Smart mirror

Using smart clothes in combination with a smart mirror to address users' needs.

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1 INTRODUCTION

We currently live in a consumer society where people keep buying and buying new items without really considering what impact this can have on the environment or thinking how they can reduce/minimalize their buying. This is the same when it comes to clothing. Every piece of clothing someone buys, requires a lot of water and chemicals, which is often not recycled. Frequently people have way too many clothes, of which half of them they don't even wear. Not only is this very unsustainable, but it can also result in personal issues when selecting clothes from your closet. You might not know anymore what you have in your closet and spend hours in front of your mirror selecting clothes.

1.1 Concept

To solve this problem, a prototype of a smart mirror in combination of smart tags on clothes is developed. The idea is that every piece of clothing has a small NFC tag knitted into the label, which can be scanned onto the mirror with a RFID scanner. The mirror knows all pieces of clothing that are available in your closet and can show you the options you can match a particular piece of clothing with. For example, you can scan a t-shirt, and it will show you various trousers you can combine it with. Besides that, the mirror will count how many times you have worn a piece of clothing and can suggest you to put away/donate certain clothes (for example, to a good cause). This way you can better keep track of what clothes you have (without digging through your whole closet) and think twice before buying new clothes.

There are also some other functions on the smart mirror, for example to 'save outfits', have favourite outfits (by lack of inspiration) and have recommended outfits. Recommended outfits are based on the temperature, which can be measured by a temperature sensor integrated into the smart mirror. The process of adding clothes is simple, you just scan the tag in front of the mirror and the mirror will guide you through the process of adding. This way it's sustainable and you don't have to buy 'special clothes', you can just add a tag into a label of an already existing piece of clothing.

This concept is mainly designed for personal use, not for in stores, but can always be expanded. Furthermore, this concept is selected for this assignment since it uses a lot of the practical workshops that were treated in the course (e.g. 3D printing, Arduino, processing, e-textile) and can be applied to the material (e.g. filters, prototyping dimensions, critical design).

1.2 Relation to existing technologies

By generating a quick google search, it becomes clear that the concept of smart mirrors has been existing for way longer. Smart mirrors mainly display time, weather, calendar news and social media updates. The reason why this prototype is different, is because of the combination with the smart tags. The component of viewing your whole closet inventory combined with the idea of reducing the consumer society gives a new angle on the subject.

2 DESIGN PROCESS

In this section, the design process and flow of the prototype is discussed, including the use of the theory of the lectures and material from the workshops.

2.1 Formulating the concept

To start, the concept of the prototype had to be formulated. Therefore, a brainstorm session including a mood board and a MoSCoW theory were used. To help formulating the idea, several pictures were put together of already existing technologies. This can be found in figure 1.

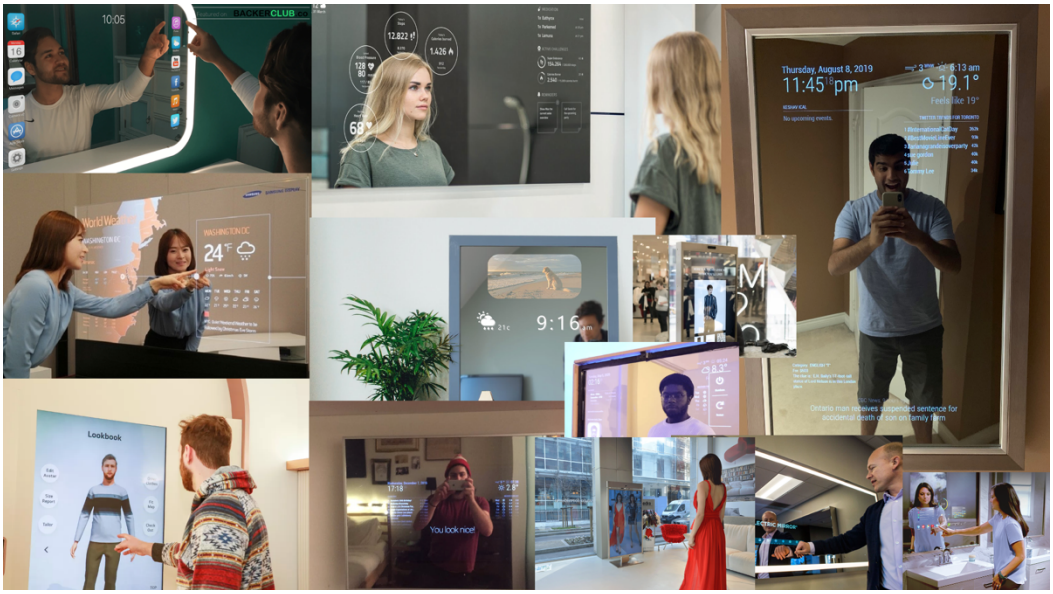

Figure 1: Moodboard and brainstorm session

Besides that, the MoSCoW strategy was used, which stands for 'Must have', 'Should have', 'Could have' and 'Would have'. Using this strategy makes you think about the prototype/concept in a different way, and really focus on what is important and what could be added later. The results of the MoSCoW strategy were as follows:

Must have:

- A way to identify clothing pieces to the mirror
- A screen that shows you what clothes you can combine it with / a way to see what you have in your closet

Should have:

- A way to add existing clothing pieces to your smart mirror
- Visuals on the screen how the clothing together would look
- Small tags in clothes (that should be invisible)
- Wireless

Could have

- A function to save favorite outfits
- A mirror/webcam to see yourself on it (or the miniature person in the prototype case)

Would have:

- buzzers/light/vibration of where a clothing piece is after you decided you want this to combine it with

2.2 Identifying appropriate prototyping concepts and techniques

To continue the prototype, valuable theory is considered to steer the direction of the prototype.

To start off, we look at the dimensions of prototyping. In the paper of Beaudouin-Lafon and Mackay (2002) they discuss the 4 dimensions of prototyping: representation, precision, interactivity, and evolution [1]. Representation describes the form of the prototype. In the beginning we want our form to be low fidelity, so it is convenient to start with sketches on paper. After that we want a more high-fidelity prototype, real 3D printed objects combined with Arduino and processing. This means the precision also evolves over time, it starts with a very informal sketch, up to a more detailed evaluation. There is no interactivity in the beginning at the sketch, but the goal is to implement a lot of interactivity in the program. Finally, the 'evolution' dimension, describes the expected life cycle of the prototype, which is neglectable since it's an online program (and a very small 3D object).

Why are we making this prototype and what does it prototype? This can be answered with the help of the paper by Houde and Hill [2]. In their paper they discuss 3 different aspects: role, look & feel and implementation. This prototype focusses on role and look & feel. The aspect 'role', questions the function that an artifact serves in a user's life. I want to assess if this prototype can be useful in someone's life and if it fulfils a need. Would they really use it? Besides that, the 'look & feel' is assessed with the prototype, meaning we look at the concrete sensory experience of using the artifact. Does the user like the looks, feels, and hearings while using the prototype?

There are more goals of making this prototype, namely exploration, refining and communication (as discussed in the lecture). We want to explore the prototype to get a better idea (either in getting the design right or getting the right design), and refine the prototype by correcting the design vision. But most importantly it is a way of communication, evaluation if people like the prototype. After that we can change the prototype to people's needs and likes.

By actually making the prototype as a 3D object (in combination with Arduino and processing), we can make people experience the prototype. This idea was influenced by the paper of Buchenau and Fulton (2000) [3]. If the representation is designed to engage with the product, it opens up active participating (e.g. via a scenario). This way you understand user experiences, explore design ideas, and communicate ideas to an audience.

When talking more about the details of the hi-fi prototype, we looked at the paper by Hornecker and Buur, 'tangible interaction' [4]. This paper is very valuable, since it offers questions which you can use when designing the prototype. For this prototype, I mainly looked at tangible manipulation. Tangible manipulation consists of 3 dimensions: haptic direct manipulation, lightweight interaction and isomorph effects. Haptic direct manipulations questions if users can grab, feel and move 'important elements'. I tried to incorporate this by really making a tangible 3D model and clothes with a touchable tag, combined by 'grabbing' elements with the computer mouse on the screen. Lightweight interaction questions if users can proceed in small, experimental steps with feedback. I tried to incorporate this in the computer program, by having clickable buttons with text, and also by having rapid feedback by LED light when a tag hits the sensor. Finally, isomorph effects questions how easy it is to understand the relation between actions and effects. I tried to solve this by aligning the physical components (e.g. red and green LED on the mirror), with the red and green button on the screen. They move/change at the same time.

Besides tangible manipulation, parts of spatial interaction and expressive representation are also used. Spatial interaction consists for example of 'inhabited space', which questions if people and objects meet in a meaningful place. I tried to incorporate this by stimulating the scenario in a miniature version. The scenario that is now carried out in the prototype could also be scaled up, which would be the real version. Expressive representation consists for example out of 'representation significance'. This questions if physical and digital representations are of the same strength and salience. This is an interesting question, since the idea of 'mirror' is realized in a computer program with the webcam configurating as mirror. I tried to make the online mirror as similar as possible to a real mirror, by looking at other examples of smart mirrors. There are way more dimensions to look at, but it cannot all be incorporated in such a short time, so therefore it has been filtered and downscaled to these.

It is important to select the filter the prototype, since you cannot focus on too many aspects. This is discussed in the paper of Lim et al. (2008) [5]. In the paper they talk about filtering dimensions and manifestation dimensions. In this prototype, the filter is on functionality, appearance, interactivity, and data. The prototype is a very small scale, low functionality prototype, so the system functions are not that advanced yet. Therefore, the functions of adding clothes, saving favourites, recommended outfits and favourite outfits don't work yet. These functions are just added to get the idea, but don't work (the focus is more on aesthetics, so appearance). The interactivity is filtered, since the input and output behaviour are now via the computer screen, and not via the actual mirror. Finally, the data is filtered, since there are only 2 actual pieces that work yet, the rest of the tags are not added to the system (but do work).

As discussed in the paper of Kochler and Hochreuter (2014) [6], the simple distinction of high versus low fidelity does not always work. This prototype also has mixed fidelity for several aspects. The fidelity is for example higher on interaction and shape, and lower on size, weight, and data. Finally, the paper 'filtering and informing the design space' by Halskov and Lundqvist (2021) [7], points out that prototypes and prototyping should be combined and coordinated with other artefacts and activities. Therefore, the sketches are combined with the tangible 3D objects, which are combined with the tangible textiles and the computer program.

Instead of focussing on the product (filters, dimension), it's also important to focus on users. This can be done with constructive research and the theory from the book 'design research through practice: from the lab, field and showroom' [8]. It's important to realize that this prototype will be very different form the final prototype. Right now, this is a 3D printed mirror that doesn't do anything, that has its functionality on the computer screen. Realize that this prototype is to introduce the design idea, not to develop the product. Testing on people is on a 'showroom' basis, not in the lab. The prototype is not a hypothesis, there is no basic prototype to experiment against. This could be for a later phase.

Finally, the theory from critical design is incorporated in this prototype [8]. At first sight it might not be obvious that critical design is implemented in this prototype. But, if you look closer to where we started (the consumer society), you can see what the prototype is trying to do. It wants to make you think about the amount of clothes you have in your closet; do you really need it? A counter looks at how many times you actually wore a piece of clothing and can give you tips on what to donate to other people. It tries to create a debate, an impact on the society in this way.

Combining all the theory above, the final prototype technique/flow went as follows: first a brainstorm session with a mood board and MoSCoW were performed, after that lo-fi prototyping with sketching of the idea, scenario and interface. After that, hi-fi prototyping of 3D printed person/mirror, e-textiles, Arduino, processing and interactive rooms were performed. All the information from the workshops is incorporated in this.

2.3 Low-fi prototyping

The low-fi prototyping started with sketching. There are 4 sketches made. The first sketch is a sketch about the concept. Here you can see how (1) the tag is placed in the clothes, (2) how you have too many clothes in your closet, (3) the struggle of choosing clothes, and (4) standing in front of the mirror.

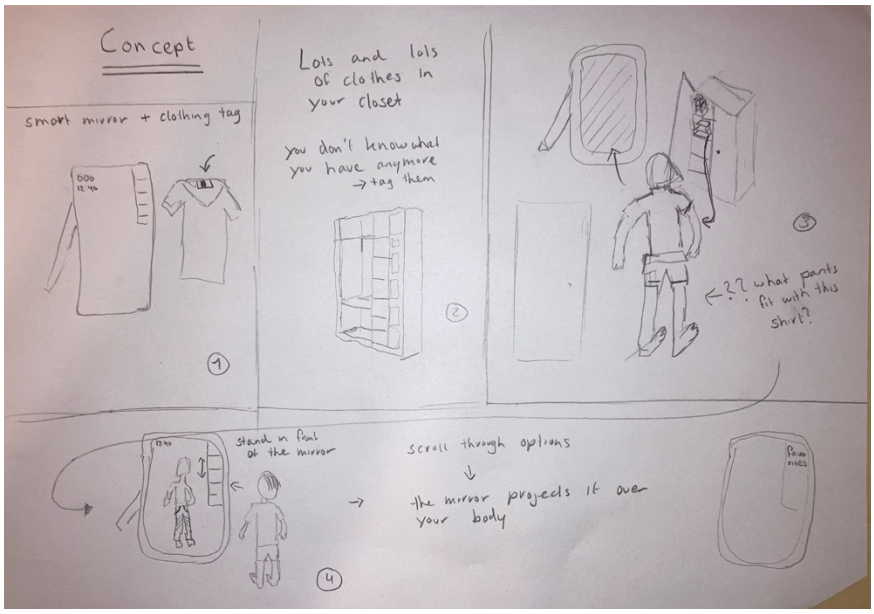

Figure 2: concept sketch

After that, a sketch for the interface (computer screen) is made. This interface is based on the MoSCow requirements as mentioned before. The sketch can be seen in figure 3.

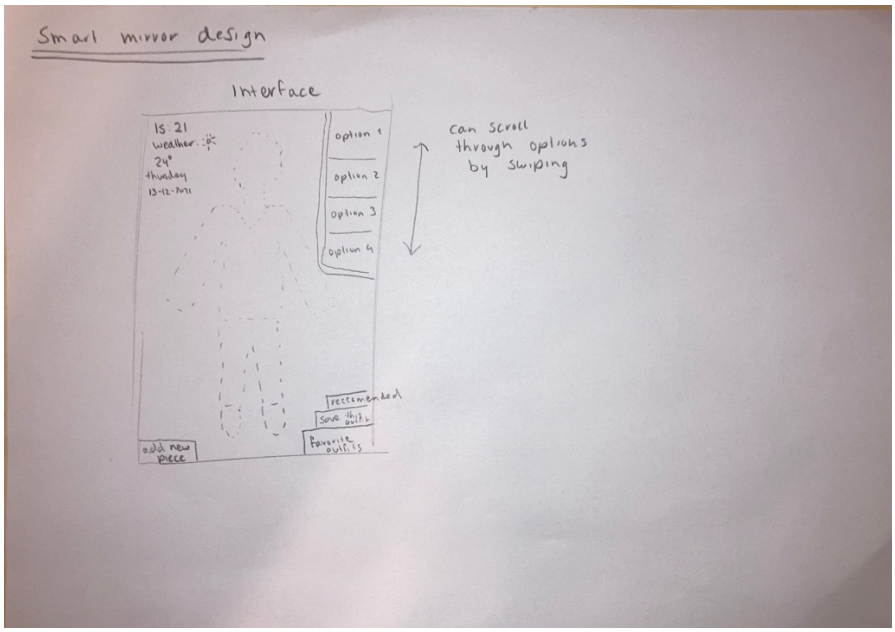

Figure 3: interface sketch

The concept only works if you buy all new clothes that already have the tags, or if you add tags to already existing clothes. This idea is also sketched and can be seen in figure 4.

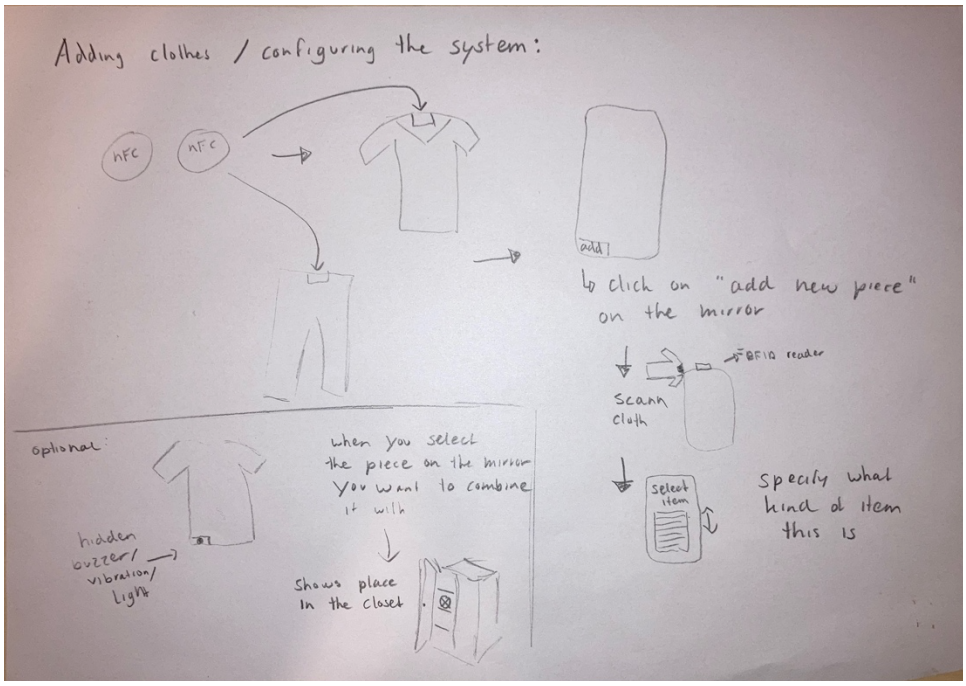

Figure 4: adding clothes sketch

Finally, for the purpose of carrying out the idea of the prototype, a sketch is made that shows how to connect all the hardware with each other. The NFC stickers go to the RFID chip reader, which is connected to the Arduino, which in turn goes over the internet/Bluetooth to the laptop. This can be seen in figure 5.

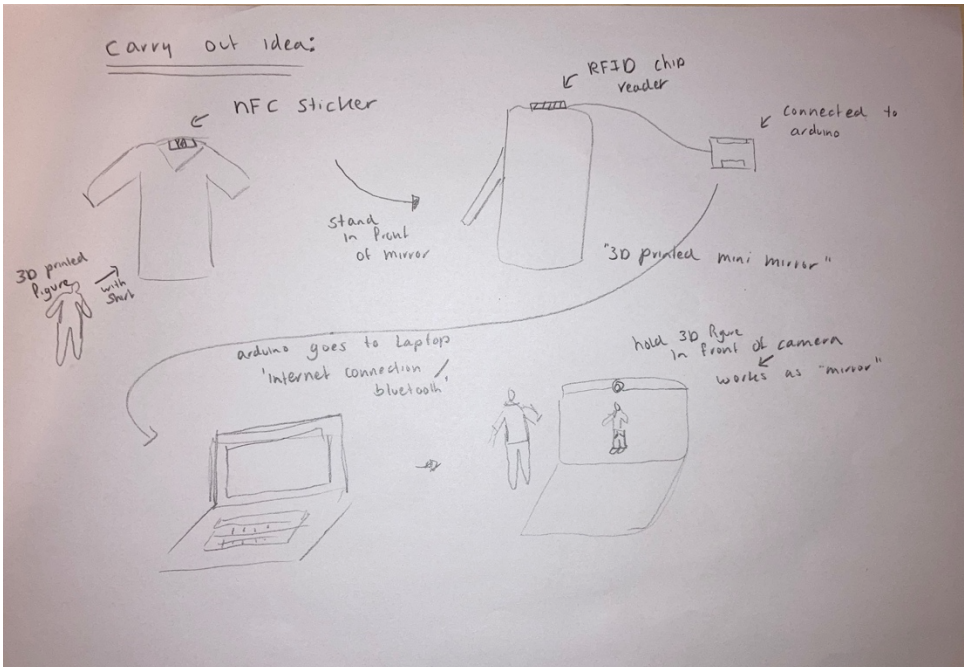

Figure 5: hardware sketch

Besides sketching, a scenario (as seen in figure 2 and 4) is carried out for evaluation. The prototype scenario goes as follows: a person walks towards his closet and puts a piece of clothing on. He does not know what he has in his closet anymore to combine it with, so therefore he stands in front of his mirror. The mirror shows him options, and he can click on them. When he clicks on them, the piece of clothing is visible on the mirror (transparent). There are buttons for recommendation, save, favourites and add clothing.

2.4 Hi-fi prototyping

The hi-fi prototyping starts with making a 3D model of a human and the mirror. This is done in 'Maya Solidworks' a desktop 3D modelling software. It is put into the software 'Ultimaker Cura', where it could be sent to the Ultimaker 2+. This process can be seen in figure 6 and 7.

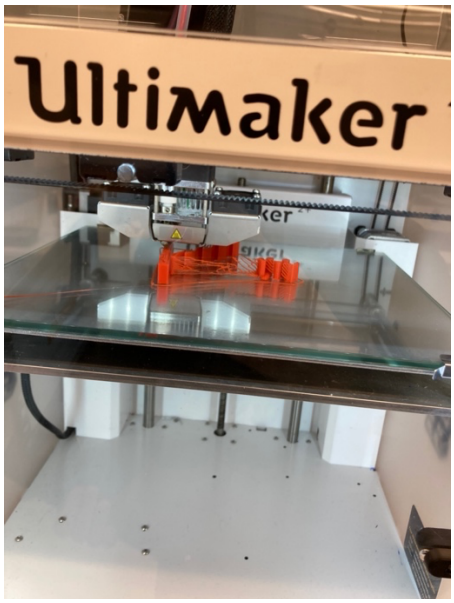

Figure 6: ultimaker 2+

figure 7: 3D printed objects

After making the 3D models, it was time to make the e-textiles with the tags in it. First, a t-shirt was made, with the chip integrated inside the material. If you would scan this to the mirror, the mirror would show pants to combine it with. To also test it the other way around, pants were made. The results of these e-textiles are seen in figure 8. In the last picture, the white circle (NFC tag) is visible inside the t-shirt.

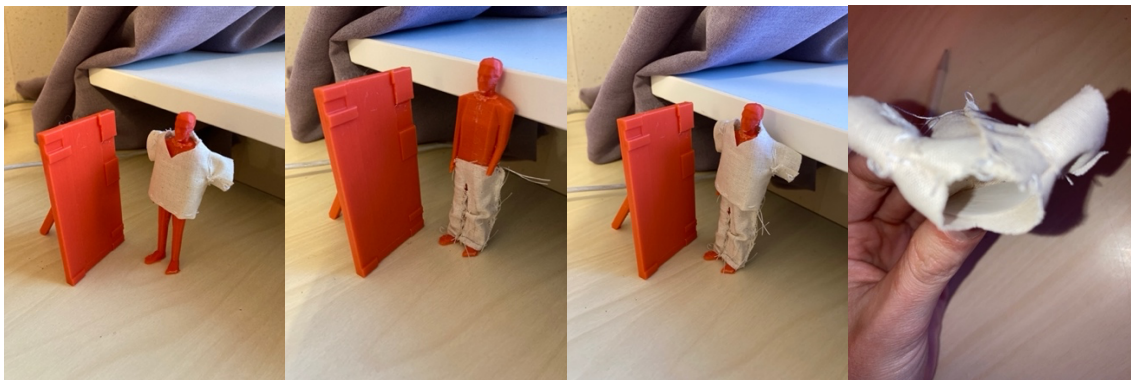

Figure 8: e-textiles and NFC tags

After making the textiles, it was time to make the Arduino RFID reader and the temperature sensor. 2 LED's were also added to more rapid feedback, as discussed in the section above about tangible interaction [4]. This concept was tried two times, once with a normal Arduino and the second time with an Arduino nano, with the purpose of connecting it to Bluetooth BLE later. This is visible in figure 9.

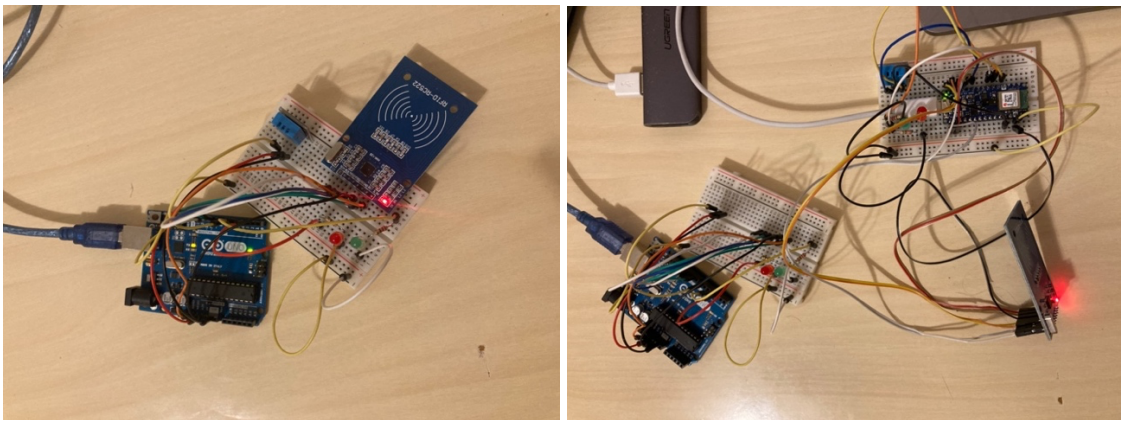

Figure 9: Arduino uno and Arduino nano setup

If you connect a ‘known’ tag to the reader, it will give a green signal feedback. If you connect an ‘unknown’ tag to the reader, it will give a red feedback LED. This is shown in figure 10.

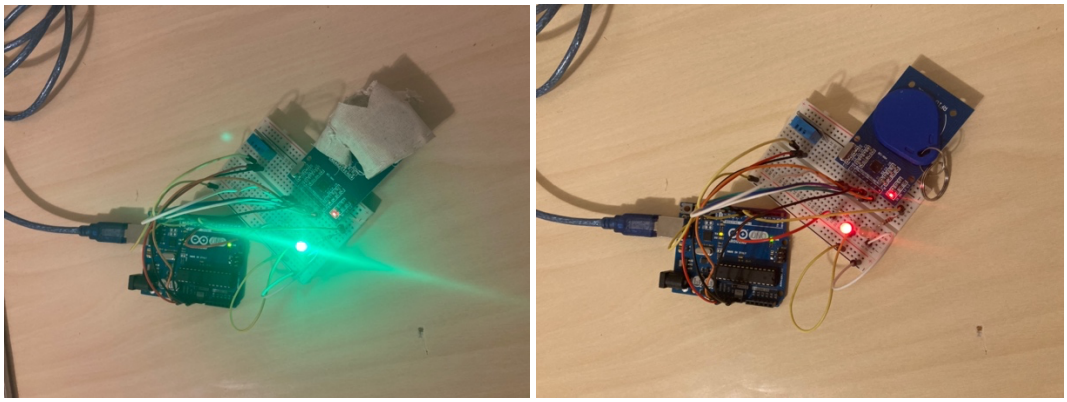

Figure 10: green and red LED

The RFID reader was connected to the mirror, and the full setup (with Arduino nano) is shown in figure 11.

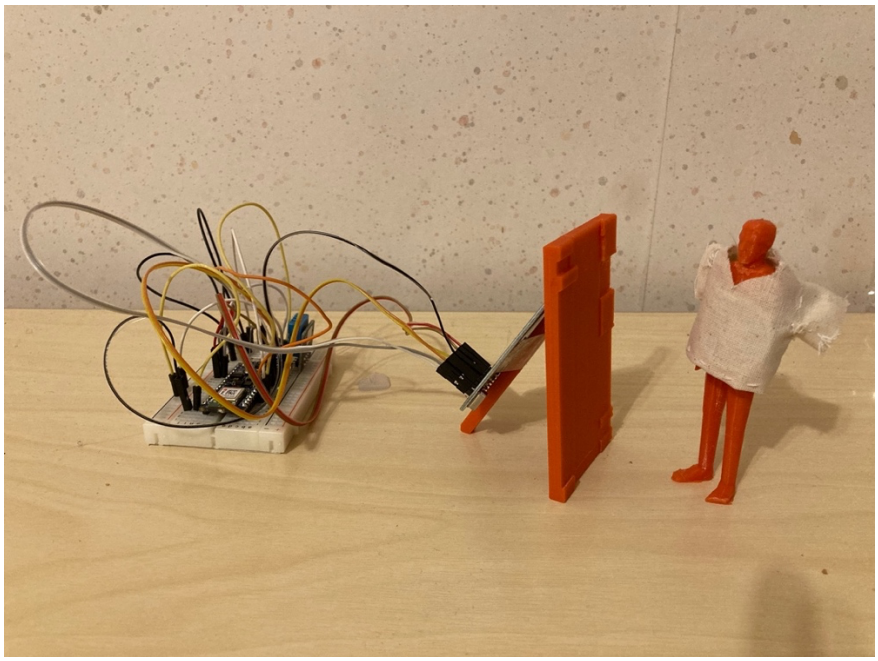

Figure 11: full setup

After setting up the Arduino and its hardware, it was time for the processing software. This consists of 2 parts, connecting the Arduino with processing, and then writing the processing code. The interface consists of a transparent placeholder for the person, boxes for clothing options, 4 interaction buttons and an information placeholder with time, date and temperature (figure 12). As soon as you scan a piece of clothing, options will appear in the boxes (figure 13). When click on an option, it will appear on the mirror (figure 14).

Figure 13: interface

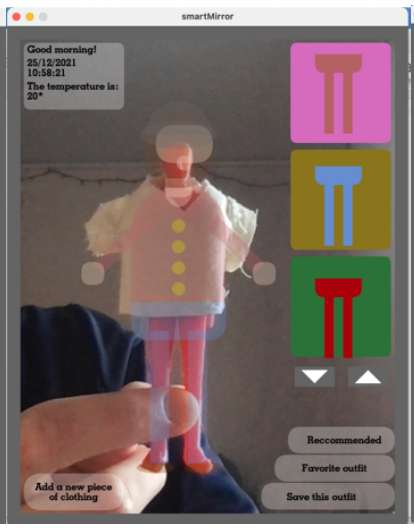

figure 14: scan tag

figure 15: interface choice

The four buttons (add, save, favourite, recommended) are all interactive. When clicking on them, a new screen will appear with the appropriate information. As discussed above, the buttons don't fully work after clicking on them, and this is not developed further due to the choice of filtering on other aspects [5]. In figure series 15, you can see from left to right: recommended outfit, favourite outfits, save outfits, and add a new piece of clothing. In the last 2 pictures you can see the colour of the tag changing when you hold a new tag in front of the RFID reader. This goes hand in hand with figure 10.

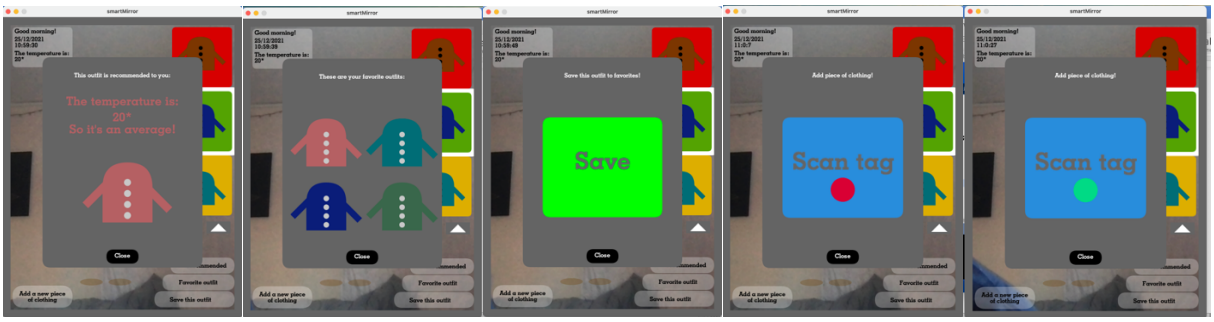

Figure series 15: interface options

The scenario of holding the 3D person with its textile in front of the camera is shown in figure 16. Finally, the full setup and scenario is shown in figure 17.

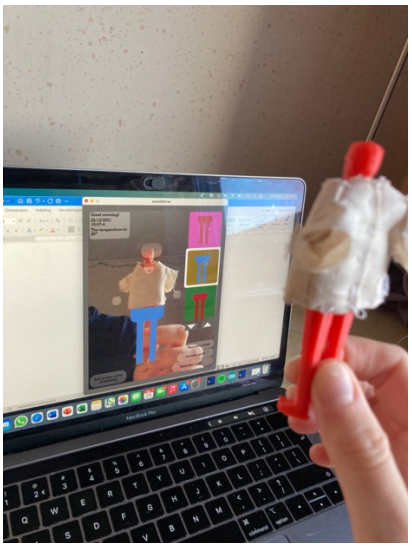

Figure 16: camera setup

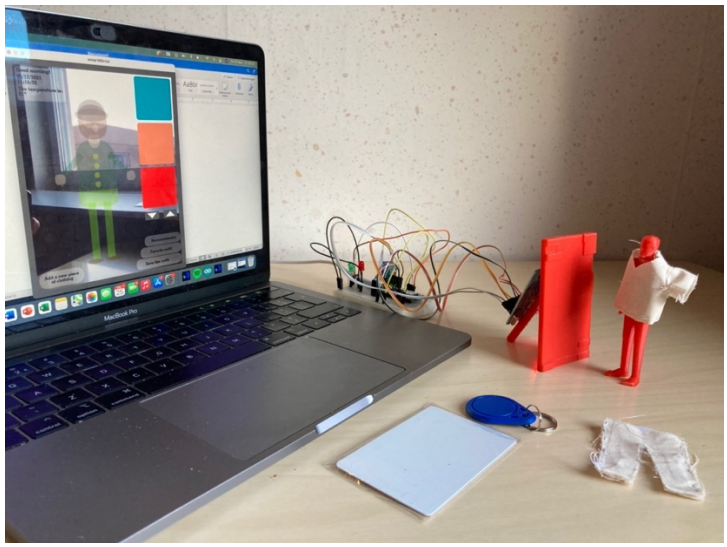

Figure 17: full setup

There are different kind of tags that you can use with this RFID reader. The ones used in the textiles here are small NFC circles, but it also works with card readers and key tags. Options are shown in figure 18.

Figure 18: scanning options

3 EVALUATION

One of the most important goals of this prototype is to evaluate the design. Therefore, an evaluation of the final prototype is included.

3.1 Evaluation process

The evaluation of the prototype is based on individual sessions with a few participants, in which they learn about the prototype, act out a scenario using the think aloud technique and take part in a post-interview. Before taking part in the study, the participants are asked to fill in the consent form, which is added in the appendix (B).

There are various aspects on which the prototype is evaluated. First off, the evaluation looks at the aspects of 'what do prototypes prototype'. As discussed before, this prototype is a mixture of 'role' and 'look and feel' (Houde and Hill, 1997) [2]. Role means that it questions the function that the artifact serves in a user's life, and looks at the way in which it is useful for them. Therefore, the post-questionnaire consists of questions such as:

1. *Do you feel like this is something you would use in your daily life?*
2. *What would you like to have changed if you would use it daily?*
3. *Does the prototype address a 'need' of you?*

Besides that, it also prototypes the 'look and feel', which questions the sensory experience of using an artifact [2]. It questions what the user looks at, feels, and hears while using the prototype. Therefore, the following questions are added to the questionnaire:

1. *Is the system easy to understand? Can you rate it from 1 to 5 (1= very easy, 5 =hard)?*
2. *What would you like to have changed to make the system easier?*
3. *Do you think the 'adding clothes' system is easy?*
4. *Does it esthetically look nice, or would you have something changed?*
5. *Would you like to have other versions of feedback implemented, such as haptic feedback or sound?*

In the lecture, other purposes of prototyping were also discussed, such as the purpose of exploration. You can get a better idea by either getting the design right (ideas build onto each other) or getting the right design (choosing from a few). With this in mind, the following questions were added to the questionnaire:

1. *What could be implemented that makes your experience better?*
2. *Were the steps logic and easy to understand?*
3. *Was the interface intuitive?*
4. *Do you feel like anything is missing?*

When talking about the 'right design', we can include tangible interaction, which was discussed in a framework on physical space and social interaction by Hornecker and Buur (2006) [4]. As discussed in earlier sections, I tried to implement haptic direct manipulation (can users grab 'important elements'), lightweight interaction (experimental steps) and isomorph effects (relation between actions and effects) in this prototype. Therefore, the following questions were added:

1. *Do you feel like you can proceed in small, experimental steps? Is there feedback during the interaction?*
2. *Is the system easy to understand: do you understand the relationship between actions and their effects?*

Finally, in the course book by Koshinen, we talked about critical design [8]. This prototype is not only intended for critical design, but it's more a side note and interest if this has the potential to be used for critical design. The evaluation questions if this prototype can start a social debate about overconsumption, e.g. having too many clothes which you don't use. Can this design change behaviour in that way? To examine this, the following questions were added:

1. *Do you think this prototype will/can change your behaviour?*

2. *Do you think if the mirror would suggest you to do things, for example put clothes away, you would do it? Would you listen to suggestions?*
    a. *E.g. if the mirror counted how many times you actually wore stuff, and now you can donate it to others*
3. *Do you think this design can create debates, and therefore have an impact on society?*

To conclude the interview and ask for any last thoughts, the following questions are added:

1. *Was there anything that surprised you / stood out / confused you / expected to be there?*
2. *Is there anything else you would like to add or comment?*

The complete interview can be found in the appendix (A).

3.2 Evaluation results

The evaluation is carried out with 3 participants. Their feedback was constructive and led to a few confirming points and a few improvement points.

First of all, the participants felt like the prototype is something they could use in their daily life. One participant mentioned that she often searches for a long time in her closet for something to wear. She has the feeling that she has a lot of stuff but does not know how to combine it or how to create new outfits. She mentioned the smart mirror is useful to see what you already have, and to not forget old stuff. There was nothing the participants could think of to change when using this product on a daily basis. However, the mirror does not fulfil a 'need' for them, but it's more an extra fun thing to have.

Participants rated the easiness of the system respectively a 1, 2 and a 1, which means they found it easy to understand. A suggestion of a participant to make it easier to understand, would be adding a voice, for example a voice telling you the temperature. This way also people with disabilities could use the system and it would fit to all people. The system of adding clothes was also perceived as easy, but overall, there was the sidenote that the real product would be of real-life size, so everything would be easier to grasp. The participants liked the square with information in the left corner, which displays the time, date and temperature. Some participants mentioned that other types of feedback (haptic or sound) would not necessarily give an extra value. However, a suggestion that a participant gave, is to make a function where the mirror can evaluate the state of the clothes. It could, for example, detect holes, or provide details about the composition of the clothes. Clothes are made from different fabrics with different qualities, and the mirror could give advice about which fabrics are good to wear with which weather, or which fabrics are comfortable to wear together.

When asking about the design, one participant mentioned that the computer interface was intuitive, but to figure out the scenario she had a bit more trouble. It was difficult to understand that she had to put the 3D printed prototype in front of the computer mirror to grasp the idea. The interface itself was perceived as easy, one participant said there are obvious titles on the buttons and nothing can really go wrong.

Critical design was also mentioned in the interview, especially in context of the possibility of the prototype changing behaviour. One participant mentioned that it's difficult to say if this can really change behaviour, since fashion is always changing. She feels the need to always buy new stuff to keep up with the latest fashion trend. Especially with social media being involved, it's hard to really change someone's behaviour. However, that being said, she did see a possibility and a positive angle of this prototype changing people's behaviour. She mentioned it could be a starting point, a first step to solve this social problem perhaps with the help of other campaigns alongside. She wishes it would create a debate and have an impact on society, since this is a social problem, and people have to understand that they also can be happy and fashionable without having 100 pants. Besides this, participants mentioned that they are not sure if they would really put away a piece of clothing if the mirror would tell them to, but it would make them aware, and probably give them the realization to put it away. Most people nowadays do a big cleanup once a year/half year, and with the smart mirror you would just do it more regularly.

Finally, the participants mentioned that it's an interesting idea, they had never heard of it before. It could be something that they could really picture in the future, but are afraid it would be reserved for the rich people. They think it would fall into the category of having robots in your house, and that it would be too fancy for the average citizen.

3.3 Further development of the prototype

As discussed in the evaluation above, it could be possible to implement sound into the prototype to include disabled people. Furthermore, the smart mirror could provide details about the composition and fabrics of the clothes. The idea could also be expanded from personal use to corporate use, for example in clothing stores.

Right now, the prototype is filtered on a lot of aspects. There is a main focus on tangible manipulation, but with more time also expressive representation could be incorporated [4]. Right now, the focus was less on the actual functionality of the buttons in the digital prototype. For example, the buttons 'add', 'save', 'favourite' and 'recommended' don't really work, but are just there now to give away the idea. This could be elaborated in a future prototype. Additionally, if there would have been more porotypes, it would be possible to test it in a lab setting and to test different hypothesis [8].

Finally, a future prototype could have more e-textile incorporated. For example, geo-location trackers of where you piece of clothing is in your closet, vibrators to indicate where a piece of clothing is, or just simple LED's.

4 DISCUSSION

In this section, the the process, prototyping concepts and constructive design research will be discussed.

4.1 Process

The things that worked well were the Arduino sensors, the connection between Arduino and processing and the processing code. Besides that, the 3D printed objects were valuable since it gave opportunity for tangible interaction. The e-textiles did their purpose (having tags and being scanned), but could be improved, since it is very passive e-textile at the moment,

Something that I learned along the way/would do differently, is the connection of the Arduino over Bluetooth. The initial idea was to connect the Arduino over Bluetooth/BLE, or over internet with a client/server program. The client/server program did not really work out, since I could not try it with 2 laptops, and I acknowledged that it did not have that much extra added value for the state of this prototype. The Bluetooth/BLE also did not really work out, since I did not realize that you need at least 2 Arduino nano's / feathers, to make the master/slave program. Therefore, the Bluetooth connection was not realized in the end, due to lack of material. This did not add that much extra value to the prototype, so it's a bit beyond the scope of this project.

Furthermore, the 3D printing experience did not go completely smooth as well. In the first try, the 3D printed person did not have a solid base ground, and started moving along the print. This resulted in printing 'in the air', and not in a nice model. This can be seen in figure 19. In the second try, adhesion was added to the model, and this derived in the desired result.

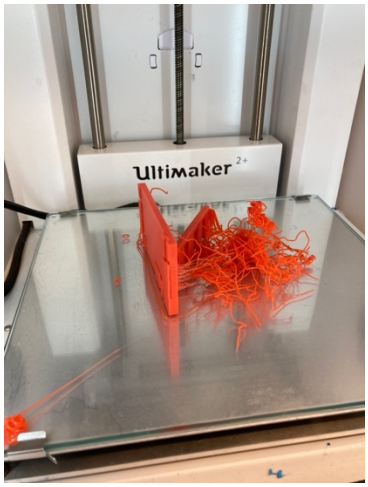

Figure 19: dislocated 3D print

4.2 Prototyping concepts

The prototyping techniques of lo-fi prototyping (sketching), 3D printing, e-textile, Arduino, processing and interactive locations were very useful for this project and can be seen in the prototype. Less useful was the wizard of Oz technique and the VR programs, since VR took too much time to do, and wizard of Oz was not necessary in this case.

Regarding the theory, the framework on physical space and social interaction by Hornecker and Buur (2006) was very useful [4]. It provides a lot of questions on a prototype, of which you would not have thought about beforehand. Especially the questions about tangible manipulation and special interaction came in handy. Less useful were the dimensions of prototyping, I feel like you can put your prototype in a dimension , but besides fitting it into the theory it did not add any extra value to the development of the prototype [1][2].

4.3 Constructive design research

Constructive design research aims to put construction (a product / system) central and make it a key means in constructing knowledge [8]. Constructive design researchers imagine new realities and build them to see whether they work. In this case, a smart mirror (new reality) is built and tested to see if it works. The prototyping activities can potentially produce new knowledge, in which the evaluation of the prototype is most important.

There are various types of constructive design research, such as work in the lab, work in the field and work in a showroom. For this prototype, evaluating in a showroom can be best supported. A lab is a controlled setting where you can test hypothesis, but since this is the first prototype there is no null design and new effect cannot be evaluated. In the field, it is easier to understand people and their system of meanings. It can serve as a starting point, and it can be in a context in which the prototype can be found. However, tangible representations (real size mirror) of imaginary solutions are in this stage of prototyping not yet achievable. For future prototypes, lab research would be a good fit. A showroom is in this case the most applicable, since it builds more on art and design, rather than on science. Critical design can in this case also be evaluated, if the prototype is a design for debate (in which this case it partly is).

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A APPENDICES

A.1 Post-questionnaire

Role:

1. Do you feel like this is something you would use in your daily life?
2. What would you like to have changed if you would use it daily?
3. Does the prototype address a 'need' of you?

Look and feel:

1. Is the system easy to understand? Can you rate it from 1 to 5 (1= very easy, 5 =hard)?
2. What would you like to have changed to make the system easier?
3. Do you think the 'adding clothes' system is easy?
4. Does it esthetically look nice, or would you have something changed?
5. Would you like to have other versions of feedback implemented, such as haptic feedback or sound?

Getting the right design/design right:

1. What could be implemented that makes your experience better?
2. Were the steps logic and easy to understand?
3. Was the interface intuitive?
4. Do you feel like anything is missing?

Tangible manipulation:

1. Do you feel like you can proceed in small, experimental steps? Is there feedback during the interaction?
2. Is the system easy to understand: do you understand the relationship between actions and their effects?

Critical design:

1. Do you think this prototype will/can change your behaviour?
2. Do you think if the mirror would suggest you to do things, for example put clothes away, you would do it? Would you listen to suggestions?
    a. E.g. if the mirror counted how many times you actually wore stuff, and now you can donate it to others
3. Do you think this design can create debates, and therefore have an impact on society?

Finish-up questions:

3. Was there anything that surprised you / stood out / confused you / expected to be there?
4. Is there anything else you would like to add or comment?

A.2 Consent form

1

Consent Form

Please read this form carefully and ask any questions you may have before agreeing to take part in the study.

What the study is about: The purpose of this study is to examine the prototype 'smart mirror'. The smart mirror prototypes the potential solution to having too many clothes and being able to vision this in a clearer structure. The mirror works together with clothes that are provided with tags, which you can scan on the mirror, and it will show you possible combinations of clothes.

What we will ask you to do: If you agree to be in this study, you will be asked to act out a predefined scenario and answer to a post-questionnaire.

Your answers will be confidential. The records of this study will be kept private. Research records will be kept so that only the researchers will have access to the records. If we tape-record the study, we will destroy the tape after it has been transcribed.

Taking part is voluntary: Taking part in this study is completely voluntary. If you decide to take part, you are free to withdraw at any time.

If you have questions: The researcher conducting this study is Froukje Temme. Please ask any questions you have now. If you have questions later, you may contact the researcher at f.f.temme@student.utwente.nl.

Statement of Consent: I have read the above information, and have received answers to any questions I asked. I consent to take part in the study.

Your Signature _____ Date _____

Your Name (printed) _____