with the user group. This mismatch is caused by the



Visit care home

unexpected behaviour of people with dementia. Moreover, they are not able to learn any new information.

This gained knowledge was applied in the brainstorm during the elective. The goal of the brainstorm was to come up with a design and to make a Low-Fi prototype of it. Drinking tea was still seen as the activity with the lowest threshold and the best way to involve both the person with dementia and their caregiver and family member.

My input during the brainstorm was steering the concept towards a design of a tea ritual for people with dementia. This idea was developed further by tinkering with the materials everyone brought to the elective. The tinkering happened on a big circle that was cut out of carbon. While working on the carbon circle, the ability to turn the table turned out as a suitable interaction for the concept. It visualizes the process of making tea and with that making the ritual easier to understand.

- A visitation to the care home took place to gain experience with the user group

- During the visitation a Chinese ritual was performed and recorded. Insights on behavioural characteristics were gained by observing the footage.
- During the elective a Low-Fi tea ritual specially designed for people with dementia was made.



Feedback Rioteers

IDEATION

Feedback

Rioteers workshop

For the elective a one day workshop was organized by the other people involved in the 'Social Innovation' project, called 'Rioteers'. This group included researchers and designers from Sweden.

The day began with a yoga session to create body awareness. This session was followed by exercises to create insights in body language and non-verbal communication. These insights were used to make new Low-Fi prototypes or improve the ones that were made earlier. While presenting the prototypes, the Rioteers gave quick feedback on them. The feedback was used to improve the prototype. The Low-Fi prototype of the tea ritual was improved by organizing the elements of the ritual better. Beforehand, the elements were placed in a chaotic way without any order. Moreover, certain elements were attached the table to ensure that the interaction found place on the table, otherwise the person with dementia would bring it to their lap. This would make

their body language closed; making it hard to connect with the person.

After improving the prototypes, they were evaluated using role playing as a method. One of the group members played the role of the caregiver, while others played a person with dementia. Both introvert as extrovert personalities were acted out.

The main outcome of the feedback sessions was the



importance of keeping the attention at the table. This stimulated an open body language and kept the attention at the tea ritual. This resulted in a lower threshold of communication with the person with dementia.⁴

GGZe discussion group

Another feedback moment was a session planned with the Innovate Dementia discussion group at the Geestelijke Gezondheidszorg Eindhoven, GGZe. The discussion group consists of people with dementia, their partners and some caregivers.

Due to miscommunication, the limited amount of students that were able to host the session were informed the evening before. For this reason not much could be prepared, like a higher quality prototype. That is why the process, including pictures of the Low-Fi prototype were showed. During the presentation the tea ritual was performed again.

During the discussion afterwards, it became clear that the declined motor skills of the people with dementia need to be taken into account. Moreover, the familiar should be more

embraced in the design. An example given was using typical old tea cups and plates.

- To keep the user engaged the user needs to be stimulated to keep the attention at the table
- A balance should be found in the familiarity and unfamiliarity of the design.
- Objects need to be adjusted to take the decline in motor skills into account



GGZe discussion group

IDEATION

Similar products

Intelligent dynamic lighting for night Japanese tea ceremony

Master student Shigeru Yamada designed an intelligent dynamic lighting which uses kinect sensors to sense which order of the tea ritual is being performed. It adjusts the position and brightness of the lighting to the different steps of the tea ritual.

This design was an inspiration for the project in a way it adjusts the lighting to the different steps of the tea ritual.

Symposium

A dementia symposium was held before the doctoral defence of Rens Brankeart. During this symposium various people talked about their company/product. Head of the Department at care home 'Mariënburcht' in Budel, Hans van Wetten talked about experience focused care. He showed examples of this extraordinary care home. One of the things that stuck out was the themed interior. The care home consist of rooms decorated as a real living room, bar

and church. Another remarkable phenomenon was how they involve people with dementia in baking activities. To increase appetite they also spread the smell of fresh coffee early in the morning.

The focus on the experience of the people with dementia living at a care home was very inspiring. It showed that contributing to a positive experience in the present is already a great goal to accomplish.



Design Shigeru Yamada

- Inspiration using light for the different steps of the tea ritual
- Inspiration focussing on the user experience, rather than practicalities



Mariënburcht

CONCEPT

Sensuous Dementia exhibition

Plans

Throughout the elective we were stimulated to work with the environment. The bigger project behind the elective focuses on a 'Smart Homes'. That is why responsive environments is an interesting area for them. This also matched with the project topic I had chosen for my FBP, namely 'Responsive Environments - Living Culture'.

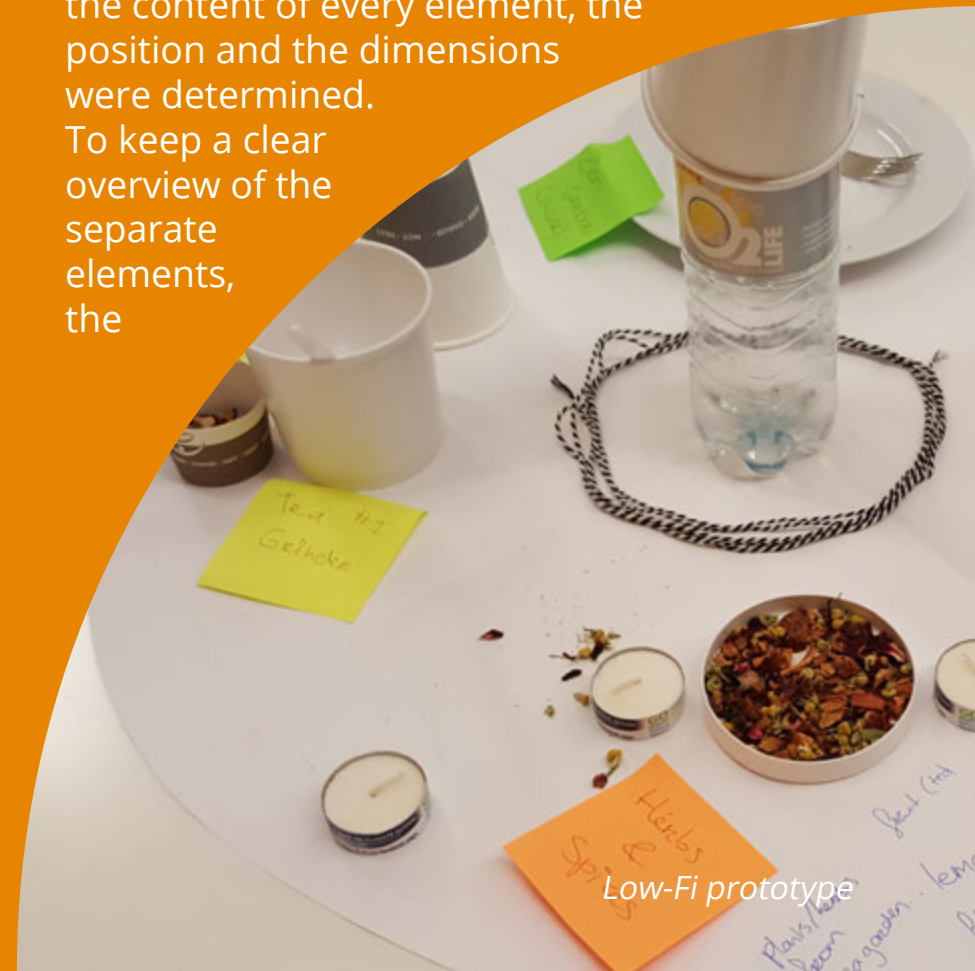
The plan for the final design presented at the exhibition in the Designhuis was to have a light that forms nature based patterns on the floor through casting shadow. Another brighter light would guide the person with dementia to the table. Speakers in the room would give sound feedback to what happens on the table.

The concept of these elements was developed to create a responsive environment around the tea table. However, due to lack of time and the missing added value, these elements were not developed for the final prototype. It was also advised to leave the lamp on the ceiling out due

to impracticalities with the ceiling structure.

Scenario

To think every aspect of the prototype through, a role play was performed together with another group member. Through acting the whole scenario out with a new Low-Fi prototype the content of every element, the position and the dimensions were determined. To keep a clear overview of the separate elements, the



Low-Fi prototype

platform was divided in four. These elements consist out of an element for fresh ingredients, one for the tea leaves, one for the sugar Zen garden and another one for the teapot.

Prototype

As found out during the making of the first Low-Fi prototype, a turnable round platform helps with the guidance through the elements of the tea ritual. After exploring various options, it was clear that making a ball bearing with marbles was the easiest and most effective option.

The wish diameter for the turnable platform was not available. That is why a slightly bigger one was chosen. The table on which the platform would be placed, was already arranged. To have enough place for the cups, the platform was not placed at the centre of the table. Luckily, this fit the concept of having three people at the table and having a common focus area.

Inspired by a previous Bachelor College course, the idea of using light at the centre of the table for feedback was formed. However, simple

changes in colour temperature would not stimulate the user to go to the next element of the tea ritual. That is why the idea changed to a light that guides the process. The two other group members worked on making the guiding lamp. The rest worked on the bearing and the tea ritual elements.

A button was placed underneath the tabletop to give the caregiver the control over the pace of the tea ritual. By pressing the button one of the four



Bearing

CONCEPT

spots in the lamp fades out, while the next one fades in. The caregiver is given this control because he/she knows the person with dementia the best and know how many time they need per element. ⁵

The tea ritual consists of four elements. The first one is a platform with fresh ingredients. The purpose of this element is for the user to explore the ingredients with their senses. The colour, smell and taste stimulates multiple senses.

The second element consist of various tea leaves and a mortar & pestle. The purpose of this element is to interact with the table by crushing the tea leaves. The released smell can give a rewarded feeling.

The third element is the Zen garden. The purpose of this element is for the user to find comfort in their repetitive motion. Moreover, by placing the sugar in a different context, room for free interpretation is created. By playing with food the family members, who are also involved in the tea ritual, is taken out of their comfort zone.

The fourth element consists out of a teapot. This element is purely for the caregiver to

provide hot water for the tea.

Set-up

Although the plans of creating complete responsive environments were aborted, the intention was still to design a experience and with that a certain kind of atmosphere. For this reason furniture was rented from the thrift shop to create a senior style living room. Attributes like books, plants and photo frames were used to create this



Set-up exhibition

particular atmosphere in detail.

To create a kind of museum style exhibition, Caroline Hummels came up with the idea to have a conversation between 'a person with dementia' and 'the caregiver' recorded. This way the first impression of a fictive person of dementia could be played through the speakers when the visitors of the exhibition enter the room.

Exhibition

About fifty people from different backgrounds visited the exhibition at the Designhuis. Ranging from designers, caregivers and people with a background in healthcare to random people passing by. Some of them joined the tea ritual, others observed and passed by. Some visitors, including a caregiver, acted out how a person with dementia would interact with the tea table. More reliable feedback could be extracted from this. It showed that every element should be safe in a way that it is not easy to choke in an object, when it is put in the mouth. A person with dementia can put everything in their mouth. Moreover, it should prevent of turning into a big mess. Especially

the honey made everything very sticky.

Overall, the concept received a lot of positive reactions. People saw the value in creating more pleasant experiences during visitations of family members.

The main returning comment was that there were too many objects on the table. As a consequence the user receives too many stimuli. This has a negative influence on the focus of



Exhibition

CONCEPT

people with dementia. People with dementia are easily overwhelmed by too much choice and stimuli.⁶

Another comments was the fine motor skills that were needed to use certain objects, like the small spoon. People with dementia need to be able to pick the objects up easily.⁷

- The focus changed from responsive environments to a interactive system
- The main feedback received on the prototype was to reduce the stimuli to make it less overwhelming and to adjust the objects in order to take declining motor skills into account.

Simplify concept

According to the feedback received from the exhibition at the Designhuis the concept needed to be simplified. At first the objects which were not adding many value to the whole experience were taken out. This was the honey with the honey dripper and the chasen, a bamboo tea whisk. The honey made too much mess and the chasen was a too unfamiliar

object.⁸ Furthermore, the choice of tea leaves was lowered to two kinds. The cup size of the tea leaves was also increased to make it more accessible and the small spoons were taken out.



First version prototype

Midterm Demo Day

There was no usual midterm demo day planned for the squad. This means that nothing specific needed to be prepared. Due to the fact that most people in the squad have a research project, an explanation on how to set up a research paper was presented by Bart Hengeveld. After the explanation about an hour was scheduled to prepare a paper presentation. Design projects also needed to be presented according to the structure of a research paper.

Through presenting the project with this method, the lack of a clear defined goal became apparent. Specifically having measurable outcomes. In a discussion with Bart Hengeveld he explained how he defined simple measurable outcomes when working with toddlers. Moments of attention, smiles and active participation are simple actions that can be counted when analysing footage of a user tests.

With this gained knowledge a list of specific measurable outcomes was set up:

1. Eye contact

2. Change from closed to open body language
3. Active participation
4. Smiles and laughter
5. (Non-) verbal communication
6. Focus on illuminated element on table

- **Predefined measurable outcomes had to be defined in order to verify the effectiveness of the design**

User test

Arrangements

Via the mother of a roommate contact was made with care home 'Archipel Passaat' in Eindhoven. At first the plan was to keep the prototype in the Designhuis and build a café atmosphere in the room. This way the context of a Alzheimer café was imitated. It was not possible to hold the user test at a real Alzheimer café because those are open once a month and have a tight schedule.

The user test was postponed a couple of times due to staff shortage and one time due to unforeseen technical difficulties.

CONCEPT

After rescheduling a couple of time, it was decided to move the prototype to the care home. Previously, the staff was excited about combining the user test as an activity with going for a walk. Unfortunately, the weather was not being very cooperative.

Set-up

For the user test the prototype was set up in the middle of a room at the care home. The room looked like a living room. The first session started with a woman with dementia, her daughter and the caregiver. Unfortunately, the family members of the other three participants cancelled last minute. The woman of the first session had a relative mild form of dementia. The symptoms increased with every session. At the other three sessions another caregiver, who did not work there for a very long time yet, joined the tea ritual.

Instead of placing a button underneath the tabletop for the caregiver to control the light, the control of the lights was in my hands. This way various possibilities could be explored, like changing the position of the light before, during or after turning the platform.

Expectations

The fact that people with dementia are known for their misinterpretation and unexpected behaviour, made it hard to have any specific expectations. That is why one of the expectations was to find the predefined measurable outcomes by observing the tea ritual and analysing the footage. Another expectation was that the central lamp attracts the attention to the specific element on the table and with that increase their



User test

concentration.

Results

The first session started a bit rough. The lamp had a loose connection, which resulted in the light sometimes jumping to other elements. According to the caregivers, the family member who joined the session was not the ideal participant. She kept on talking and did not give her demented mother the chance to communicate. The first session was also the first experience of the caregiver with the tea ritual. She used this time to explore the purpose and possibilities of the prototype.

The other sessions went smoothly and gave valuable outcomes. In the appendix the exact analysis can be found based on the predefined measurable outcomes. However, besides the standard predefined outcomes a couple of very interesting moments occurred.

One of them was when Mrs. Spruit's state completely changed. At first, she was looking downward, mumbling and only saying 'yes'. She did not recognize the lemon, but when the caregiver let her smell the mulethi (zoethout) she reached for the jar and started talking in

words other than 'yes'.

After the caregiver used the serving spoon, Mrs. Spruit also reached to pick it up and observe it closer.

Although nobody used the Zen garden as it was intended to be used, it did trigger a positive response from Mrs. Spruit. She bursted into a state of laughter.

Mrs. Sleutjes did talk, but there was no connection with the current moment or subject. It was difficult to communicate verbally with her. However, the moments when she was smelling the tea leaves or interacting in another way with the tea, she did talk about the subject. During these moments verbal communication was significantly easier. When the caregiver asked for her opinion, she compared the tea with the tea she normally drinks. The caregivers were amazed by how much she talked. When the caregiver asked her whether she wants to do this tea ritual again, she answered that she appreciates that we take the time and not simply drink tea and continue with what we have been doing.

CONCEPT

Feedback

After the tea sessions the caregivers took time to give feedback on the prototype and the user test. They agreed that the interesting moments described earlier were very special and valuable results.

The tea ritual is a pleasant activity to do with the caregivers and visitors. Especially for visitors, it makes the visitation less confronting and uncomfortable. It provides something to talk about, but it is also fine when there is no verbal communication. Moreover, triggering the various senses had a positive influence on the state of the person with dementia. Another response they noticed is that the restless leg of Mrs. Spruit calmed down throughout the tea ritual.

They were very positive about the prototype. Overall, it looks very attractive. The old style of the table fits the preferences of the elderly. The prototype should not look too modern. That is why it is positive that the lamp looks normal and the LED-strips are hidden.

The white colour of the plates was a very

important detail. The white colour makes the colour of the tea more visible. Another interesting reaction was that the glitches of the lamp during the first session was seen as a positive element. This way the light is not only a guide, but also attracts attention. This change in illumination attracts the attention of the person with dementia and brings the focus back to the table.



Although many positive responses were received, there was one main comment. The serving objects should be designed in a way that no fine motor skills are needed. This makes it easier for the person with dementia to interact with the elements.

- **Positive results in the amount of achieved predefined measurable outcomes**
- **The design triggered extraordinary positive reaction, like lucid moments, (verbal) communication and laughter.**
- **The lamp attracted and guided attention**
- **The objects still need to be adjusted to take the decline in motor skills into account.**





Final Concept

Dementia is the beginning of a lot of heart breaking stories. Besides seeing your loved one slowly slip away, another struggle is communication. Words lose their meaning. Leaving the person with dementia and the loved one both frustrated.

With my design I want to make care home visitations less uncomfortable and confronting. Through the shared experience of preparing tea, another form of communication is stimulated. The tea ritual is specially designed to attract and guide the attention. A common area of attention lowers the threshold for communication. Moreover, elements like 'the sugar Zen garden' leave room for own interpretation, free interaction and unexpected behaviour.

Sensory stimulation is key in this design.

It decreases agitation and restlessness of the person with dementia and increases engagement in the activity.

This stimulates (non)verbal communication with outcomes like moments of lucidity, laughter or even just a glance.

Design



Design

Basically, the design is a table with a turnable platform. The lamp in the middle of the table consists of four spots. This lamp is controlled through both a time loop and a button underneath the tabletop at the place of the caregiver. The first spot fades out after eight minutes and the spot directed on the next element fades in. This is how every next spot goes on and the previous one goes off. The purpose of the lamp is to guide the attention of the person with dementia to the next element. Through turning the platform, the illuminated element is placed in front of the person with dementia. This makes the area of focus smaller and with that increases the ability to concentrate.⁹

The caregiver is able to let the current element be illuminated for a longer period or to go quicker to the next element by using the button. This control is given to the caregiver because that person has a lot of experience with the person with dementia and therefore is better in estimating how much time he/she

needs for every element.

Besides the lamp in the middle of the table, light is also used to attract the attention through LED strips underneath every element. If the user is close to or touches one of the elements, that specific element lights up. In the prototype the LED-strips are placed underneath or embedded in the trays. However, in future design the LED-strips will be embedded in the tabletop. This makes it possible to easily change the objects on the table.

The main purpose of the design is to attract and guide the attention of the person with dementia. The table is applicable for various contexts and themes. A tea ritual is chosen due to its variety and low threshold. Moreover, multiple senses are easily stimulated when preparing tea. Part of the design is a suggestion on how to fill every element, but this is free for own interpretation.

3. Sugar Zen Garden



4. Tea Pot



2. Tea Leaves



3. Fresh Ingredients



Business plan

Stakeholders & Investors

Although the big cuts in long term care are cancelled for 2016, these are still difficult times for the healthcare sector. However, the government invests € 32,5 million in 'Deltaplan Dementie'. One of the things they stand for is improving the care of people with dementia.¹⁰

Another possible investor could be the care homes. Their reason for investing is improving the care and quality of life. When the life of people with dementia improves, they are easier to handle. As a consequence the work is less labour-intensive and one caregiver can be responsible for more people with dementia. This is very appealing for the care homes because a lot of jobs have been cut.¹¹

Furthermore, most family members appreciate better care for their demented family.¹² As the design improves the visitations of family members, they benefit from this as well. At care home 'Archipel Passaat' family members can already subscribe to various kinds of activity

packages for their demented family member. Due to shortage at the care home, the family has to pay for these subscription.

Insurances and healthcare institutions are also involved. For insurances this design could be interesting in a way that it cuts the costs of calming medication, when the design contributes in calming the people with dementia. Moreover, one design reaches more people at the same time compared to medicine. Healthcare institutions can get better recommendations, if they improve their care.

Philips lighting worked on installing a dynamic lighting system in 'Am Kirschbaumer Hof' care home to create a calmer ambience by reproducing the familiar rhythm of day and night.¹³ This helps to regulate the sleep patterns of people with dementia. Since they are already active in improving the quality of life of people with dementia, the light of the Richness of tea could also be interesting for them.

Scalability

To increase the benefits of the Richness of tea, the design probably must be increased. Instead of having a one on one session with the person with dementia, the table could also serve as an activity for multiple people with dementia guided by one caregiver. With the shortage of staff this change of concept could make the design more appealing.

- Financially the healthcare sector receives more money than before. This creates a better opportunity for investors.
- The design is interesting for care homes because it can decrease the labour intensity for the caregivers.
- Philips lighting could be an interesting partner due to their experience with designing light installations for people with dementia.

Estimated costs

The future costs of the design itself and the production depends on the amount of the produced design.

The production will be different than how the prototype is build. The light of the lamp can be dimmed with resistors. This is more space efficient and cheaper than using a DMX controller. Furthermore instead of using Arduino a custom circuit board can be produced. This is also cheaper and more space efficient. The circuit board, the LED-strips and the light spots are relatively the most expensive components. The estimated costs of all the electrical components together is estimated to be between the € 100,- and the € 150,-.

The table, the turnable platform and the other 'hardware' of the design is estimated to be 50,-.

This results in a total amount of € 150,- to € 200,- for the design. However, this is excluding the costs of the labour of producing the design. The electronical aspect are not very complicated.

The labour costs decreases when the scale increases. This is why the costs will be higher when the product is just brought onto the market.

Technology

Prototype

Lamp

The lamp in the middle of the table consists of four spots. These fade in and out with a timespan of eight minutes. A button underneath the table can pause or fasten this time span. However, for testing the prototype was limited to only the button. By pressing the button the current spot that emits light dims and goes out and the next spot slowly goes on.

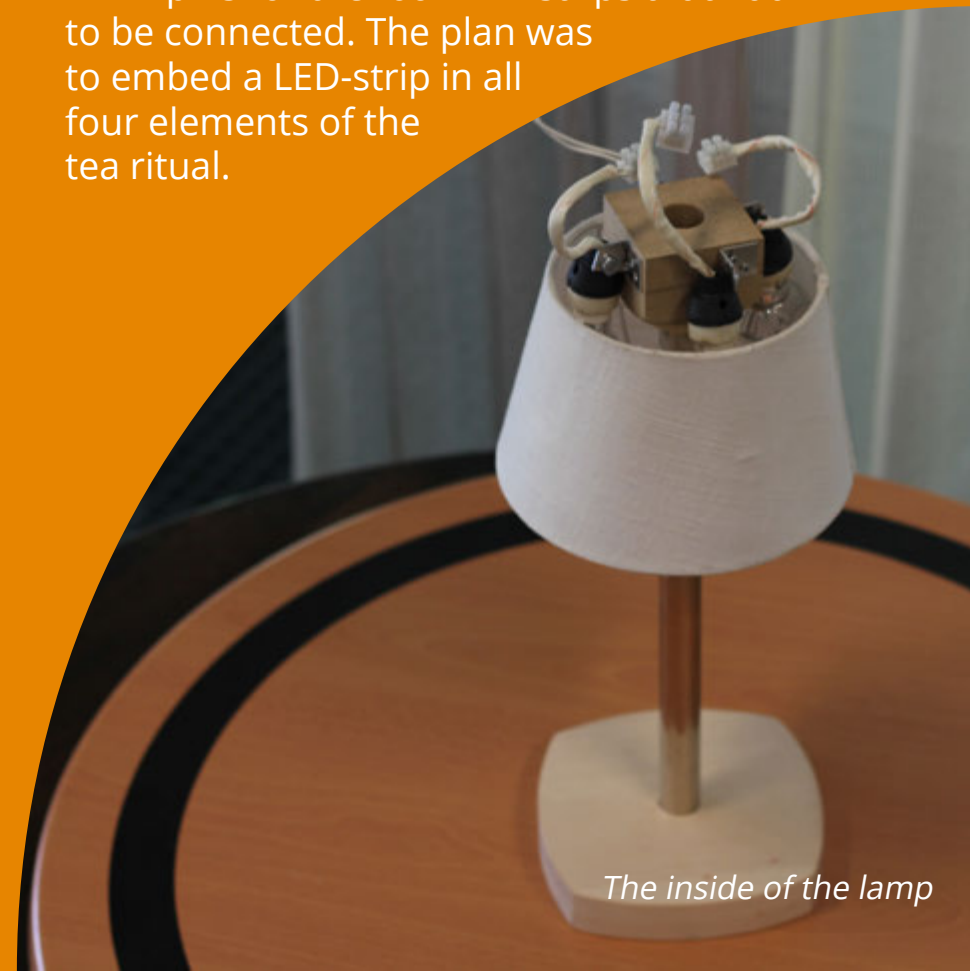
To dim the light spots a four channel DMX light controller was used in combination with a DMX shield for Arduino. An Arduino Mega was programmed to control the DMX light controller.

The main problem faced when working with the button as an input was that sometimes it continuously received a high value. The cause of this problem was that the digital circuit had a floating state. This was solved by using a pull-down resistor.

LED-strips

The MPR121 capacitive touch sensor module was used as an input for the LED-strips underneath the trays. The bottom of the trays were covered in aluminium foil to create a conductive surface.

An Arduino Mega was needed to have enough PWM pins for the four LED-strips that had to be connected. The plan was to embed a LED-strip in all four elements of the tea ritual.



The inside of the lamp

The MPR121 module worked when it was hooked up to one LED-strip. Unfortunately, when using more channels of the MPR121 module as input and more LED-strips as output, it did not work anymore. Moreover, the functioning set-up of one LED-strip did not always work. The cause of this uncertainty was not found. Even after consulting an Electrical Engineer multiple times and looking at it together extensively, the problem could not be found and fixed.

Electrical circuit & code

The set-up of the electrical circuit and the code can be found in the appendix. As a base the standard wiring of a LED strip and the standard wiring of the MPR121 are used.



Consulting an EE

Past & Future

Discussion

Project Proposal

The goals set in my project proposal for my Final Bachelor project was to form a bridge between the patient and the visitor which engages the looping of a patient in the design. The design should invite the patient in a way a person with dementia would understand, while at the same time being accessible for the visitor.

The design should form an unobtrusive bridge which connects the patient and the visitor. It stimulates interaction between the patient and the visitor passively. The patient should feel comfortable and not forced to interact in the way that is 'normal' for us. Instead, the design should be adjusted to their 'norms' and behaviour. While at the other side, it needs to be accessible for the visitor by involving the visitor and taking the frustration away. The extra challenge set for this project was to design a responsive environment. The responsiveness of the room created the opportunity of making a 'wise environment'. This way the environment is able to respond

to each individual differently. This intelligence would be beneficial because every patient with dementia is different, as well as every visitor.

Project goals

For the project goals regarding the user group and prototype were set. Due to the difficulty of receiving feedback from people with dementia, the goal was to find and use another method to be able to user test the prototype. The goal set for the prototype was to have the prototype functioning exactly as it would be if it would be brought on the market.

Discussion

The direction of the project deviated from the project proposal. The main difference is the change of designing an installation rather than a responsive environment. The cause of this change was the required reduction of stimuli and distractions. When the project headed to the direction of a tea ritual, designing a responsive environment became irrelevant. Throughout the master elective the focus was on sensory experience. This had a huge impact on the scale of the project. If the focus would have been on responsive environments, the

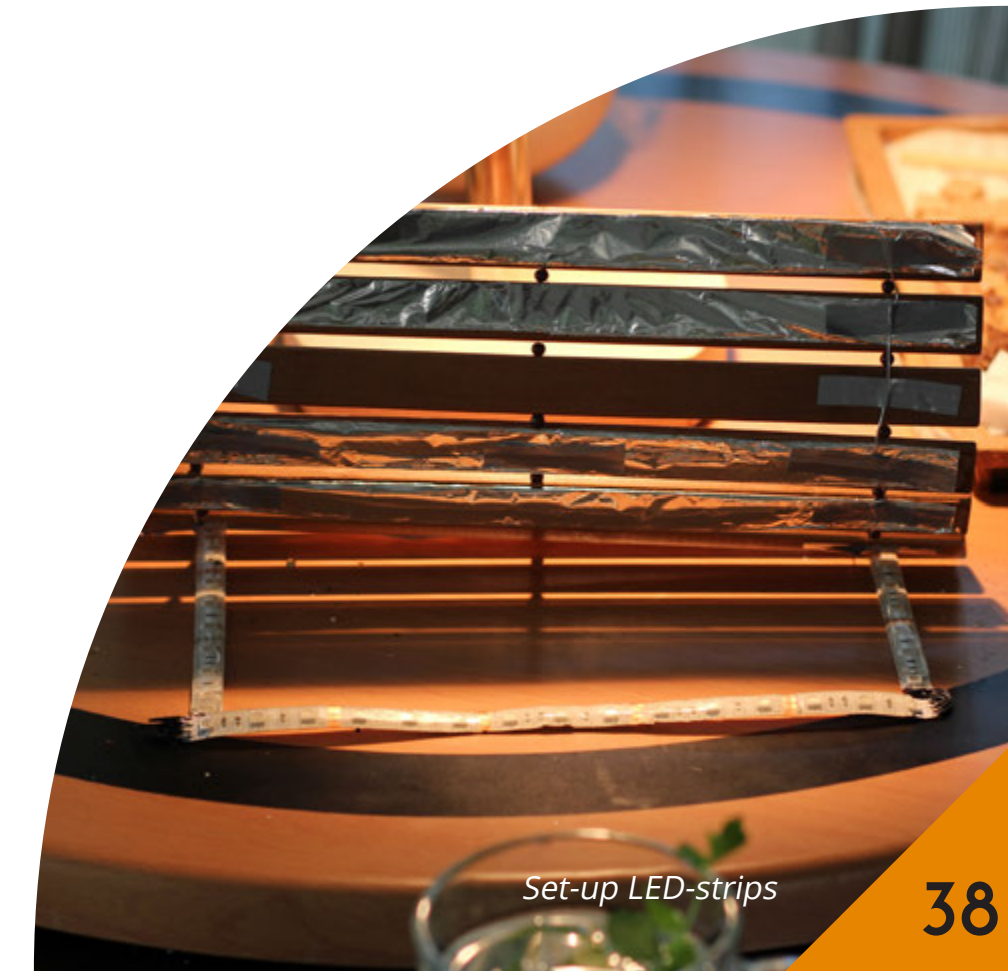
project would have had a completely different outcome.

The prototype was not developed as far as wished. At a certain point the process got stuck due to insufficient knowledge about how to fix the electronical issues. That is why intensive consultant sessions were arranged with an Electrical Engineer. When he could not find the cause of the problem another expert should have been consulted.

To verify to which extend the design accomplishes its goals, more user test need to be executed. Especially a user test with the further developed prototype of which every aspect functions the way it should is needed to get more reliable outcomes. Another user test with only the tea ritual without any technology is needed to be able to compare the outcomes and see if the design is effective.

As described in the chapter 'Concept' the other goals set were reached up to a certain extend.

- The direction of the project changed from responsive environments to a smaller scale interactive installation



Set-up LED-strips

Past & Future

Future plans

Finale prototype & service

As described in the discussion, the prototype needs to be fully developed and tested to verify the effectiveness. After this is done, every element needs to be tested separately. By tweaking every element in another test more improvements can be found.

Besides developing the prototype further according to the defined concept, the objects need to be redesigned to not challenge the decreased motor skills of the user too much. Another interesting suggestion during the Final Demo Day was to explore how to make the elements on the table more appealing. More research and tests are needed to make these objects invite for interaction.

To verify whether the design on itself achieves the desired user experience, a user test should be executed in another context than a tea ritual. A creative workshop could be the subject. Moreover, more research can be done on

attention management. Now papers are used to verify the assumption, but not to improve this aspect further

After the design is completely improved and the ideal practical forms of all the objects are developed, the form family and branding of the individual objects and total design has to be developed. This way the design strives for an ultimate interaction and user experience on an aesthetic level as well.

Research project

This design project will be part of a bigger research project. Caroline Hummels and Ambra Trotto kicked-off this research project with the master elective 'Social Innovation'. There is no clear plan on how this project will contribute to the bigger project. However, there are a few aspects on which research can be conducted. One is the guidance and attraction of people with dementia with a light and what influences this has on their focus and behaviour. Another one is the relationship between stimulating various senses and improvements in overall mental health.



Reflection

Personal reflection

User & Society

This expertise area played an enormous role in my project due to its user-centred approach. However, the challenge within this project lied in the fact that 'normal' non-verbal communication was not the most effective way to receive feedback from the user group. At first, I found it a bit scary to work with a user group with a serious illness. Especially, because it was hard to get input from them. However, the gratitude of the whole sector helped me to get over the fear of doing something wrong.

Although I see myself as quite an empathic person. This user group was extremely difficult to predict in any kind of way. I learned a lot from the body awareness exercises and exercises in non-verbal communication. Through these exercises and by putting effort in role playing, a better understanding was created.

In my PDP I described that through observing the user group, I want to receive feedback.

No specific method or expectations were set. These gaps in the final purpose of the design were found during the Midterm Demo Day. I learned a lot about the method of structuring a design project as a research paper. This helped me strengthen the final purpose of my design.

Throughout this project something changed in me. Although my vision was always based on looking for the small things in life that can be improved. I did not put these small improvements in a societal context before. The impact of these small things strengthened my vision and motivation.

Technology & Realization

Although the goal I set in my PDP to have a completely functioning prototype, was not reached. I developed my approach throughout the project by consulting the Light Lab and an Electrical Engineer to explore the options of technical realization.

Besides showing more initiative in this expertise area, communication with other disciplines was developed as well. Instead of just consulting an Electrical Engineer, we

worked together on finding the error or solution. He challenged me in using different approached.

Overall development

This semester I developed my attitude as a designer enormously. Although my internship semester was an excellent semester, my attitude got challenged when I had to do it by myself for my FBP.

By joining the master elective besides my bachelor elective, I did not only gave my project a kick-start, but was consciously working on the approach and process of it. Furthermore, executing this project in such extend made me aware of my competencies and how these were connected and contributed to the industrial designer I am now.

When going to the PhD defence of Rens Brankaert on Design for Dementia, I noticed that I am more future-focused. It goes further than thinking about what master to do next. I am exploring on what my place will be in the world of design and what my contribution.

Acknowledgements

Master elective

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I am thankful to Caroline Hummels in admitting me to the master elective, even though I am still a Bachelor student.

I would like to express my gratitude towards Jun Hu for coaching me this semester and challenging me and my project through the discussions during the coach meetings.

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Appendices

Appendix 1: Analysis user test

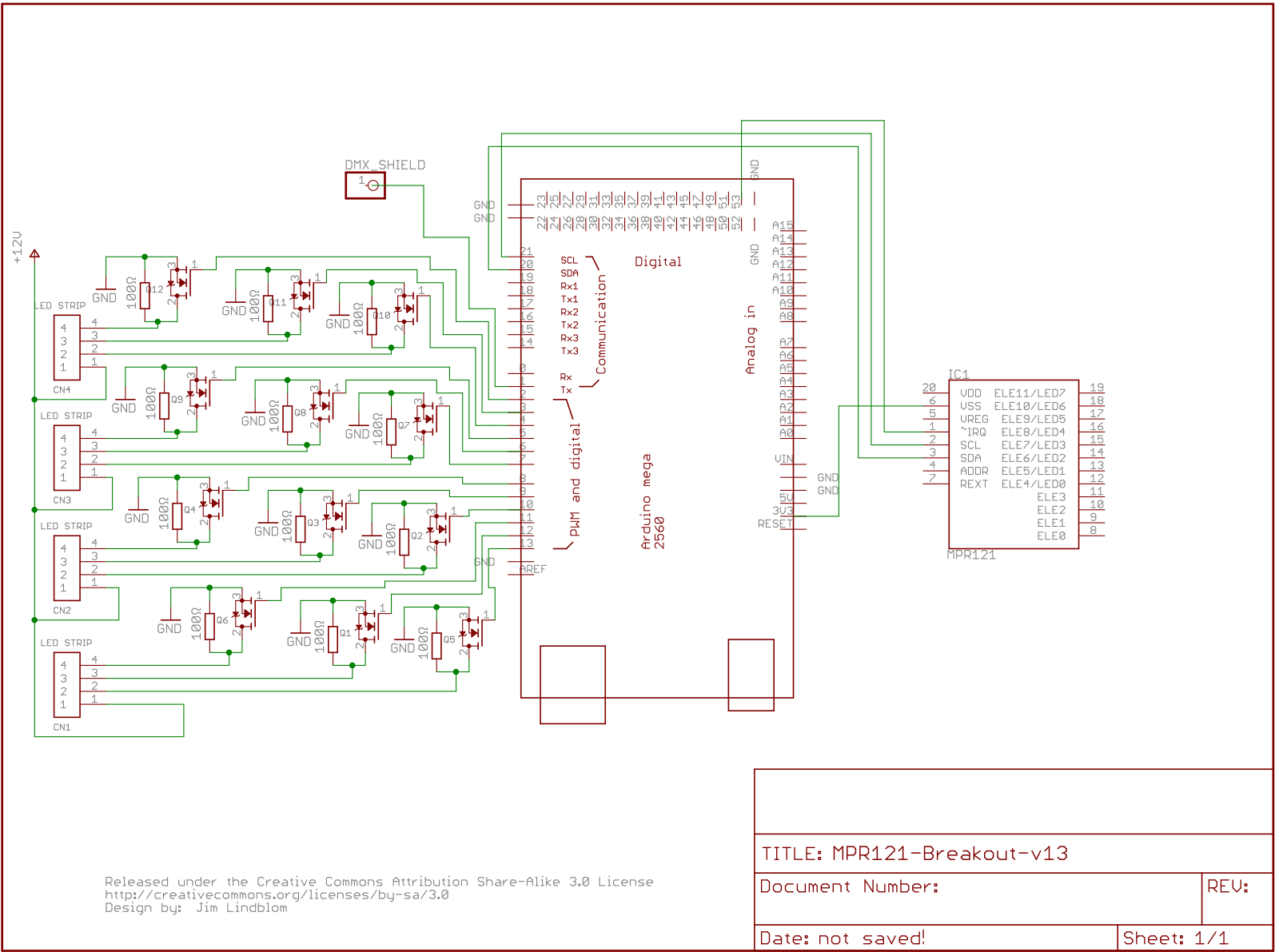
The list underneath consists the total amount of actions performed by the user during the user test. The counting took place while analysing the footage of the user test.

1. Eye contact: 12, 25, 18, 16
 2. Closed to open body language: 1, 3, 1, 2
 3. Active participation: 5, 8, 4, 3
 4. Smiles and laughter: 6, 2, 4, 2
 5. (Non-) verbal communication: 4, 16, 8, 7
- Focus on illuminated element on table: 10, 8, 13, 17

Appendix 2: Electrical circuit

On the page on the right the schematic diagram is presented. The DMX shield is not drawn out completely

9-6-2016 16:07:46 C:\Users\Paul\Downloads\MPR121-Breakout-v13\MPR121-Breakout-v13.sch (Sheet: 1/1)



Appendices

Appendix 2: Arduino code

```
#include <DmxSimple.h>
#include "mpr121.h"
#include <Wire.h>

#define LEDR 9
#define LEDG 8
#define LEDB 10

boolean buttonState = false;
long currentLamp = 1;
int currentIntensity;
int irqpin = 18; // Digital 2 mega 18
boolean touchStates[12]; //to keep track of the previous touch
states

unsigned long lastStep = 0;
int stepSize = 50;

void setup() {
  Serial.begin(9600);
  Wire.begin();
  mpr121_setup();
  DmxSimple.usePin(11);

  pinMode(51,INPUT);
  pinMode(irqpin, INPUT);
  pinMode(LEDR, OUTPUT);
  pinMode(LEDG, OUTPUT);
  pinMode(LEDB, OUTPUT);

  digitalWrite(irqpin, HIGH); //enable pullup resistor
}

void loop() {
  readTouchInputs();
  buttonState = digitalRead(51);

  // regulate the speed with a step measured in milli seconds.
  if(lastStep + stepSize < millis()) {
    // if button is pressed then go forward
    if(buttonState) {
      currentIntensity = currentIntensity - 5;
      Serial.print("Button pressed \n");
    }

    // if button is not pressed then snap back to the nearest fully
    on mode
    if(!buttonState) {
      // snap backwards
      if(currentIntensity > 125 && currentIntensity <= 250) {
        currentIntensity = currentIntensity + 5;
      }

      // snap forward
      if(currentIntensity <= 125) {
        currentIntensity = currentIntensity - 5;
      }
    }
  }
}
```

```
}

// if the intensity is below 5 then go to the next step
if(currentIntensity <= 5) {
  currentLamp++;
  currentIntensity = 255;
}

// update the step timestamp
lastStep = millis();
}

// write the intensity to the lamps
DmxSimple.write(currentLamp%4 + 1, currentIntensity);
DmxSimple.write((currentLamp + 1)%4 + 1, 255- currentIntensity);

// for debugging
// Serial.print("Lamp : ");
// Serial.print(currentLamp%4 + 1);
// Serial.print(" Intensity : ");
// Serial.print(currentIntensity);
// Serial.print(" Lamp+1 : ");
// Serial.print((currentLamp + 1)%4 + 1);
// Serial.print(" Intensity : ");
// Serial.println(255-currentIntensity);
}

void readTouchInputs(){

  if(!checkInterrupt()){

    //read the touch state from the MPR121
    Wire.requestFrom(0x5A,2);

    byte LSB = Wire.read();
    byte MSB = Wire.read();

    uint16_t touched = ((MSB << 8) | LSB); //16bits that make up
    the touch states

    for (int i=0; i < 12; i++){ // Check what electrodes were
    pressed
      if(touched & (1<<i)){

        if(touchStates[i] == 0){
          //pin i was just touched
          Serial.print("pin ");
          Serial.print(i);
          Serial.print(" is touched \n");
          digitalWrite(LEDR, HIGH);
          digitalWrite(LEDG, HIGH);
          digitalWrite(LEDB, HIGH);
          int test = digitalRead(LEDR);
          Serial.print(test);
          test = digitalRead(LEDG);
          Serial.print(test);
          test = digitalRead(LEDB);
          Serial.print(test);
        }
      }
    }
  }
}
```



```
Serial.print(test);
delay(100);

}else if(touchStates[i] == 1){
    //pin i is still being touched
}

touchStates[i] = 1;
}else{
    if(touchStates[i] == 1){
        digitalWrite(LEDRL, LOW);
        digitalWrite(LEDG, LOW);
        digitalWrite(LEDDB, LOW);
        delay(100);

        //pin i is no longer being touched
    }

    touchStates[i] = 0;
}

}

}

void mpr121_setup(void){

    set_register(0x5A, ELE_CFG, 0x00);
```

```
// Section A - Controls filtering when data is > baseline.
set_register(0x5A, MHD_R, 0x01);
set_register(0x5A, NHD_R, 0x01);
set_register(0x5A, NCL_R, 0x00);
set_register(0x5A, FDL_R, 0x00);
```

```
// Section B - Controls filtering when data is < baseline.
set_register(0x5A, MHD_F, 0x01);
set_register(0x5A, NHD_F, 0x01);
set_register(0x5A, NCL_F, 0xFF);
set_register(0x5A, FDL_F, 0x02);
```

```
// Section C - Sets touch and release thresholds for each elec-
trode
set_register(0x5A, ELE0_T, TOU_THRESH);
set_register(0x5A, ELE0_R, REL_THRESH);
```

```
set_register(0x5A, ELE1_T, TOU_THRESH);
set_register(0x5A, ELE1_R, REL_THRESH);
```

```
set_register(0x5A, ELE2_T, TOU_THRESH);
set_register(0x5A, ELE2_R, REL_THRESH);
```

```
set_register(0x5A, ELE3_T, TOU_THRESH);
set_register(0x5A, ELE3_R, REL_THRESH);
```

```
set_register(0x5A, ELE4_T, TOU_THRESH);
set_register(0x5A, ELE4_R, REL_THRESH);
```

```
set_register(0x5A, ELE5_T, TOU_THRESH);
set_register(0x5A, ELE5_R, REL_THRESH);
```

```
set_register(0x5A, ELE6_T, TOU_THRESH);
set_register(0x5A, ELE6_R, REL_THRESH);
```

```
set_register(0x5A, ELE7_T, TOU_THRESH);
set_register(0x5A, ELE7_R, REL_THRESH);
```

```
set_register(0x5A, ELE8_T, TOU_THRESH);
set_register(0x5A, ELE8_R, REL_THRESH);
```

```
set_register(0x5A, ELE9_T, TOU_THRESH);
set_register(0x5A, ELE9_R, REL_THRESH);
```

```
set_register(0x5A, ELE10_T, TOU_THRESH);
set_register(0x5A, ELE10_R, REL_THRESH);
```

```
set_register(0x5A, ELE11_T, TOU_THRESH);
set_register(0x5A, ELE11_R, REL_THRESH);
```

```
// Section D
// Set the Filter Configuration
// Set ESI2
set_register(0x5A, FIL_CFG, 0x04);
```

```
// Section E
// Electrode Configuration
```

```
// Set ELE_CFG to 0x00 to return to standby mode
set_register(0x5A, ELE_CFG, 0x0C); // Enables all 12 Elec-
trodes
```

```
// Section F
// Enable Auto Config and auto Reconfig
/*set_register(0x5A, ATO_CFG0, 0x0B);
set_register(0x5A, ATO_CFGU, 0xC9); // USL = (Vdd-0.7)/
vdd*256 = 0xC9 @3.3V set_register(0x5A, ATO_CFGL, 0x82);
// LSL = 0.65*USL = 0x82 @3.3V
set_register(0x5A, ATO_CFGT, 0xB5);*/ // Target = 0.9*USL =
0xB5 @3.3V
```

```
set_register(0x5A, ELE_CFG, 0x0C);
}
```

```
boolean checkInterrupt(void){
    return digitalRead(irqp);
}
```

```
void set_register(int address, unsigned char r, unsigned char v){
    Wire.beginTransaction();
    Wire.write(r);
    Wire.write(v);
    Wire.endTransmission();
}
```