STRESSLESS CURTAIN

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Introduction

Intelligent systems in the everyday home environment have the capacity to be meaningful, comfortable, and connective. However, giving form to this kind of modern space is challenging. It requires, specific smart behavior. Behavior that knows how to learn to act on situations, create awareness, display behavior, recognize, and much more. This study aims to design this kind of behavior and explores how the interface between the digital and the physical world can be shaped through sound design. This study examines the function of the curtain in a hypothetical smart system through an object-centered ethnographic study and a conceptual design.

The curtain acts as a filter between the home and the outside environment and thus controls what goes and what goes out (2-way system). Within the home system, the curtain is an interconnected, sensitive, and influential object, on which both non-human objects and humans depend. It controls the atmosphere and rhythm of the living space and acts on human well-being.

This study aims to understand and connect with the concept of a smart curtain by employing first-person and third-person ethnographic methods to gain insight into the motivations of a curtain as a smart object. The results of this study are used to redesign the curtain and led to the following concept; stressless curtain. This conceptual smart curtain design has two additional functionalities: a filter for light (1) and a filter for sound (2). These functionalities are implemented in the future home system, where the focus of this redesign is on incorporating sound design within this complex smart system.

The Curtain's physical context

The concerned curtain is situated in my Room in Nijmegen close to the center. I live in a very old, monumental building surrounded by other residential buildings. My room has a high ceiling and big windows. Because it is quite old, the windows are thin and because I live in a neighborhood next to a busy road, there is a lot of noise pollution (see figure 1). Noise such as cars passing by, loud people at night, construction work, playing kids, etc. My room has in total three windows, one next to my bed, one next to my working space, and one big bay window. The curtain of the bay window will be observed during this study, the other two windows will not play a role.

Figure 1: Room from the outside, bay window, street view bay window

Perspectives

In this study, the curtain is approached from the human's perspective (third-person) and the curtain's perspective (first-person).

Third-person perspective

Initially, the human perspective on the curtain is examined. A diary was created to document all interactions with the curtain over a 24-hour period. This diary revealed the interactions with the curtain, the intentions behind those interactions, and the relationship between the individual and the curtain (see figure 2). To get a more holistic view I have explored all of the curtains in the room. However, the design is merely focused on one curtain (bay window). In addition to the diary, I made notes based on my initial thoughts on curtains in general and the system (see appendix A).

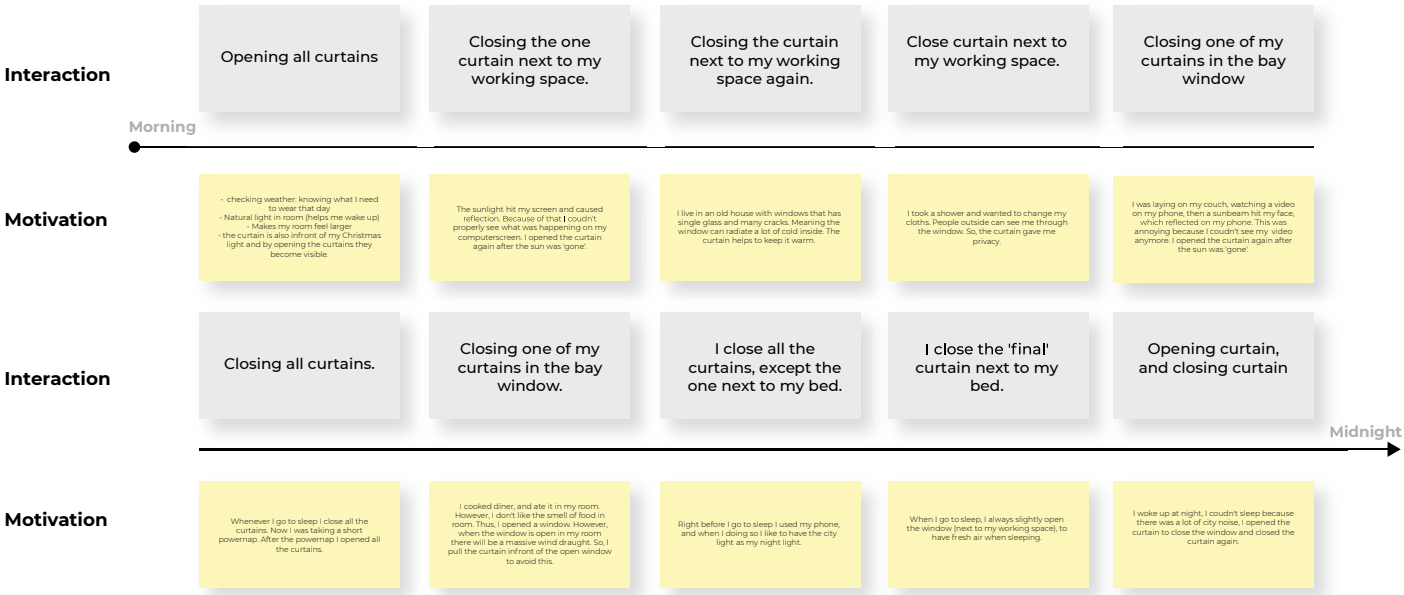


Figure 2: Curtain diary

Taken these methods together revealed that my motivation to interact with curtains has much to do with what I was exposed to or confronted with. Exposed, because often, I was motivated to interact with the curtain due to (random) events outside, like changing weather conditions, chirping birds, or loud noises. In addition, these methods showed me that the curtain's interaction within the living space system is quite drastic, by means of whether the curtain is closed or open, there is not much in-between. This lack of nuance centered between the home environment and the outside environment motivated me to redesign the (traditional) curtain. Combining the diary method with these written notes revealed a complex network of interconnected agents within my living space system (see appendix B). This network showed that the curtain is related to practicalities, like having an influence on the amount of natural light in the room and thus on the light system. Furthermore, the network shows more complex relations, like the amount of privacy and therefore vulnerability of both myself and my neighborhood.

The thing that caught my attention the most is the fact it has a great influence on my behavior, well-being, and motivation. For example, the curtain enables me to look outside while being situated in the home environment. This makes me feel comfortable yet connected with the outside world and its ambiance. On the other hand, the curtain helps me to be less distracted or overstimulated by the city environment. For example, by closing the curtain I can isolate myself from the outside environment when I am working. This also works the other way around, people might not like to be exposed to my private living space. This interplay between the inside living space and the outside world, and being a part of this is valuable, but complex. However, despite its complexity, it can be managed through smart behavior.

First-person perspective

Objects manifest how we think, which values we hold dear and how we experience the world around us. As a result of this perspective a thing-centered perspective was applied through the object Object Persona Method to gain a more comprehensive understanding of the curtain as a smart object (Cila et al., 2015). The goal of this study was to gain insights into why the curtain would do something by speculating on the inner life of the curtain and how its social relationships would look in a smart environment (see appendix C).

Toward a conceptual smart system

Stressless curtain

I envision the role of the curtain as a filter of the home environment. However, as described in the Third-perspective I wanted to redesign the curtain to add nuance and dynamic to the system, as nuance is key to becoming smart (Nuij, 2020) . This conceptual smart curtain design has two additional functionalities: a filter for light (1) and a filter for sound (2). The light filter option has the ability to transform from 0% transparency, meaning no light will go through, to about 80% transparency (see figure 3). This gives the opportunity to extend and play with the room's atmosphere and vista. The sound filter works as follows, the curtain can absorb noise or purposely let sound through, which works from both ways (2-way system). Taking these filters together gives the user of the room the opportunity to interfere with the visible outside world in gradual steps and based on rhythm. In addition, it allows having an appropriate soothing atmosphere in the home environment where artificial sounds and natural ambient sounds are closely working together through different agents that act on a set of behavior rules. As a result, this avoids the user to feel completely isolated from what is happening outside, yet feeling at ease.

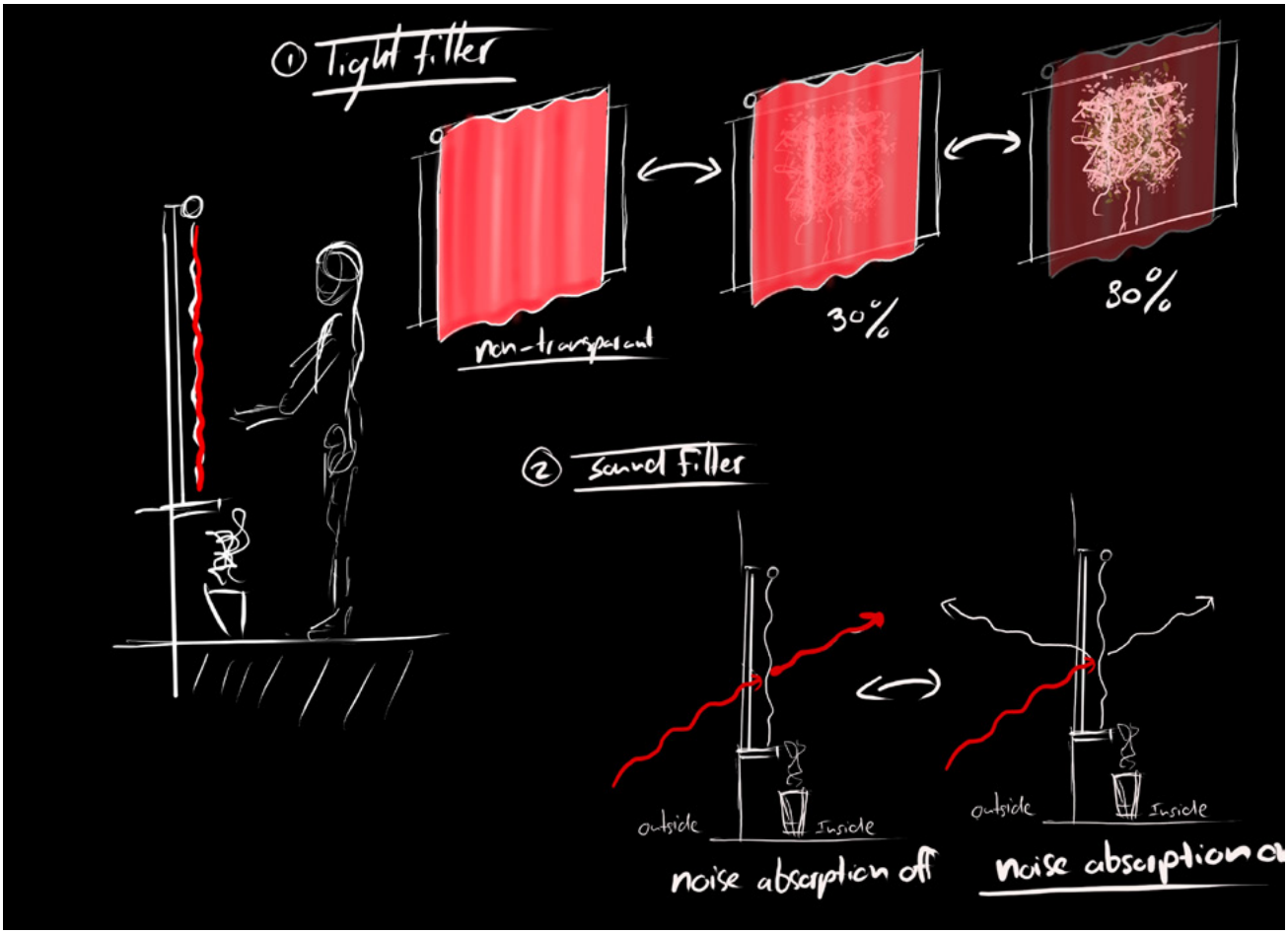


Figure 3: Stressless curtain concept sketch

Behavior rules

The final step towards creating a conceptual smart system was to connect the characteristics of the objects with their behavior within the system. This allows the objects to communicate with each other in a functional way. To achieve this, the smart behavior of the objects needed to be defined. To accomplish this, the object persona (description of inner life and personal relationships) was simplified and generalized into behaviors by filling in 'persona sentences'. To understand the end-user's perspective, a format often used in user-centered design personas was utilized by filling in the following persona sentence:

"When … [situation] ... I want to... [action]... so that ...[result]..." (Randi Nuij, 2020)

Inspired by the smart behavior pyramid, these persona sentences were divided into three different types of behavior; response behavior, adaptive behavior, and social behavior (Nuij, 2020). In many cases, the motivation behind these responsive sentences, which are defined as ''if-then sentences" could be connected to intelligent behavior sentences, such as ''I want to learn to … '' and the social sentences that define the character of the behavior. Therefore, after writing them separately, I grouped these sentences in clusters (see figure 4).

Figure 4: Object persona sentences clusters

System behavior

As the motivations and purpose of the smart curtain became distinct, the potential behind the smart system started to arise. However, the opportunities offered by such a hypothetical smart system are endless. As a result, the functionalities given to this smart system are refined on the basis of my personal preferred interactions in the scenarios, how well the concept and holistic experience of the stressless curtain in a smart system can be represented and how sound can play a role in this smart system. The system behavior overview illustrates the smart rules that were chosen for the video and the corresponding behavior rules (see figure 5).

#	Rule	Behavior based on rule	Sound output
01	**The user should have a consistent daily rhythm on the bases of natural lighting and sound (day and night).**	Check → Checking if the light system is off → Checking if the alarm is set → Check if the light system in the room is off Action *Going to sleep* → The curtain cancels the neighborhood noise by turning on the noise filter. → The curtain becomes 0% transparent, so the room will be dark. *Waking up* → The curtain becomes slowly more and more transparent until it reaches its preferred setting, which in this case is the maximum of 80%. → Parallel to this the curtain slowly lets more outside natural sound through until the preferred setting, which in this case is 50%.	*Going to sleep* The noise filter is turned on: A textured sound, which sounds like the noise is being sucked-up and disappears, I like to refer to it as sound ''A''. After this sound, the outside city noise slowly fades away to almost complete silence in the room. The natural wake-up is activated: quick cinematic futuristic confirmation sound. *Waking up* The user wakes becomes morning city noises, such as church bells entering the room. This motivates the user to wake up and open the curtain. When the curtains are open the stressless curtain knows the user woke up with a confirmative sound that sounds similar to the confirmative sound when the natural wake-up is activated, although this sound has a higher pitch, making it more positive, like something is completed.
02	**Loud neighborhood noise should be reduced when interfering with the desired volume in the room.**	Check → The camera outside detects loud sounds coming from the neighborhood and checks if they last for a long period of time. The camera has learned to recognize (ai) if they can be considered as noise (unfamiliarities) or music. → Checks user's agenda and what appliances are turned on (television, computer, stereo installation). Action → The curtain starts to turn on the sound filter at 100% and cancels most of the sound produced by the neighborhood. → The stereo starts to play nature sounds.	Curtain's sound filter on: Sound A is played. After this, the city noise slowly fades away and very few neighborhood sounds can be heard from inside the room. Then the stereo starts to play calm ambient nature sounds in the background to maintain a natural atmosphere in the room. When the nature sounds to start playing a notification sound can be heard. This informs the user that the sound is artificial and originated from the stereo instead of the outside.
03	**Nature sounds (wind, rain, thunder, birds etc.) that happen outside should enter the room.**	Check →The AI camera outside detects recognized nature sounds and records birds flying, raindrops, or lightning strikes. → Checks if the stereo installation is off. Action → The noise filter of the curtain opens gradually, meaning the outside nature sounds enter the room slowly (despite the fact the birds can not be seen)	The curtain sound filter slowly opens. Before this happens a soft sound is played, which is the same as sound A but reversed, which sounds like something new is coming instead of disappearing. After this, the room is slowly filled with clear natural sounds (birds chirping) that are coming from the outside.
04	**Sensitive and private conversations or loud voices should be filtered from the outside world.**	User's agenda and what appliances are turned off (television, computer, stereo installation) Check → The curtain detects the voices in the room and how loud they are. → Camera checks if there are other people outside. → Communicates this with the user Action → The curtain turns on the sound filter to 100%.	People situated in the room are talking loudly. To make the user aware of this a slow beat with a low frequency starts to play, which creates tension but is not too dominant. This activates the user to close the curtain. Before this beat starts a long-stretched bell sound can be heard to catch the user's attention above all the noise. When the user starts to close the curtains this beat stops and a short rising sound can be heard. When the curtain is fully closed and the noise filter is on sound A confirms that the noise filter is activated.
05	**When the weather is changing the user should be aware of the outside and therefore be warned.**	Check → The weather application shows a remarkable (compared to the other weather forecasts in the past weeks) change in the weather condition; thunder and lightning. Action → Curtain becomes 80% transparent for a moment, and the curtain shows a sneak peek of the weather for 15 seconds (in the video shorter).	When the 15 seconds are counting: a slow repetitive rhythm starts to play, overlayed with the outside weather sounds (thunder) in the background. This invites the user to think about the option the weather has to offer. For example, when the user likes to weather and decides to open the curtains, the curtain makes a confirmative sound. However, the user can also decide to not interact with the curtain and to do something else instead, like going for an active walk instead, leaving the curtain silent. When the curtains are opened a confirmative notification sound is played that the vista is in full display.

Figure 5: System behavior overview

Implementing sound design

First of all, I wanted to make the sounds feel realistic and because I was part of this system myself, I also approached the sounds from a first-person perspective and kept asking myself whether I would like these sounds in my own room or not. The implementation of sound in this smart system can be classified into; communicative, connective and natural.

Communicative

The smart and autonomous behavior presented within the smart system calls for further explanation. The user needs to be aware of the system's complexity and intelligence and needs to understand why it behaves in particular moments of time.
Therefore, I wanted to use sounds that are transparent and fit the audience in a way that they are adapted to whom or what its communicated to and form a connection between the signal and what the other object is saying (communicative echo). For example, the natural wake-up scenario, where the sounds communicate when the noise filter is turned on if the natural wake-up scenario is activated (feed-forward) and when it is active, and if the whole wake-up scenario is completed.

Connective and natural

Through sound, I wanted to expand the experience of merely being in a room by involving the sounds that the world beyond my room had to offer, like being connected to the sound of nature, even when you cannot see it. Therefore, it is interesting to make the outside ambient sound a dominant part of the smart living space system; creating an immersive experience that is not limited to the 'artificial' inner space and atmosphere of the room. I want to avoid the sounds starting to become static, repetitive, and thus uninteresting. From a first-perspective, I think this is very valuable, considering that the unpredictable character of sound coming from outside triggers the imagination and curiosity to be involved within the system and to become active, such as guiding the user towards the curtain. The system should also recognize these soothing nature sounds. Having this idea of the "sound of nature" being a form of escapism from the isolation of the room, inspired me to make the stereo installation a part of this experience. Because when the outside ambiance is not as pleasant, nature sounds can be played via the stereo and overshadow the noise.

Most of the sounds used in this video are obtained via Freesound.org and edited in Adobe Premiere Pro. The final video deliverable for this assignment can be seen with the following link: final video.

Discussion

All videos have been watched during the last lecture of the course. After we had watched all the videos, the lecturers started to share their thoughts on the videos and gave general practical tips. These tips helped me to re-evaluate my design and to make some sound and system behavior adjustments, see video V2. When I would redesign this final system, I would definitely pay more attention to the pro-activity. For example, the system is connected to the weather forecast and the prediction of the weather goes hand in hand with the concept of being proactive. For example, when the sun is shining, there will be more chirping birds outside and therefore the camera knows that it should be focussing on birds instead of other objects. As a result, the pro-activity could prevent the system from being too late to detect bird sounds. The biggest challenge for me was to find a balance between adding too many or too less sounds to the system. Too many, by means of creating an intrusive/annoying experience, giving the feeling that I underestimate the intelligence of the user or creating this place that feels unnatural. Too less, by leaving the user with not enough information. I have tried to achieve this balance by using real-time ambient sound as an important part of the design. Overall, I found this balance a very difficult thing to grasp, especially realizing how subjective the sounds in such a system can be.

Conclusion

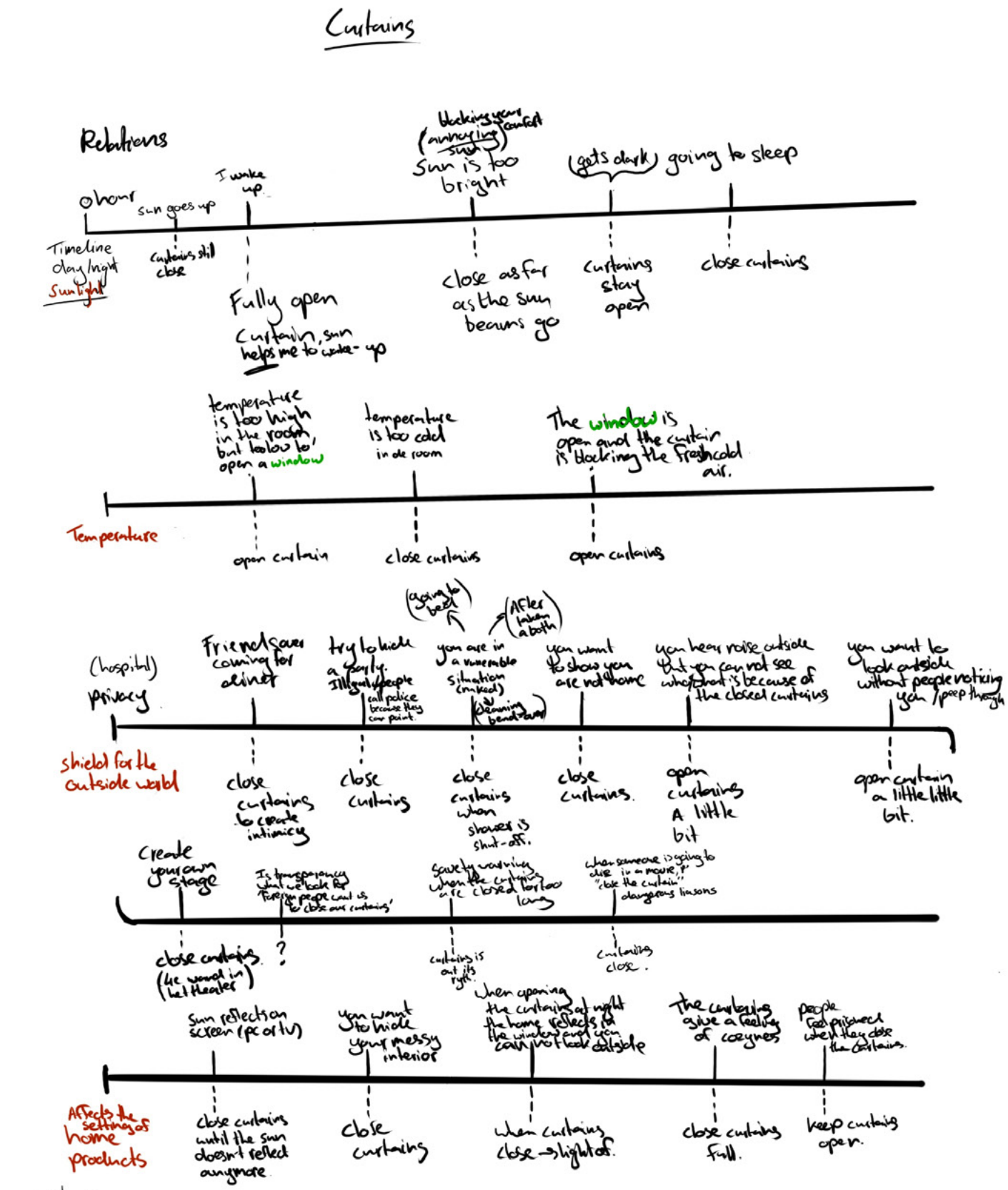
Throughout this assignment, object-centered ethnographic methods were employed to explore the potential role of a curtain design (stressless curtain) in a smart home system. These methods provided a better understanding of the complex interconnective system where the curtain is situated. The outcomes of these ethnographic studies formed the foundation of the smart redesign. By exploring the inner lives and social relationships of the curtain, the ''object persona" was created. This object persona was simplified into behavior rules by filling in "persona sentences", which was followed by creating smart functionalities in the designed system. After this, the role of sound was explored and implemented into the system and connected to smart behavior. A final video is created to give insight into the smart behavior of this system and the role of sound in it.

References

Cila, N., Giaccardi, E., Tynan-O'Mahony, F., Speed, C., & Caldwell, M. (2015). Thing-centered narratives: A study of object personas. In Proceedings of the 3rd Seminar International Research Network for Design Anthropology : Online proceedings (pp. 1-17)

Nuij, R. H. (2020). "Please make me smart!" – Your watering can; A design exploration of the thing perspective. Unpublished manuscript.

Appendix A: Initial thoughts-notes

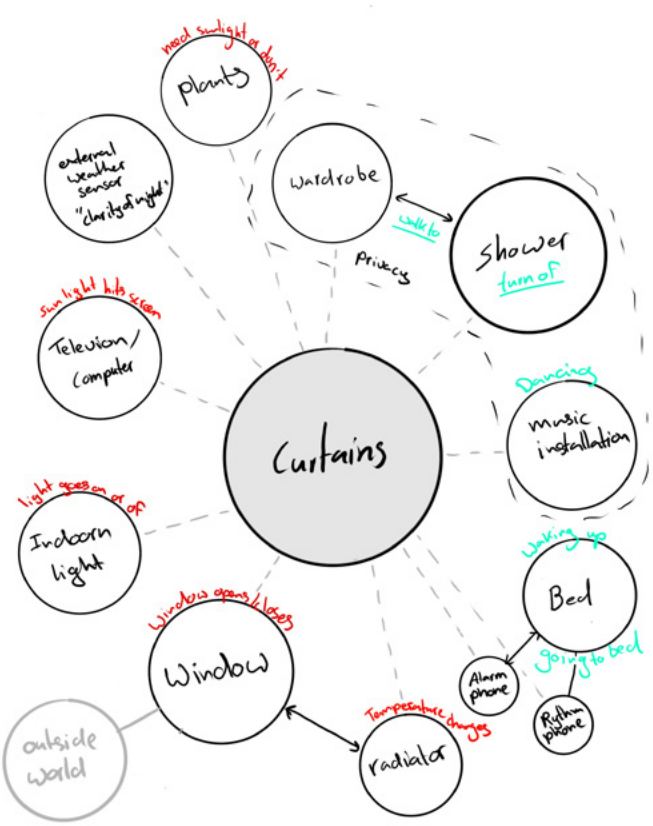


Why is a curtain more interesting than a door?

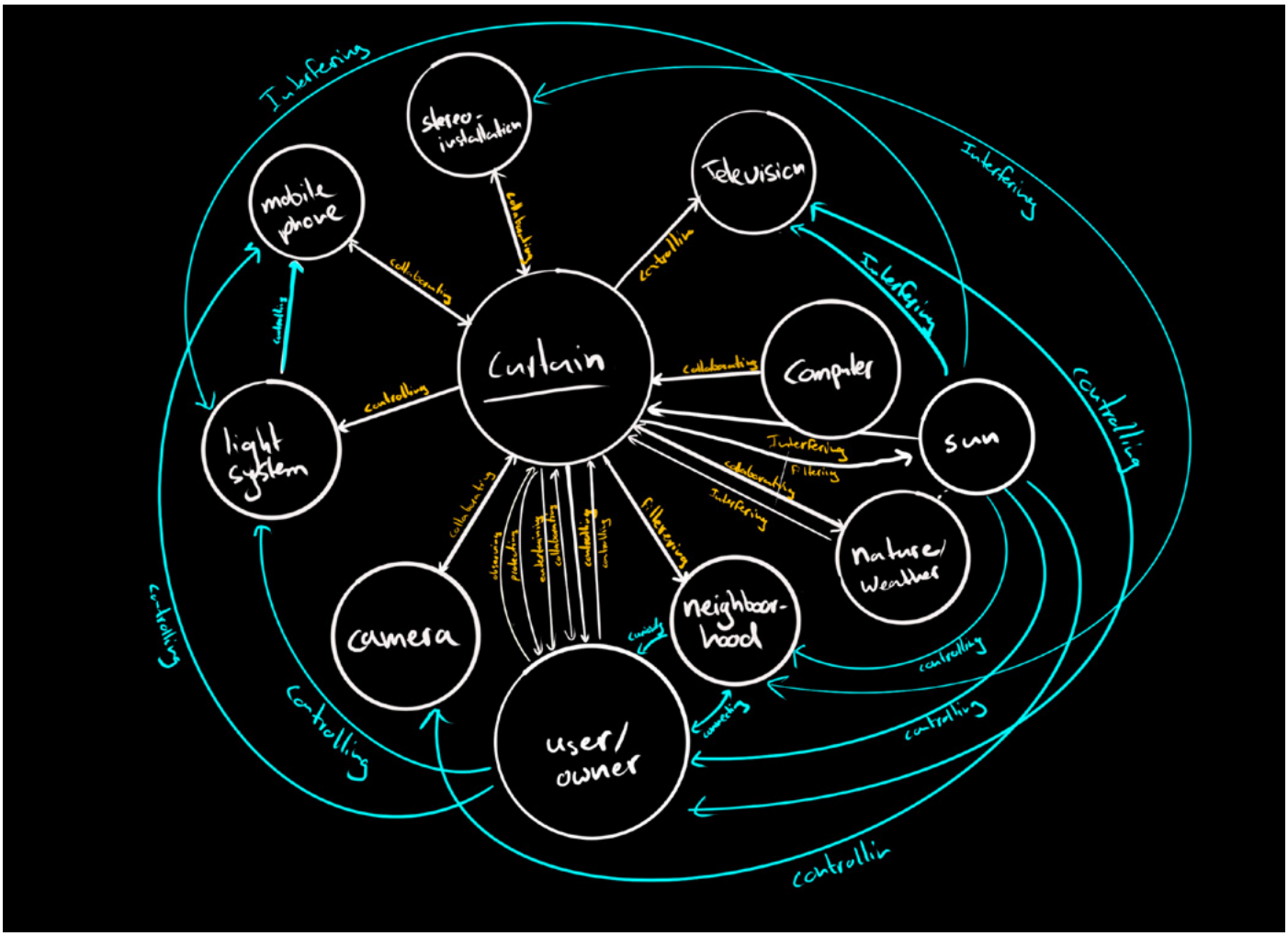
Because it can embody a person, people hide behind curtains.

Wind blowing is suggestive / someone in the room / that something divide / imaginary wall / tent.

curtains are a poor mans divider.



Appendix B: SYSTEM MAP



Appendix C: Object Persona

Curtain: Inner Life

Personality

I am highly sensitive and make subtle decisions about what goes in and what goes out. I like to refer to myself as the privacy skin. The in-between person mediates between the big outside world, the world that is full of surprises, and the inside domestic world. Where privacy is something that I respect and propagate and always try to take into account and communicate. I want to make people feel at ease, relax and I do what it takes to achieve that. For example, I like to collaborate with my domestic fellow agents, but also love the dynamics of the outside world. Meaning I am not always in complete control, but that's fine because I don't like to be considered a complete control freak and on top of that, I know the other agents are always in for a surprise. In other words, I am not afraid to adapt to new circumstances, it makes me excited. However, I do like to work consistently and always listen to what they have to say. I am open to new things, but also like to close things.

Attitude towards life

I like to live peacefully and efficiently, for example, I don't like when something contradicts each other. Not because it was unavoidable, but purely because of a lack of communication. In addition, I like to make people feel secure and confident in their surroundings.

Needs

I want to act on my surroundings with respect and subtility, without accidentally overshading the opinion of others. Therefore, I want to be part of a community-like environment, where others are open-minded, and always feel welcome to share their needs and preferences. For me, this keeps the environment refreshing yet structural and I can learn from that.

Likes and dislikes

+ Likes to be challenged and to learn

+ Likes to go personal

- Doesn't like to be forgotten, or when nothing happens (nobody at home)

- Doesn't like to be used as a climbing object (by kids or cats)

Frustrations

When the other agents do not anticipate me or do not communicate when they start acting. For example, when I have closed myself and the window decides to open while it is super windy outside, I will be blown outside the window. This makes me completely useless at that moment.

Aspirations, desires

- Being able to bring the nature of the outside world inside.
- I want my my owner to feel at ease so that he does not feel stressed and work without distraction.

Fears, complexes

Miscommunication with other agents, by means of sharing the wrong information or not knowing when to give or receive information. Considering privacy this can cause very awkward and vulnerable situations.

Skills & abilities

- Protecting your privacy, while taking the environment into account.
- Making others feel understood and that they matter

Ambitions
I would like to be the most trustworthy and desirable of all curtains.

Habits
- Sometimes I like to be embodied, people like to hide behind me.
- Sometimes I like to hang weirdly, crooked, and not cover the whole window.

Curtain: Social Relationships

How is the social structure in the room?
I believe the curtains are on top of the social structure, together with the human agents and the window. We are most connected with the outside world and sense what is happening there and what can come in, which makes us very powerful. The human agent decides how much control she/he wants to give me and has the power to connect me to other agents However when I am connected, I am in control and this human agent gave me a lot of control. The other agents in the room know this and see our relationship as something positive.

Who are friends and who are enemies?

I am kind of friends with everyone, I am friends with the other agents in the system, but also like to hang out with my friends outside, like the weather and the neighborhood. I think the friends inside like me because I am not only trying to filter the outside world, but I also like to take over tasks or vice versa, for example with my friend 'the artificial light'. Sometimes at night, the light is off and the room is dark, making it very private, which means there is no need for me to close. But we also work together when we want to make the room extra cozy. Another good friend of mine is the stereo installation, we think alike, I like to cover up the view, while he likes to cover up the noise. But he also likes to be silent, so other things enlarge, like the sound of rain when the rain starts to hit the window, which makes me feel relaxed.

I have a hate-love relationship with the sun, sometimes the sun becomes very stubborn and likes to shine for a very long time or be gone for a super long time. This can be very annoying because the other systems have to work harder, and this can make them super tired. At the same, I love that he gives me a straightforward purpose in life, which is occasionally prevent the sun from lighting up the room. However, we both know it goes deeper than that.

I also have a professional relationship with the security camera, we both like to make people feel comfortable and she learns a lot and warns me and tells me what she sees and hears.

My closest friend is the window, we literally do everything together, he understands me and we always try to protect the outer world from the inner room and vice versa.

My biggest enemies are intruders in the neighbourhood. Mostly human's that make unexpected sounds or noises, talking about things I do not like to hear, but what I pick up anyway. I am always trying to make the human agents inside the room feel at ease and secure, but sometimes the outside world can be so unexpected that I start to freeze and lose my rhythm.

What is the curtain's relationship with its owner?

The relationship is based on mutual joy. The curtain is very grateful to have such an owner because the owner provides the curtain value, purpose, rhythm, and connection. Although, the curtain does not like the fact that the owner is not at home very often, making it sometimes a bit monotonous.

Appendix D: SYSTEM BEHAVIOR OVERVIEW

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