Sculpture showing “life–purpose” quotes

A Kinetic Sculpture developed for Menperium

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Abstract

A small company from Enschede, Menperium, have given us the assignment to develop a kinetic sculpture that could display motivational quotes. The goal of this sculpture was to make people reflect upon themselves, and make them think about their goals and future. This sculpture would be sold to companies and be placed in their entrances. Therefore, the following research question was worked on: "*How can an art installation showing quotes, placed in the hallway of a company, bring out employees' intrinsic motivation in order to reach personal goals?*".

This research question was split up into several sub-questions, where the most important division was between the two sides of the project: Samantha Galvez did research to how one could attract people to the installation, and keep people intrigued, while I did research on how one can encourage people through an object. In this thesis, the focus is put on this second part of the research. In this second section, the literature research that was done in the field of "non-human encouragement" (encouraging people through other forms then human contact) revealed that this was a largely unexplored research area.

Several ideas were come up with and over the course of six months a kinetic sculpture was developed and build. Due to time limitations it was not possible to test whether or not the installation could motivate people to reach personal goals. However, it could be tested if it would be able to fulfill this function. Two tests were run using the sculpture that was created: One that researched how many people looked at the installation and for how long, and one that researched if people were able to understand the function and the meaning of the sculpture. 41% of the 1536 passerby gave the installation attention. However, many people seemed to struggle with the meaning and function of the installation. Five out of the eighteen interviewee assumed its function had to do with motivating people / bringing over a life lesson, and only one got the story of the sculpture correct. Even though this study had a small sample size, these results were seen as subpar. Two simple suggestions were given to increase the outcomes of both studies: add a title and / or add a sign explaining the installation.

The main research question still remains unanswered, but certainty is given that after the listed improvements the sculpture could be able to bring out employees' intrinsic motivation in order to reach personal goals. The current prototype can easily be adapted and used in future research regarding non-human encouragement.

Acknowledgements

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First of all we would like to thank our clients, Clemens Mensink and Fabienne Heijne, for giving us a lot of freedom while developing the sculpture. During the meetings lots of feedback was given which helped us to make the right design choices. As well, the product would not have looked as complete without the financial support that was received.
Secondly, we would like to thank our supervisor for his feedback and his critical thinking during the meetings in the early stages. Especially his industrial design-view helped us to reflect critical on the developed idea.
We would also like to thank Richard Bults for the coordination of our Graduation Project, and for providing the necessary information. Alfred the Vries deserves a lot of credit for this project. From Mr. de Vries we were able to borrow many of the parts that were used in the installation. He also helped us by cutting the dozens of laser cut files that were handed in during the course of this project.
Without a place to work, the entire prototype would not have been realized. We owe a big thanks to Han Davina, the coordinator of the wood workshop in the Vrijhof. He took the time to help us with our designs, help us with the usage of the tools and materials, and how we could assemble the idea best. His knowledge saved our project many times.
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Index

1 – Introduction

Intrinsic motivation is very important to the human being. It tells us what we want to do, solely because performing that action makes us happy. This contradicts to extrinsic motivation, where actions are performed to get external rewards such as money or prices (S. Reiss, 2012).

Menperium, a small company from Enschede, gave us (Samantha Galvez and I, Sjoerd Baarslag) the assignment to create a sculpture that could boost passerby their intrinsic motivation and make them reflect on their actions and future. Over the past few years they have collected hundreds of motivational quotes and the given assignment to embody these into a kinetic sculpture. During the upcoming weeks, a refined prototype, and a blueprint for this sculpture will be developed. These sculptures will later on be sold to companies that will presumably place these in their hallway. Therefore, we have composed the following research question:

> *"How can an art installation showing quotes, placed in the hallway of a company, bring out employees' intrinsic motivation in order to reach personal goals?"*

During the following chapters, the sub questions listed below will be answered. First, a clear overview of the problem at hand will be created, where a closer look will be taken at the requirements, stakeholders and people that will interact with the installation. Then, knowledge will be gathered on how one can encourage someone through ways that are possible to implement in an installation. As well, research will be done on the topic of how it is possible to attract and entertain passerby with the installation, and how we can measure the amount of attention that is given to the installation in a scientific manner. After this state of the research has been conducted, the ideation phase will be described, where all possible ideas will be presented. One idea will be chosen, and a section will be devoted to why this idea fits best with the requirements.
Once the installation has been build, its functionality will be tested, and using the knowledge gained from the test the research question will be answered.

- What is the best way to implement non-human encouragement?
- How does one make an engaging interactive art installation?

- How do artists create a communication between their art piece and the environment?
- How do artists embody motivation into their art pieces?
- How do artists incorporate a story into their art installations?
- How do artists incorporate interaction into their installations?
- Which concept would fit best looking at the requirements and literature?
- How can the chosen idea be realized?
- How well does the realized prototype keep the attention of passerby's?
- Does the realized prototype spark curiosity in passerby's while people are still interacting with it?
- Do the passerby understand the meaning and function of the prototype?

2 – Problem definition

This chapter will try to define the problems that are being faced. In this chapter, the question “What aspects should be taken into account while designing the statue” will be answered. This question will be approached by taking a close look at the requirements that were given by the client Menperium, defining the space in which the statue will operate and define the users that will interact with our statue as well as a list of requirements that came forth from the knowledge of the literature research and the state of the art.

2.1 – Requirements given by the client

Several requirements were given out by the client Menperium. Here, a closer look will be taken at what those requirements are, and what they can mean for the design of the design of the statue. For consistency, the given requirements were translated to English.

- **Requirement 1 – (The statue should) receive attention in a reception hall of a company, take "Hal B" as starting point.**
    - The statue should be designed for the reception hall of a company as this is its intended location once the product is completely finished. For this refined prototype however, hall B will be used as location as it is presumably possible to use this location for testing. Hall B is as well the closest we can get to the entrance venue of a company. This requirement could have effect on the size of the sculpture, and the fact that the sculpture should not be site specific.
- **Requirement 2 – (The statue should) receive attention by those who have not seen the statue yet.**
    - One important requirement is that the sculpture should receive attention on its first encounter. This means that the sculpture should be intriguing. The literature review written by Samantha Galvez provides insight in how this can be accomplished. One example would be the three aspects of Hekkert (2006) that will be taken into account whilst designing, being emotional response, attribution of meaning and aesthetic pleasure. Many people will enter the company's hall, some only very rarely. Such people can be clients, or members from other companies who come by for a meeting. The statue should intrigue these visitors and represent this company in a way. As Samantha Galvez wrote in her literature review, catching the passerby's attention is the crucial first step to a successful art installation.
- **Requirement 3 – (The statue should) receive attention by those who have seen it (several times).**
    - A requirement that is closely related to the previous requirement, is that the statue should also receive attention by those who have seen it numerous times, such as the employees that use the entrance frequently. One example that our client gave was water or fire, which due to its unpredictability and liveliness remains fascinating, even though not much changes over time. Again, Samantha Galvez her literature review gives insight in how this requirement can be met.
- **Requirement 4 – The goal is to make people think about their future and vision.**

    - This requirement will mostly influence the story of our installation. To make people think about their future and vision, the statues story should be open for their own interpretation, and relatable. The story should raise question rather than give answers.
- **Requirement 5 – May be adapted to circumstances, till example from day to day**
    - Tom Morsink was working on a feature that made the quotes related to the current news headlines, making the statue ideally only displaying quotes that were relevant at that moment. Such a system may be implemented in our sculpture.
- **Requirement 6 – Has to be customizable for each company**
    - It is important that the company can include certain elements to the sculpture, so that the sculpture can be personalized to the company's goals and vision. This means that the developed concept should be open to changes, or allow changes by the user. An example of such personalization that was given by our client was the ability to place props in the sculpture as if it was a display cabinet. This way the company can add its own element which can be changed on the spot, while the sculpture's design remains the same.
- **Requirement 7 – Menperium star has to be used somewhere**
    - The Menperium star, or Menperium logo has to appear somewhere on the installation. Exposure for the company is always appreciated, and as this statue will be presumably be placed in hall be for a considerate amount of time a logo is a must. This holds for the eventual final version as well: people should be able to know who to contact for such an installation.
- **Requirement 8 – Easy to move**
    - The sculpture that will be developed during this graduation project should be relatively easy to move from location to location. For one, the installation will be built at a different location then where it will be displayed, and after the graduation project is finished it will probably be moved to yet another location. Therefore it should be easy to move and easy to set up. Regarding the design this will affect its size and weight. The design should also not be location specific (E.G. using a way to mount it to the ground that can only be used in hall B).
- **Requirement 9 – Easy to detach**
    - Similar to the requirement that the installation should be easy to move, the installation should be easy to detach. Of course, the prototype that we are working on will have no specific location, and can therefore not be mounted to a spot permanently. It is important that it is easy to detach it and take some place elsewhere.

- **Requirement 10 and 11 – Attractive and Eye catching**
    - Very similar to requirement 2 and 3, and this requirement will have no further impact on the design choices.
- **Requirement 12 – Possibly interactive**
    - The installation may or may not have interaction with the user. This decision is up to us to make during the ideation phase. Whether or not we want to do this heavily depends on the story we want to tell, but this decision will have great impact on the design.
- **Requirement 13 – Present the quotes**
    - The main goal of this art installation is to present the hundreds of quotes that Menperium collected over the past few years. This will mean that we will need to implement some way to display text, whether it's analog or digital. A large part of the design will probably deal with the displaying of these quotes so they will have a major impact on how our installation will look
- **Requirement 14 – Possible explanation of quotes**
    - There is freedom to add explanation to the quotes provided by Menperium. This requires more room for the text to be displayed which might alter the design.
- **Requirement 15 – Link between quotes and installation**
    - A clear link between the looks of the installation and the quotes themselves should be present.

2.2 – Our requirements

The list of requirements that were presented by Menperium were quite elaborate, however some requirements that should be taken into consideration were still missing from our point of view.

- **Requirement 16 – Should be buildable in eight weeks**
    - For the building of the art installation, eight weeks were planned. This is more then was recommended by the Creative Technology guidelines, but given that it was expected that the statue would have quite a considerable size this schedule was quickly rearranged. However, eight weeks is still rather limited and during the design phase it should be taken into consideration that it is possible to develop the idea in this period.
- **Requirement 17 – Should be affordable**
    - The costs should be kept in mind while designing the sculpture. The materials and hardware that will be used needs to be affordable. This might have effect on the chosen design.

2.3 – Location

The prototype of the sculpture will be developed with two locations in mind: the one which the final product will be placed (the entrance of a company) and the one where our prototype will probably be tested (Hall B at the University of Twente). It will be developed for medium to large sized companies that can be found in and around Enschede / Overijssel as that is where Menperium is located. On this location it will be seen by employees, customers and visitors. Therefore, Hall B at the University of Twente is a good testing location. Although it might be a bit bigger and busier than the entrance of a company, it still fulfills the same purpose. Its higher number of people will also make testing (EG. finding people to fill in questionnaire) easier.
The fact that we are designing the prototype for Hall B might have effect on the design decisions for the sculpture. As this is not a permanent location, it is not possible to bold the sculpture into the ground.

Figure 3.3.1 and 3.3.2 – Hall B, the location where the prototype will presumably stand

Hall B can be described as a large and open entrance. It has several iconic characteristics, the first one being art installation that is hanging on the wall. The materials used in this part of the university are rather unique. Most of the walls are decorated with brown / orange wood and the front of the building consists mostly out of glass. From the ceiling, massive orange lamps are hanging, reaching halfway to the floor. Two trees are placed in shiny pots of steel, which reflection shows an abstract representation of the hall itself. A large staircase leads to another part of the university. Perhaps these elements can be (re)used while designing the installation to make it more site-specific.

2.4 – Defining the users that interact with the statue

The two different locations described above (the entrance of a company and Hall B) both have slight differences when it comes to who will interact with the product. As hall B is located at the university, many of the people will be students around the age of 18 till 24. Further users are professors and other university employees but these will be in lower numbers. This contrasts the users that it might have in the hallway of a company, where the average age of users will be higher. Another large difference between the two locations is the duration which it will be present which alters the interaction. For instance: In a company this installation will be placed for a long time which implies that it will also have to be maintained or cleaned of dust at some point, interactions that are not necessary in the short time that it will stand in Hall B. Not too much can be said however about the end users, as this product could be bought by many different companies, housing many different kind of employees. One possible assumption that could be made is that it will be a company that wants to make a good impression on the guests, and decorate their hallway with this product. As the eventual product might not be cheap
During testing it should therefore be taken into account that the results might not be as representative as they are wanted to be. The concept should be designed with the long term use in mind.

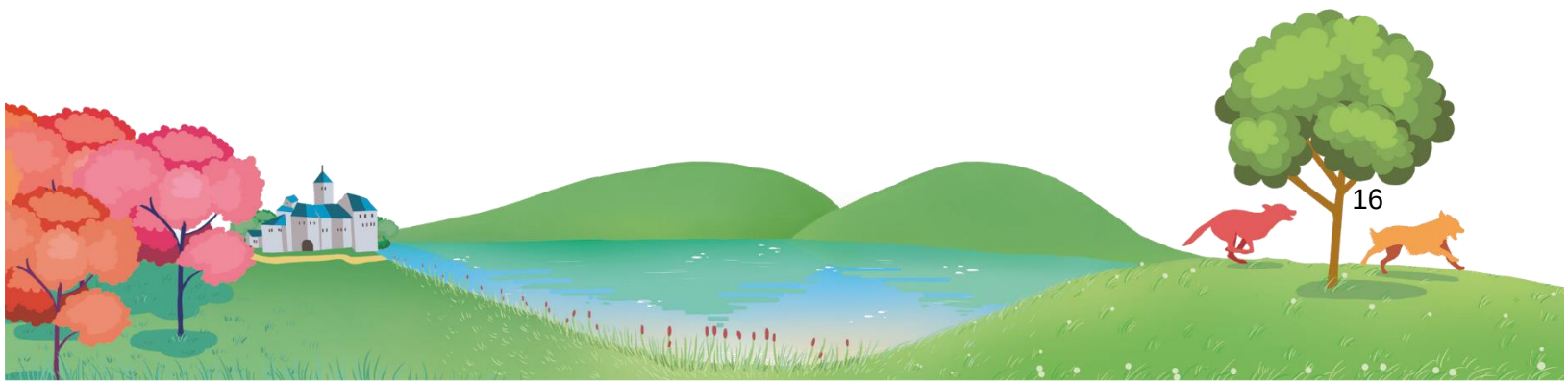
3 – State of the art

In order to get an overview of the current developments surrounding this topic, a state of the art was conducted. This state of the art was separated into two sections: a scientific literature research where solely peer reviewed sources were used, and a non-scientific part which takes a closer look at how artists encounter the problems we are facing.

The literature research was separated into two topics. Samantha Galvez researched how one can make an engaging interactive art installation, deepening into topics as how does one design for experience, what makes an art installation attractive, and how does one measure that an art installation is attractive. Meanwhile, Sjoerd Baarslag tried to get more insight into encouragement that does not require the presents of a human being.

Just as the literature research, the non-scientific part of the state of the art was split up as well. The function of this part of the state of the art was to see how other artists deal with the problems we are facing, as well as getting tools and inspiration to work with during the upcoming design process.

Here, Samantha Galvez found examples of interactive art installations, and art installations with a story. Sjoerd Baarslag found examples of how art installations incorporate the environment they are standing in and how other art installations try to motivate people. All sections are combined in this document.



3.1 – The implementation of non-human encouragement, a literature overview

This literature review will try to get an overview of the current use and knowledge around non-human encouragement. Its goal is to get a clear view of the use of non-human encouragement so that this can be incorporated successfully in the sculpture.

Encouragement through other forms then human voice or touch have always been around, but in this digital age its role has risen to new heights. Hundreds of apps are available to encourage you to exercise more, or eat healthier, and robots are being developed that for instance encourage children while playing chess (L. Leite, Castello, Pereira, Martinho, Paiva, 2014). But also packs of cigarettes are labeled in certain countries with texts that encourage you to stop smoking.

This form of, by lack of a better word, "non-human encouragement" is not only becoming more common, it is also becoming more important. Not only can it help with reaching personal goals, it will also play a big role in the healthcare, where the aging population and shortage of healthcare professionals is becoming a serious topic. To counter this problem, a lot of focus is put on self-care and mHealth solutions such as health-apps (Sama, Eapen, Weinfurt, Shah, Schulman 2014) , where this type of non-human encouragement plays a big role.

This article will take a closer look at the effect of this non-human encouragement, weather used to reach personal goals or solve healthcare issues. It will try to get a better view on the difference with human encouragement, and look for strategies that make this type of encouragement more effective to answer the question “What is the best way to implement non-human encouragement”. Articles from different study fields will be compared to answer these questions.

3.1.1 – The created definition for “non-human encouragement”

In this literature review, when referring to “non-human encouragement”, any type of encouragement that does not require the presence of a human being is included. As mentioned in the introduction, this ranges from encouraging messages in apps, to the encouragement through a computer voice, but also non technological methods, such as printed text, are included in this definition. Despite its growing use and increasing importance, no earlier definitions of this type of encouragement seem to have been made in any field.

3.1.2 – A comparison to normal encouragement

One big advantage that should be used when implementing non-human encouragement, is the fact that you can encourage a user more often than is possible with human interaction. This positive effect is shown by Steinberg, Levine, Askew, Foorley and Bennett (2013). This study tested a text message intervention for weight loss against the usual care that one would get in such a situation. By the end of the study, the intervention group lost 1.27kg on average, while the control group gained 1.14 kg. 70% of the participants receiving text messages strongly agreed that this was easy and helpful. A study by Norman et al. (2012) supports this hypothesis of frequent messages being effective. This study compared the effect of text messages to encourage fruit and vegetable intake against a control group that received general information. The study showed a higher change in body weight and fruit/vegetable intake with the intervention group. This suggests effectiveness of frequent messaging.

Compared to encouragement from humans, non-human encouragement seems to show similar properties when it comes to flattery. A study by Fogg and Nass (1997) shows that flattery from computers shares strong similarities to flattery from humans. During this study, a computer was set up to give three types of encouragement: sincere praise, flattery (insincere praise) or generic feedback. After each assignment, the participants either got sincere praise (praise that was related to the task they performed), flattery (insincere praise, praise that had no relation to how they completed the task), or generic feedback (a neutral message). Both flattery and praise had high effectiveness. According to the article, these results show similarities to flattery through humans as it is described by psychological literature.

3.1.3 – Common strategies of non-human encouragement

The literature shows three non-human encouragement strategies that seem successful: Boosting competence, ignoring the start, and making the encouragement personal.
The positive effect of boosting competence is shown in studies from Leite et al. (2014), Bricker et al. (2014) and King at al. (2016). Leite et al. (2014) demonstrate that children perceived the interaction with a robot as most supporting when the robot boosted their self-esteem. In this study a robot encouraged children to play chess. This robot was programmed to encourage in four ways: it could encouraging the self-esteem of the user by giving lines as “That was professionally done”, giving emotional support by saying for example “I really enjoy playing with you”, providing information support by giving suggestions, and giving tangible assistance by occasionally playing a bad move. The children were asked to order the type of supportive behavior from the ones they liked most to the ones they prefer the least and choose the interaction that boosted their self-esteem

as most enjoyed. Bricker et al. (2014) compared two apps that helped people to quit smoking, where the one focusing on competence was more successful. Encouraging competence by normative feedback was integrated in the app by providing the user with stories of former smokers. These stories explained how quitting smoking has helped them. This research was done with a double-blind randomized controlled pilot trial, with n = 196. The overall quit rate for the app that encouraged competence had an overall quit rate of 13%, compared to 8% for the users of the other app. The study by King et al. (2016) compared three types of apps that motivated people to move. The app that showed the progress of randomly assigned team members in comparison to the users outperformed other versions of the app. The goal of the study was to find out which of three versions could motivate underactive adult aged 45 and older to move more. These persons had no prior experience with using mobile phones. The three types of apps that were build were an “analytic” app, a “social” app and an “affect” app. The analytic app focused on goal setting, behavioral feedback and suggestions on how to go over behavior change. The feedback to the user was given through two colorful meters, which displayed the amount of moderate to vigorous physical activity and sedentary behavior compared to the set goal. The “social” version of the app was built around social influence. It focused on normative feedback through displaying the users score to scores of randomly assigned group members, giving insight in how well your performance is compared to other users. The last version of the app was the “affect” app, which encouraged through reinforced scheduling (giving “treats”), attachment and nurturance motives. This app displayed a picture of a bird which changed its position and posture depending on the user’s activity for that day. Rewards were given in the form of custom backgrounds. The social app users showed a significant increase in movement compared to the two other app versions. These studies show that one way of effectively implementing non-human encouragement is to boost the user’s competence, which can be achieved in numerous ways.

The importance of ignoring the start when encouraging people to change behavior is hinted towards in two studies that test apps that help people to quit smoking. In both studies from Bruller, Borland, Bettinghaus, Shane and Zimmerman (2014) and Bricker et al. (2014) the arm that focused the least on the starting process were the most successful in getting people to quit. In the study from Buller et al. (2014) one test group received frequent text messages from the Onq test messaging system. The other group used a more sophisticated app (Real e Quit). This app has similarities to the Onq text messaging system as it used the same supporting messages, but it also added features as creating lists for reasons to stop, write down the benefits of quitting and coping with stressful and challenging situations. These extra features however did not have a positive effect on the test results. Six weeks after the test had started, 40% of the app users had a quit date, against 12% of the text messaging service, but contradictory 73% of the text messaging service had quit, against 33% among the app users. A study by Bricker et al. (2014)

compared two different smoke quitting apps, where the one focusing the least on the starting process showed a higher success. One study arm used an app that provided features as “Thinking about quitting” where users have to make a list on reasons why to quit, “Preparing to quit”, “Quitting” and “Stay quit”. The other app, smartQuit, did not provide such elaborate assistance for these first stage. Instead, it starts at the “quit plan”, much closer to the user’s goal. The quit rates for the smartQuit app were 13% against 8% for the QuitGuide app. This could mean that the user starting to interact with the system should be seen as the first step, and therefore less focus should be put on encouraging to start.

Personalization is the final point that the literature presents as a key element when applying non-human encouragement. Juan Fasola and Maja J Matarić (2012) performed a study using an interactive robot on rehabilitating elderly. They compared two versions of software running on the same robot: One that communicated more personal, referring to the patient by his or her name but also giving compliments and using humor, against a version which did not do this. Not only was this personalization much appreciated by the elderly, the personalized software also proved to be more effective. A bigger study held by Celis Moralis et al. (2016) supports this finding. This study, conducted with 1269 participants, reported that the study arm with the personalized nutrition intake gave better results than conventional dietary advice which does not apply these personalized tactics. During this study, the 1269 participants were divided over four study arms, one being a control group. Using personal data gathered through a survey to tailor the food recommendations, instead of using a “one size fits all” standardized approach, yielded positive results. However, the two other arms using even phenotypic (such as body weight and BMI) and both phenotypic and genotypic (genetic information) showed no statistical improvement to these results. The fact that not all personal data has necessarily positive influence is also shown by a study by Kreuter, Oswald, Bull and Clark (2000). In this study, which revolved round weight loss, the study arm that incorporated believes, motives, triggers and other information types in their encouraging messages, did not outperform the study arm that solely relied on the messages being relevant. This relevance was determined by a questionnaire filled in by the participants and regarded subjects as weather or not they found that they would need a detailed eating plan. These studies demonstrate a positive effect making the non-human encouragement personal, however, it also demonstrates that adding more information does not necessarily make the encouragement more effective.

3.1.4 – Conclusion

This article compared non-human encouragement to human encouragement, and showed several strategies to imply. Compared to human encouragement, non-human

encouragement shows one big advantage, that being the quantity in which the encouragement can be delivered. In technical solutions such as apps, it is suggested to take use of this advantage as it can easily be implemented. Regardless of the medium on which the non-human encouragement is presented, it is suggested to incorporate the three common tactics that appeared throughout the literature: boosting competence, ignoring the start, and making the encouragement personal.
The first important strategy is encouraging the user in such a way that he or she believes that the task at hand is accomplishable. This is suggested to be an effective way of using non-human encouragement in two studies. The importance of “ignoring the start” is shown in smoke-quitting studies. Here, the study arm that focused the least on the starting process was proven to be the most successful in both cases. The final common strategy is to make the encouragement personal. In several studies the arm that tailored the encouragement to the user had the most success. However the studies also suggested that there might be a threshold to how much information is useful when it comes to tailoring.

Nevertheless, it is necessary to clarify that far too little research is performed that solely focuses on the most effective way to encourage people through non-human encouragement. Many studies focus on the effectiveness of their product compared to a situation without that product, and view the encouragement as a minor detail of said research, or even ignoring it completely. This makes the listed statements merely a suggestion, rather than a strong guideline. As well, very little research is done where non-human encouragement is compared to human encouragement in terms of effectiveness. As one goal of non-human encouragement is to partly replace human encouragement in for instance the field of healthcare, it is surprising that barely any research is done where equal amounts of time or money are spend on both sides to see which is more cost effective. Instead, most researches compare their product to a control group that receives no assistance at all, or even supposedly skewing the results by testing more than their product by adding regular phone calls and interventions to this study arm. As a final point of critique, most of the research regarding non-human encouragement is done in the field of healthcare. As non-human encouragement will play a big role in the future, albeit for reaching personal goals or as a solution for the shortage of caretakers in the future, this shortage of research is alarming and it is suggested that more effort is made to get a clear view of good non-human encouragement strategies.

Looking at our assignment, several points of critique have been found that can be used in the design phase of the statue. The three commonly applied strategies listed in the literature review can all be applied in the statue, albeit to a certain extend. This literature review gave a framework to build from, and some guidance to which ideas could and which ideas might not work.

3.2 – Addressing the components of an interactive art installation

A second literature research was conducted and written by Samantha Galvez. This research gives a clear overview of which components one can include into an art installation to make it more effective and successful. Its goal is to provide us with a clear overview of how one makes an engaging interactive art installation. This question is answered by three sub-questions: How can one design for good experience; What makes an art installation attractive and lastly how can you measure how attractive an interactive art installation is. This knowledge, combined with the previous literature research should give a solid foundation for a successful concept.

A short overview of the findings of this literature review is given here. The entire literature research can be found in the thesis of Samantha Galvez.

3.2.1 – Findings of this literature review

Several aspects of the process to create an interactive art installation have been mentioned in this literature review. First of all, usability is important for the human-product experience but is not enough to assure a successful art installation (Battarbee and Koskinen, 2005). Designing for experience can be done after a user-product relation has been conducted. This is to get better insight into the users, and their context / activities. The literature review proposes several frameworks that can be used to spot errors in the user experience.
When designing for experience, one should take into account that experience consists of emotional response, attribution of meaning and aesthetical pleasure (Hekkert, 2006). Forlizzi and Ford (2000) proposed a framework with which one can understand the human-product experience.
It is also important that the art installation receives attention by passerby. One can gain the attention of someone by presenting something that moves (Howard & Holcombe, 2010), transmits sound (Torta, van Heumen, Cuijpers, & Juola, 2012), or something that is large (Patterson & Bitgood, 1988). The contraries will rarely receive attention. Hemanson (1995) did research on exhibitions, and concluded that the given attention was based on the user's curiosity. He stated that this curiosity finds its origin in the joy of processing something new and personal. This is in line with a study held by Jacucci et al. (2010). As well, the participant should have freedom to where he or she wants to put his / her attention to.

As a final point, the literature research presented several ways the attention a visitor gives to the installation can be measured. These methods resolved around measuring the time the participants interacts or looks at the installation.

3.3 – Communication with the environment

One aspect that arises when looking at other sculptures and art installations is that they always incorporate a certain communication between the object, and the room or surroundings. Every object has a relationship to its surroundings, and when it comes to an installation specifically build for a site, this relation should be made with care. This chapter will try to find what other artists use to create a relation between their art and the environment it's placed in. The goal is to find points of attention that can be taken into consideration while developing our sculpture / art installation. Of Course, the suggested groups that are made in this chapter should not be taken as harsh as they seem, as many pieces could be placed in several categories.

3.3.1 – Communicating with the shape and rhythm of the surroundings.

What seems to be a well-used method, is to echo the shape and rhythm of the environment. This technique can be seen in plenty of art pieces. A couple of examples are listed below.

3.3.1.1 – Industrial forest

Industrial forest is an art piece designed by Eric Schuldenfrei and Marisa Yiu of ESKYIU studio. This art piece incorporates the straight lines of the buildings around it, but presents a bamboo forest. Hundreds of aluminum rods, reaching four meters high, create an artificial forest in the middle of the city of Hong Kong. Each rod is placed at a fixed distance from the other, making the forest feel very man made. When walking on the artificial grass, the rods bend towards you ever so slightly to make the forest feel alive and natural, highlighting the contrast between artificial and natural again (C. Shaw, 2013).

Figure 3.3.1.1.1 and 3.3.1.1.2 – Industrial Forest Hong Kong

3.3.1.2 – Slab for the Ruhr

Another art piece that tries to capture the essence of its surroundings is the “Slab for the Ruhr”, an art piece created by Richard Serra. As the name suggested, this art piece can be found in the Ruhr, Germany. It consists of a 67 ton Cortex steel plate, reaching 14.5 meters high. This piece is placed on a man-made hill, created from waste from the surrounding mines, which looks just as bare as the steel plate itself (JSB, Unknown).

Figure 3.3.1.2.1 and 3.3.1.2.2 – Slab for the Ruhr

3.3.1.3 – City Camouflage

One art piece that uses the environment in a different way, is “City Camouflage” located in Amsterdam. Studio Roeland Otten had the assignment to make large concrete blocks less prominent in the environment. These blocks, which were previously public toilets, were repurposed to measure air quality. The district demanded that the area should not be suffering from another brick of concrete, and studio Roeland Otten was given the task to make them less obvious. This he took quite literally, by placing photos from the street on to the concrete objects (Unknown, 2015).

Figure 3.3.1.3.1 – City Camouflage

3.3.2 – Reuse materials

A second characteristic that is often used in public art, is to make materials that appear in the environment, reappear in the art piece.

3.3.2.1 – Draper

A first example of reusing the environments material is “Draper”. Draper is a 75 feet high permanent art piece that crosses several floors of the visual art school at the Florida State University. It consists of hundreds of stainless steel strips. These strips vary in distance from the wall. The distance at which these strips were placed was qualified by taking pixel-level values of photos that were taken around the university. These stainless steel strips model the silver and white staircase (Unknown, 2011).

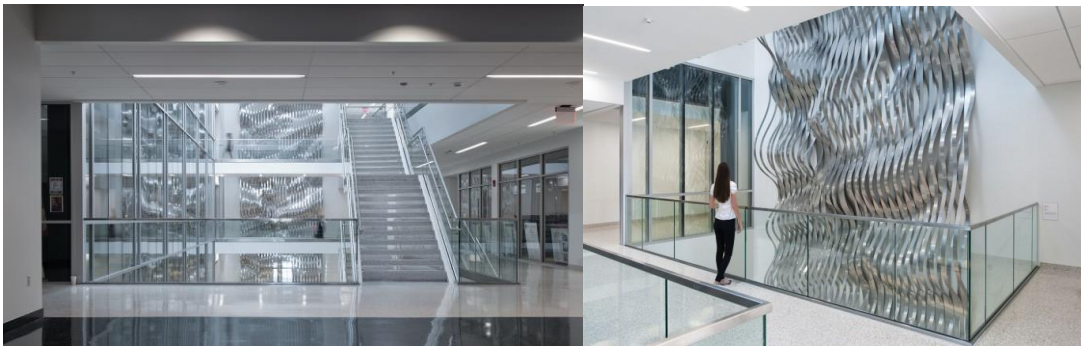


Figure 3.3.2.1.1 and 3.3.2.1.2 – Draper

3.3.2.2 – In the absence of evidence to the contrary

“In the absence of evidence to the contrary” an art piece created by Mounir Fatmi. This piece is constructed from fluorescent tubes, placed in an industrial hall. On these tubes is written in both English and Arabic. It should operate as a visual trap, guiding the viewer from one sentence to another, from one language to another, imprinting the messages in the eyes due to the high contrast. Material wise, the fluorescent tubes fit very well with the industrial location, as these often go hand in hand (Carl-Elim, 2016).

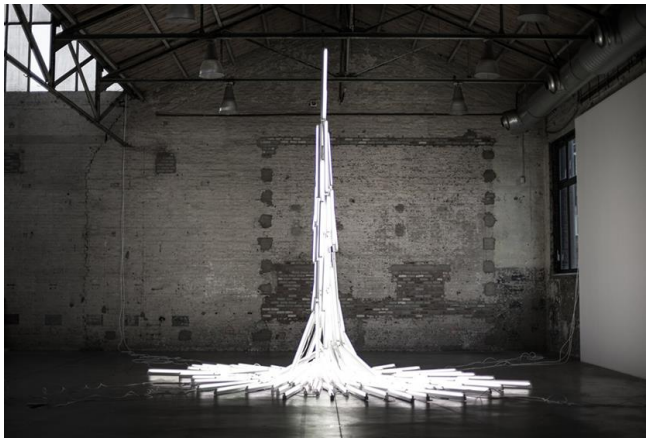


Figure 3.3.2.2.1 – In the absence of evidence to the contrary

3.3.2.3 – Signpost 5

Florentijn Hofman is known for his large art pieces, and the 3 washed ashore pianos that he made for the beach of Schiermonnikoog, the Netherlands, is no exception. Three massive pianos made out of wood seemed to have been taken up to the beach by a storm. Tumbled over, partly buried in and abandoned. The picture resembles washed ashore cargo, or whales, waiting to be salvaged or rescued. The material that Hofman chose for this installation has strong parallel with the blank wood that washes ashore constantly, making the resemblance even stronger (Simon, 2013).

Figure 3.3.2.3.1 and 3.3.2.3.2 – Signpost 5

3.3.3 – Similar use of colors

Another aspect of the environment that often gets integrated in the art piece are the colors it is standing in. Color schemes are chosen that go well with the surroundings.

3.3.3.1 – Heartbeat

Heartbeat, designed by the French artist Charles Petillon, is a sculpture made out of several hundreds of balloons. These were hung in the South Hall in London in a cloud like shape,

hanging from the ceiling. Light inside the clouds had the same warmth to them as the lights that were used on the lower floor, and the clouds itself reflected the ambient light from the glass roof (Dainius, 2016).

Figure 3.3.3.1.1 and 3.3.3.1.2 – Heartbeat

3.3.3.2 – Cardboard Pavilion

Cardboard Pavilion was designed by Miguel Arraiz García and David Monero Terrón for the Las Fallas festival. Las Fallas is the festival of fire, a five day festival that is held every year in Valencia. Most contributions to the festival are giant puppets, but García and Terrón created a sculpture where people could escape from the noise and the fireworks of the festival. A safe place where people could not just walk around, but also walk into. Its brown colors merge in with the brick environment, and the colors of the leaves. As all pieces for the Las Fallas festival, this one was set on fire as well (Furuto, 2013).

Figure 3.3.3.2.1 and 3.3.3.2.2 – Cardboard Pavilion

3.3.4 – Interaction with the environment

Many public art pieces make their work look as if they are supposed to be there, interacting with the environment.

3.3.4.1 – Le Désir et la Menace

An example of this is the sculpture “Le désir et la Menace” by Cédric Le Borgne. Borgne placed two massive wire frame birds in trees. Obviously fake, and way out of proportion compared to the tree, these birds still look like they flew to that spot and overlooked the festival (de Kwant, 2013).

Figure 3.3.4.1.1 – Le Désir et la Menace

3.3.4.2 – Stor gul kanin

“Stor gul kanin” is a big wooden rabbit made out of roof plates. This massive rabbit was made for the OpenArt biennale in Örebro by Florentijn Hofman. Given its enormous proportions, the sculpture looks like it is the toy of a giant that was left on the square, dropped just behind the statue of Engelberkt. (Erik Kim I, 2011)

Figure 3.3.4.2.1 and 3.3.4.2.2 – Stor gul kanin

3.3.4.3 – Macaco Gordo

Another sculpture by Florentijn Hofman that uses this same principle is Macaco Gordon, or fat monkey in English, which can be found in Brazil. This site-specific work was not made out of wood, but out of flip-flops, the iconic footwear from Brazil (Erika Kim I, 2010).

Figure 3.3.4.3.1 – Macaco Gordo

3.3.5 – Shaping the environment

Instead of going with the given environment, some artists choose to reshape it themselves. Applying gentle changes, or adding a complete new dimension.

3.3.5.1 – El Claustro

Massive inflated plastic balloons reshape the rooms of the former convent of San José de Gracia. Due to its massive size and prominent blue color, the feel of the room changes completely. This, and similar art pieces, are made by Penique Productions. Penique Productions is an artist collective that reshapes public places by making transformative installations (C. Jabson, 2014).

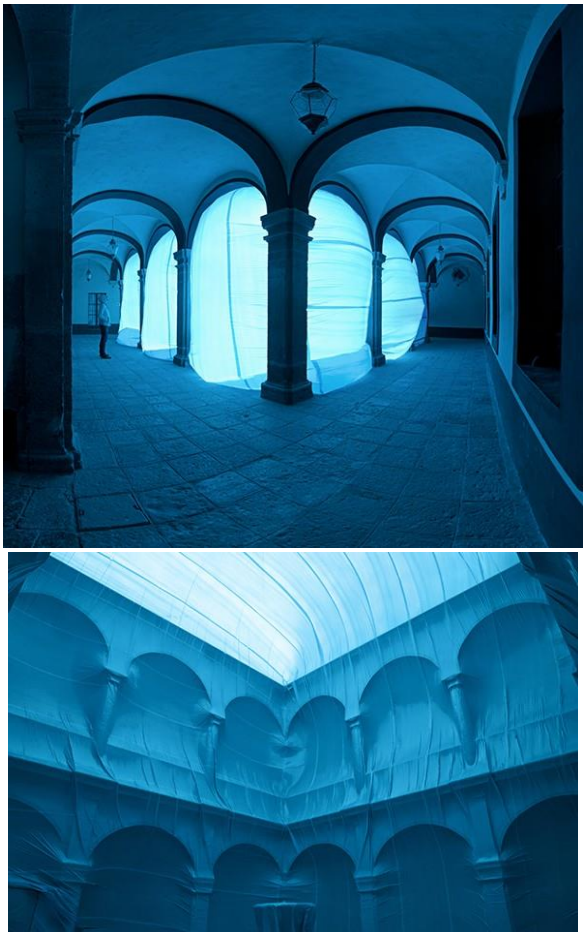


Figure 3.3.5.1.1 and 3.3.5.1.2 – El Claustro

3.3.5.2 – Laputa

Inspired by Laputa from Gulliver's travels, this identically named public art piece resembles the floating islands from the book. Laputa was created by Outofstock in Singapore. Inside a white tent, a number of hand-sculptured islands can be found. Each island is handcrafted and has its own personality, and are made out of copper and moss. The islands seem to crawl towards the gap in the ceiling, using the walls as a cleverly chosen mask that allows the artists to only use that part of the environment that they intend to use.

Figure 3.3.5.2.1 and 3.3.5.2.2 – Laputa

3.3.5.3 – Electric

Electric is designed for a venue in Paris, that is both as a restaurant, as a club and as a stage of artists. This artificial tree, which plows through the floor redefines the harsh and square space. It looks as it continues forever, and makes the room feel as a smaller portion of a bigger whole. The tree suggests to be made out of electrical wires, which spread over the sealing connecting to beamers, light installations and sound systems.

Figure 3.3.5.3.1 and 3.3.5.3.2 – Electric

3.4 – Conclusion

Five ways in which artists incorporate the environment into the art installation were described in this chapter. The first way is to communicate with the shape and rhythm of the environment. One given example was the large rectangle slab of steel by Richard Serra, which is placed in the industrial area of Ruhr, Germany. The second way is to reuse materials that appear in the environment, which makes the art piece blend in with its environment. A third way is to use similar colors as the environment, again to make the art piece blend in better. A fourth strategy is to make the piece look like it's supposed to be there, by interacting with the environment. This category mostly showed recognizable objects, such as large birds or an oversized rabbit. The final category consisted of art pieces that reshape the environment it is standing in.

Which of these categories we want to apply in our statue is still unclear, but these categories give us an overview of what we can include in our sculpture. It will also help us generate ideas in the ideation phase.

3.5 – Art installations and encouragement

Many art pieces exist that try to motivate people to change their behavior. This can be with many intentions and with many goals. Several examples are given in this chapter. The art pieces can be divided into two groups: Direct behavioral change and indirect behavioral change. The first group presents a clear goal and clear steps to reach the intended goal, the second presents more philosophical questions, and lacks clear steps that could be taken.

3.5.1 – Direct behavioral change

3.5.1.1 – Trash Talk Campaign

Figure 3.5.1.1.1 – Trash Talk Campaign

The picture above shows one of the cigarette trash bins from the “Trash Talk Campaign” in Manchester. This trash bin encourages people to use their cigarette buds to vote, instead of throwing them on the street. Its intent is clear to everyone: keep the streets clean by presenting a more joyful trash bin (Unknown, 2016).

3.5.1.2 – smART

Figure 3.5.1.2.1 – smART

SmART is an art piece that is designed to give people a more natural feedback to their energy consumption. This piece changes color when people consume too much water or use too much heat. Without using screens or numbers, people can see if their consumption matches with what is sustainable. “We are much more likely to be motivated by something that moves and changes because we ascribe life to it – you want to take care of it, like a plant or a pet.” says Gunes Kantaroglu, one of the two people who worked on the development of this piece (Space 10, 2017).

3.5.1.3 – Ambio

Figure 3.5.1.3.1 – Ambio

Ambio is a prototype for a lamp that functions on luminous bacteria. When the lamp is moved, the bacteria will come into contact with the oxygen from the air. This causes them to light up and create a calming blue light. Due to its design, the lamp will keep rocking for a while, creating a dim but constant source of light. Ambio is an example of an art project that encourages designers to try out new, environment friendly materials by showing its potential and use (S. Robarts, 2014).

3.5.2 – Indirect behavioral change

In contradiction to the previous group, the goal of the following art projects is not as clear, though the message is. Although they motivate you to take action, the action that should be performed is not always as clear.

3.5.2.1 – Ice watch

Ice watch confronts people with the brutality of global warming by placing twelve massive ice blocks, harvested as free-floating icebergs in the see of Greenland, in clock formation right in front of the location of the climate conference of Paris, COP21. Here, they were left to melt between 3 and 12 December 2015. The artist, Olafur Eliasson, says that the goal of the installation is to touch people, and to make something that they might see as very abstract a touchable reality. “Art has the ability to change our perceptions and perspectives on the world and Ice Watch makes the climate challenges we are facing tangible. I hope it will inspire shared commitment to taking climate action.” - Olafur Eliasson about the sculpture.

Figure 3.5.2.1.1 – Ice Watch

3.5.2.2 – Gyre

Figure 3.5.2.2.1 and 3.5.2.2.2 – Gyre

Another art piece that shows the impact of humans on the environment is Gyre. This piece, based on the famous "The Great Wave off Kanagawa" by Katsushika Hokusai, is completely made out of plastic trash collected from the Pacific Ocean. This artwork, created by Chris Jordan, depicts tremendous amounts of waste that humans leave in the Pacific Ocean (C. Jordan, 2009).

3.5.2.3 – Love

Figure 3.5.2.3.1 – Love, burning man 2015

Love is an art piece that was placed at burning man, a festival in Nevada. This art piece shows to adults sitting, facing away from each other. Inside them however, are their younger selves, reaching out to one another. Every night these children would light up. "It demonstrates a conflict between a man and a woman as well as the outer and inner

expression of human nature. Their inner selves are executed in the form of transparent children, who are holding out their hands through the grating. As it's getting dark (night falls) the children chart to shine. This shining is a symbol of purity and sincerity that brings people together and gives a chance of making up when the dark time arrives." says Alexander Milov about his sculpture. It calls for more forgiveness in the world (Dovas, 2016).

3.5.2.4 – Like 4 real

Figure 3.5.2.4.1 – Like for real

This installation raises the question if the "like culture really" does add something to our society. It criticizes this "like tribe", which seems to put the attention of a click on a pedestal. This meters high golden "like" was put to flames by DADARA, the artist to demonstrate that you can also have a lot of fun without this little button. It hopes to spread this message to the world (K. Aiton, 2013).

3.5.2.5 – Flower thrower

Figure 3.5.2.5.1 – Flower thrower

Flower thrower is probably one of Banskys best known art pieces. It depicts a rioting man who is at the point of throwing flowers instead of a stone. This art piece captures the message “Make love, not war” and encourages people to be more kind to each other. It was painted in the city of Jerusalem right after an attack on the gay parade (Unknown, n. d.).

3.5.2.6 – The naked truth

Figure 3.5.2.6.1 and 3.5.2.6.2 – the naked truth

The naked truth is an art piece made by the anonymous artist “Above”. Its goal is to remind the society to not believe everything that you see, and act more critical. Though made in 2009, its message of “do not believe everything you see” is still very relevant with today's fake news outburst (M. Flix, 2015).

3.5.2.7 – Washed up

Figure 3.5.2.7.1 and 3.5.2.7.2 – Washed up

Sian Ka'an, biosphere reserve and UNESCO World Heritage site on the eastern coast of Mexico, has one big disadvantage. This beautiful piece of land has currents bringing in plastic from all over the world. Its remote location cause no one to take care of the beaches. While Durán was on holiday in this area, he was shocked by the amount of plastic that was laying around on the beaches. "I have identified products from 53 countries and territories on six continents thus far," he says. On his first trip, he collected all light blue plastic trash, and arranged it against the blue sea sky to take a picture. This play of colors has since then been his signature to address the alarming amounts of plastic waste that are washing up these shores. Calm, carefully arranged compositions show an alarming message. Durán wants to inspire us to take action (B. Harlan, 2016).

3.5.3 – Conclusion

In conclusion, it can be said that two categories of motivational art can be distinguished: Ones that go for direct behavioral change, and ones that take a more indirect approach. Direct behavioral change shows the participant clearly what the intended goal of the interaction is. These goals consist of one or a few tasks that are easy to comprehend. Its contradiction is indirect behavioral change where the goals are less clear. These often revolve around topics as climate change, political issues, or societal issues. Although the issue they address is clear, a solution, or suggested tasks are not provided. However, it should be noted that these categories are not very strict.

For our graduation project, we can make decisions that make our message more direct or indirect. Looking at the assignment and the research question, it should be clear that the sculpture intends to boost intrinsic motivation to reach personal goals. However, what this means differs from person to person. Therefore, we should take care of how clear our message is. The sculpture should both be leaving room for personal interpretation but also convey a clear message.

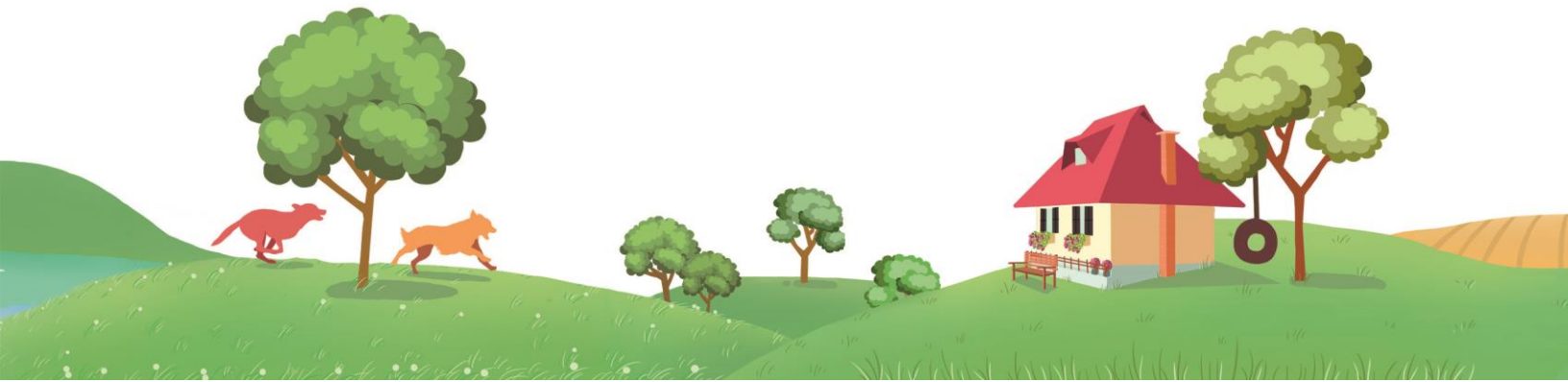
3.6 – Interactive art installation and art with a deeper meaning

Meanwhile, Samantha Galvez did research on the state of the art of interactive art installations and art installations with a hidden meaning. The complete section can be found in her thesis, as this section will present a small summary of her findings.

In short, two types of interactive art installations were found. This division was between interactive art installations that do have a technical / digital aspect, and those who do not. Several examples were given, such as the installation by Ernesto Neto called “Just like drops in time” which interacts with the participants through the use of smell. The second chapter presented several art installations that contained a deeper meaning through strong imagery. These examples showed that the explanation is required in order to understand the sculpture’s deeper meaning, as it is nearly impossible to discover them yourself. The other installations served as inspiration during the ideation phase.

4 – Ideation phase

This chapter will elaborate on the approach we used to generate our ideas. Furthermore, the chapter is divided into two sections: one describing the initial range of ideas, and the second describing the iterations that took place on the chosen idea. A separate section is devoted to why this idea was chosen.



4.1 – The approach

During the ideation phase, the following strategy was applied: Before starting to develop ideas, a close look was taken at the requirements described in the previous chapter. As well, the expected target audience (both for testing and the final product) were worked out, as was the testing / eventual location.
To gain insight in what was possible the state of the art was conducted, as well as a less structured search to similar projects and sources of inspiration. These findings were studied and listed in the chapters above. Using this as a starting point, many meetings between the two of us were arranged with the goal to produce as many ideas as possible. These ideas were written down and in their turn used as an inspiration source as well. Different combinations and variations were looked after. During this session the requirements were somewhat forgotten about, to allow for a more free thinking process. After a sufficient list was created, the most fruitful options were listed and reflected to the requirements. From this list a solution that seemed to fit best was chosen.

4.2 – Initial concepts

The most promising ideas of the ideation phase are listed in this chapter.

4.2.1 – Marbles

Much effort was put into displaying the quotes without the use of a screen, as we saw this as more analogue, more creative and less incisive. One idea was to display the text by using colored marbles. Several ways that this could have been achieved are displayed in figure 1. The color scheme could this way easily be adapted to the companies by equipping the installation with different colored marbles. Several concepts were made to display as much text as possible. The first idea was to make a giant marble wall, where the marbles would be dropped in from the top. This system could either drop a dark or light colored marble to form letters. Another concept resembled that of a LED matrix board that scrolls, where new marbles would come in from the side, pushing the ones on the left out of view. A final idea was to combine these two concepts and create a large pillar, on which the tracks would wrap around. Neither of these ideas were chosen however. The length of most of the quotes were simply too long to be displayed in this manner, as we expected the refresh rate to be too slow. Only at specific times the installation would display a full quote. A third issue we had was that the sound of the marbles dropping or being sorted would simply be too loud for the entrance of a company.

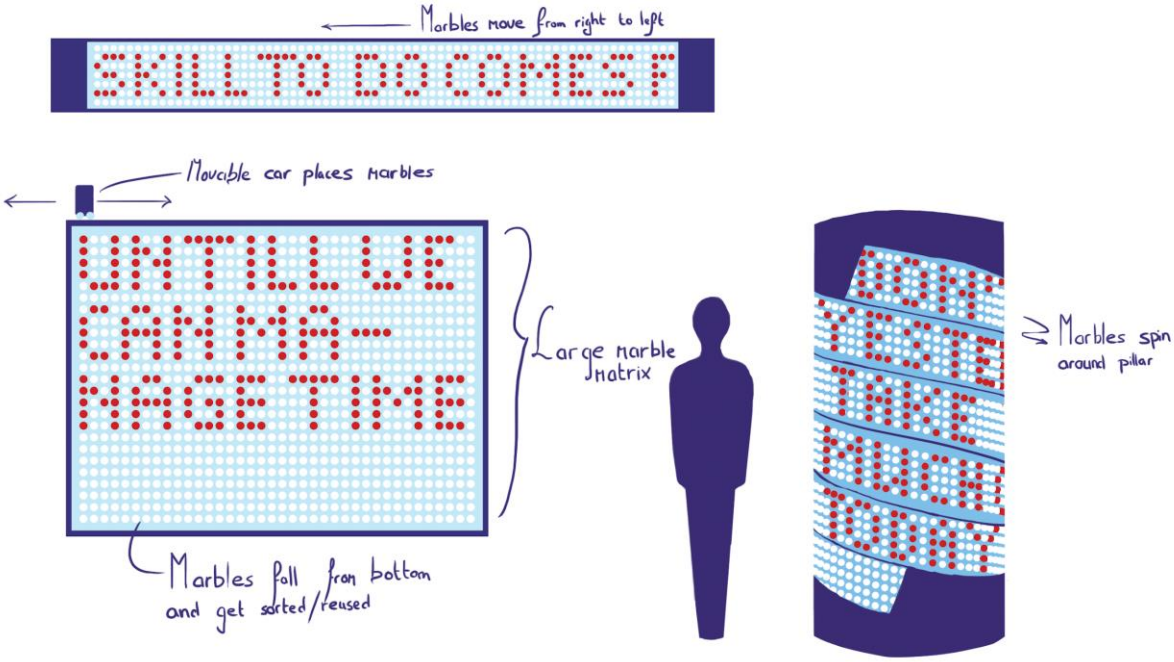


Figure 4.2.1.1 – Marbles idea

4.2.2 – Ropes

Another idea was to display the text using colored / labeled ropes. These ropes could change position vertically and with that the location of the labels. These labels could form words over several ropes as displayed in figure 2. As we expected the refresh rate of this to be faster than the marbles the length of the quotes were less of an issue. As well, these ropes would probably be a lot more silence then the marbles. Though we both liked the concept it lacked a connection to the story of the quotes.

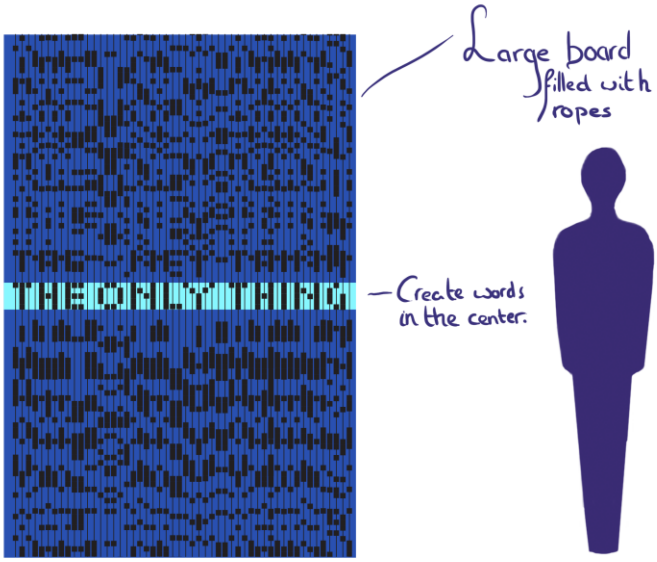


Figure 4.2.2.1 – Ropes idea

4.2.3 – The shape changing blob

This idea arose from showing the power of working on a task for a long time. It would consist of a large piece of cloth supported by several poles that could move by electro motors. These motors would control the position of the poles at a speed that could not be seen by the naked eye. However, over the period of a day or week its shape would change. Two big obvious problems with this idea were that it didn't show the quotes, and that it would change shape from one meaningless blob to another which didn't sound very motivating. Therefore, this idea was dropped. However, its concept did help us come up with the idea that we eventually chose.

Figure 4.2.3 – The shape changing blob idea

4.2.4 – Pies

Here, we tried to see the less serious side of the problem, approaching the "evil" side of motivation: the fact that it's o-so sweet, but occasionally only lasts a bit. Therefore, the idea was to print the quotes on hundreds on pies, and placing these in hall B with the story "Motivation can be sweet, but sometimes only lasts shortly". Of course, the downsides of this idea is a long list, starting with the fact that we are looking for a permanent installation. Therefore, this idea was dropped quickly.

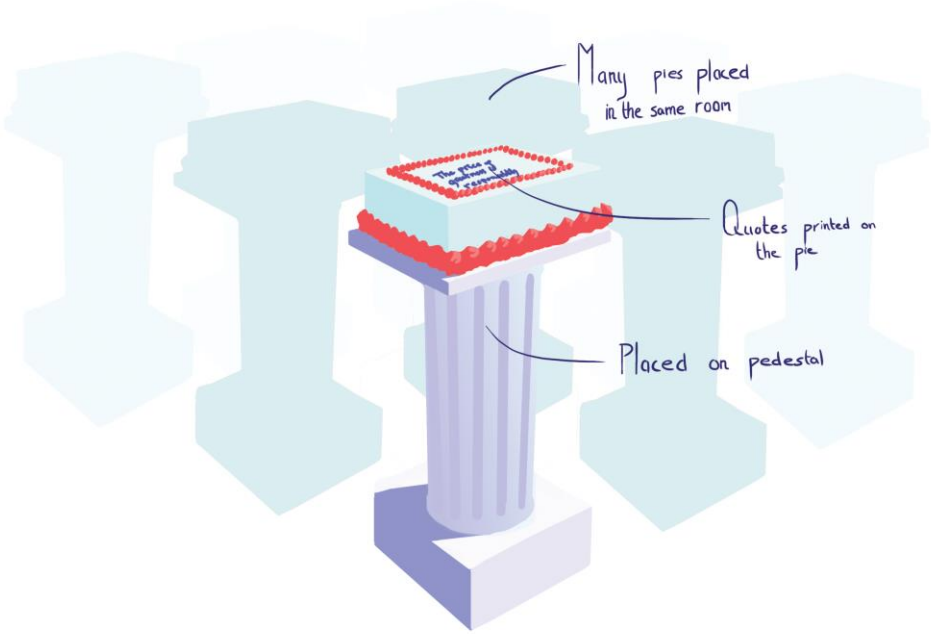


Figure 4.2.4.1 – Pies idea

4.2.5 – Ball shooting idea

A slightly more serious idea that still plays with the other side of motivation was the ball shooting idea. This concept takes the idea that it sometimes feels like society wants you to feel hyper-motivated all the time, and keeps on throwing motivation at you in a pointless manner. The idea was to make a cabinet that, when you stood close to the glass, would shoot ping pong balls with the quotes printed on them at your face. In order to be able to read the quotes, a camera would be placed next to the cabinet, which photographed both the participants face as the ping pong balls approaching him. This way, the text would become readable among a mess of balls and fright in the eyes of the participant. Obviously, this idea was not chosen.

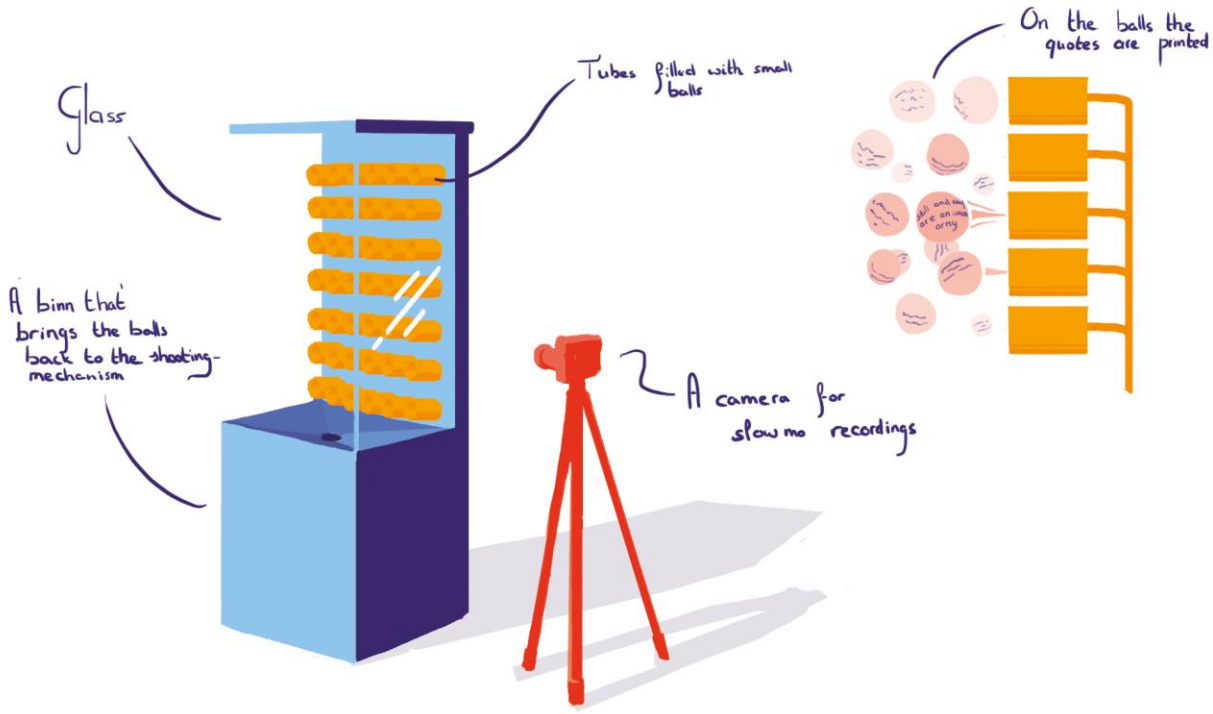


Figure 4.2.5.1 – Ball shooting idea

4.2.6 – Time-lapse

The idea of showing the effect of working for a long time on one task seemed like a nice and motivating story, but there was a lot of trouble to put this into a nice installation. The "Blob" as described above was simply too unrelatable. However, when we found this video of a massive astronaut moving in slow motion (a still can be seen in figure 4.2.6.1), we figured that we might be able to do something with a time-lapse to show this constant progress through time. This concept was combined with a video we both happen to see on the internet of someone explaining how the background was made in old Disney movies, which led to the idea of making a motorized time-lapse. The first concept of this idea can be seen in figure 4.2.6.2. Two large sheets of transparent plastic (only one is shown in the image as this was clearer) would rotate around a screen displaying quotes at different speeds. This movement would take place at a speed that was not visible if you stood next to the installation. Simultaneously, a puppet, or automata would walk at a similar speed. At a distance of two or three meters, a camera would be placed that to take a picture every five minutes or so. The viewfinder would display a time-lapse of the last hundred pictures that the camera took, and on this screen the statue would come alive. It reveals that the parts are in fact moving, and that the quotes are changing from one to another, and that the

person is on a journey. Step by step he travels through the constantly changing landscape. This should convey the message that one should not look at the progress he makes in a small amount of time, but instead take a look at the progress over a larger period. Due to the differences in size between the inner and outer ring, different combinations of landscapes would constantly be made.
A lot of the design questions, such as the look and feel of the automata and the two rings were interesting to the both of us and the assignment seemed large but manageable. Throughout the ideation phase, this idea received many iterations, which are described in the following section of this chapter.

Figure 4.2.6.1 – "Escape Velocity", a massive astronaut slowly crawling forward over a crowd of people

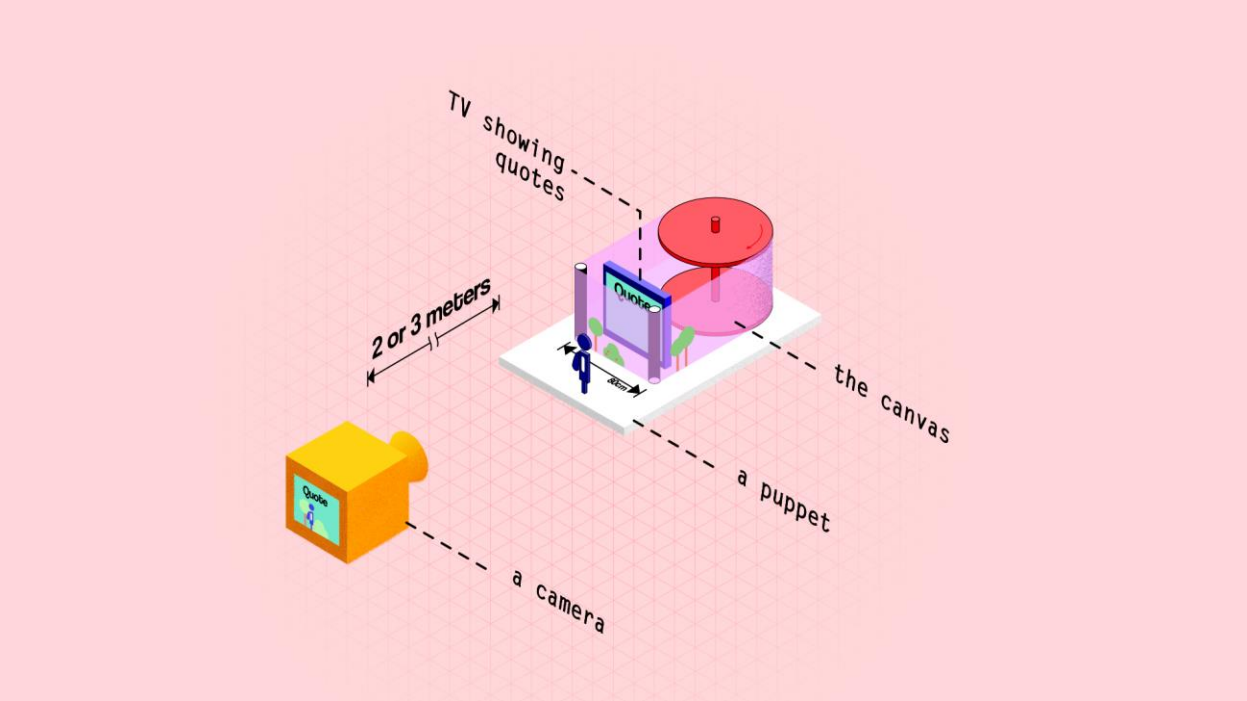


Figure 4.2.6.2 – Time-lapse idea

4.2.6.1 – Why the "Time-lapse" idea was chosen

There were several reasons why this idea was chosen, even though many aspects were still unclear at this point. The first reason being that it met a lot of the requirements given by our client. The installation seemed interesting and big enough to capture the attention of new passerby, but also interesting to people who already saw the installation several times due to its changing aspects. Unlike some of our ideas, the sculpture is able to show the quotes clearly, and this should help to make people think about their future and vision. As well, the statue has a deeper meaning which also revolves around motivation, unlike any of the other ideas. As the landscape and automata can be designed whichever way seems fit, it is possible to adapt the look to something that fits a specific company.
With the amount of unclarity around the sculpture, it was unclear if our requirements would be reachable. It was unclear if a suited material for the plastic sheet existed in the form that was required, and the costs and time consumption were therefore hard to estimate. Another requirement of which it was unsure if it would be met was the interactivity of the installation. This current idea had no true interactive part incorporated. However, this requirement was not essential and it was expected that the aspects of costs and building time would soon be clearer after several iterations and searches on the internet.

As well, the idea seemed to have much common with the literature that was found during the early stages of the project. Due to its size and its variety it fit well with the points that

were found by Samantha Galvez, such as giving the participant freedom to where he or she wants to put his or her attention. The idea had plenty of room to design for emotional response, attribution of meaning and aesthetical pleasure. The story that is present in this idea should lead to an emotional response and meaning, whilst the background and puppet should present an aesthetically pleasing experience. The large size of the project should attract passerby according to the study of Patterson and Bitgood (1988), and the moving parts are in line with the research of Howard and Holcombe (2010). For more details on how this idea complies with this literature research it is recommended to read the thesis of Samantha Galvez.

Simultaneously, the idea seems to be in line with the literature research regarding motivation. Although not all strategies that were presented can be applied in this statue, some concepts are present. One concept that was strongly present in this concept was the approach of boosting the user's / participants feeling of competence. As explained in chapter 3.1, this means that you boost the feeling that the user can accomplish the task at hand. This boost has to come from the story that the installation is trying to convey to the participant. By seeing the main character make slow progress, but large progress over time the participant might realize that he or she is able to make small changes to achieve big goals as well. Hopefully participants are able to portray themselves as the main character of the installation and make this bridge. The second strategy that has been incorporated into the installation is the fact that participants will see the sculpture rather often, and will presumably be motivated several times a day. As described in the literature review, one benefit of non-human encouragement is that it can take place more frequently then human encouragement is possible. If the sculpture is placed at the entrance of a building, employees will face the sculpture once upon entering and once upon leaving the facility. This might not seem a lot, but due to its consistency it might outnumber traditional methods. The final point that has been presented in the literature review, personalization of the motivation, will probably not be included in the sculpture as it doesn't seem to fit with the concept and the location. As the sculpture will have to interact with a lot of different people, some being one time visitors, a personal approach would be illogical. For instance, you would have to register to the sculpture in order to gain personal feedback. This seemed like it would defeat the purpose as a decoration for the entrance hall.

Clearly, these statements are still grounded assumptions, and it will have to be tested in the final stages of the project whether or not these theories apply to our installation as well.

This idea had other benefits as well, which were not incorporated into the requirements nor the literature. Given the slow movement speed of the installation, it would be likely

that this installation would be rather quiet which is a big advantage when it will be placed in the hallway of a company. As well, the idea contained many aspects that were of personal interest to us. The concept combined many disciplines, and it sounded both extremely odd, but also feasible. The rotating backgrounds and the walking puppet seemed rather interesting to work on. As well, the transition that the artwork performs seems interesting. A digital screen would be combined with physical plastic sheets containing artwork, along with a physical puppet. This would get captured by a digital camera and a time-lapse would be created of this content, which wraps it in the time-dimension as well.

4.3 – Iterations on chosen idea

At this point we chose to develop the time laps idea as described above. However, it went through several iterations before entering the specification phase, as too many aspects of the idea were unclear.

4.3.1 – Choosing the speed of the animation

In order to see if this idea could indeed give a convincing animation, a short movie was made in Adobe After Effects. Using two images, one for a foreground and one for a background, moving at different speeds it was shown that it was indeed quite a convincing image. When the background ran significantly slower than the foreground at a rate of 1:5, a perception of depth was created.

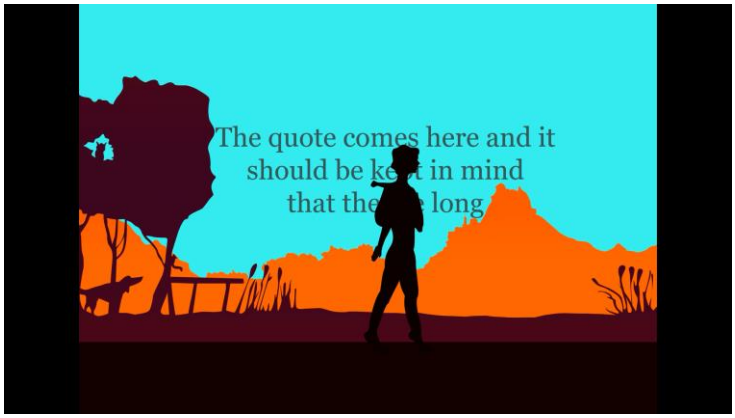


Figure 4.3.1.1 – Screenshot of the animation

4.3.2 – Other material for the environment

An aspect that adapted shortly after, was the way that the environment would be made. The initial idea was to make this out of transparent plastic sheets, on which the landscape will be put by printing, cut out stickers or paint. However, it was impossible to find the material that we had in mind, and the idea of using big plastic sheets didn't appeal to us.

There was fear that these large sheets would fold and stop rotating. Therefore, an alternative was looked for, which was found in laser cutting a chain. An image of a laser cutted chain provided the idea on how such a thing could be accomplished. This design, created as a cable holder for Laser Cutters and such, solved two problems: It could hold the environment upright and it was not able to bend back due to its shape. A quick concept was made on how such a chain could look like, which is shown in figure 4.3.2.2 and 4.3.2.3.

Figure 4.3.2.1 – Lasercut chain design by Msraynsford published on Thingiverse

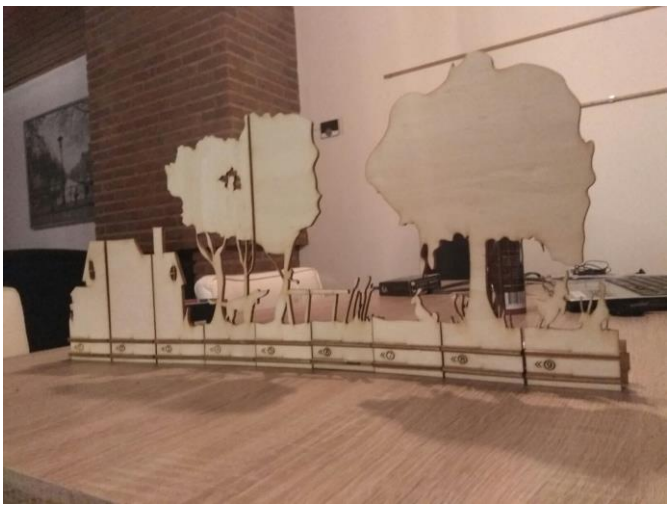


Figure 3 – Laser cutted chain from front

Figure 4 – Lasercutted chain from top

4.3.3 – Redesign of the path of the chain

Once the new chain idea was defined, another look was taken at the way the chain could be driven. It turned out that the installation would need a massive gear in order to reach around the television, and that the installation would become too big in general. Therefore, a new idea was developed. Instead of using one big gear at the rear of the television, two gears were placed next to the screen. The concept of stacking two gears on top of each other to minimize the electro motors we would need to one was still present. However, once the speed difference this would create was calculated (around 2:3 at max) it turned out that this was not a good solution. Therefore, the two chains were separated, and placed on two different gears. This concept can be seen in figure 4.3.3.1.

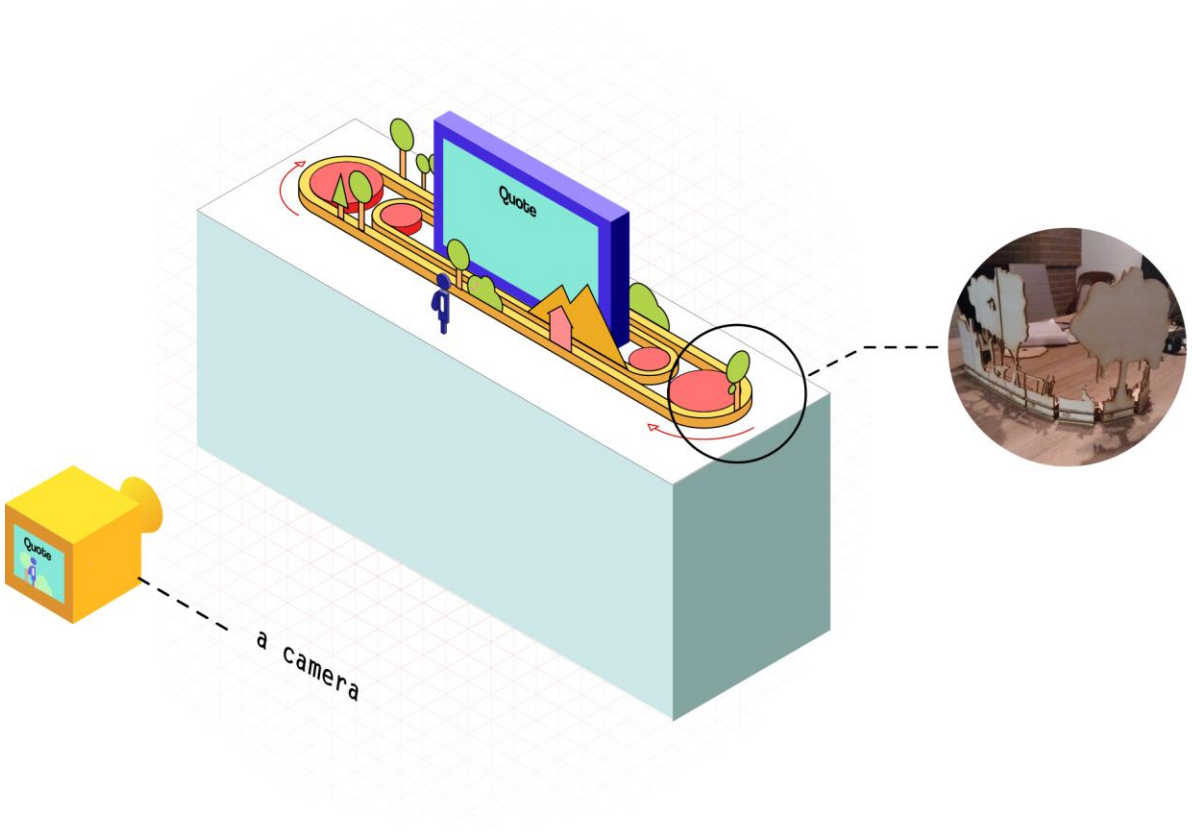


Figure 4.3.3.1 – Redesign of installation with chains separated on four gears surrounding the TV

4.3.3 – Choosing the decoration for the chain

When it came to the looks of the chain, several options were possible. Many examples of projects that cut out environments were found on the internet, with the biggest choice being if flat colors were preferred, or a more dynamic color range.

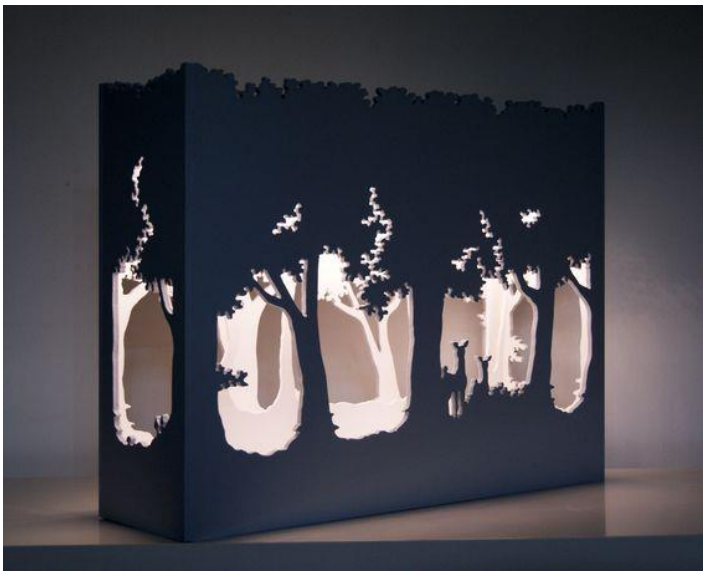


Figure 4.3.3.1 – Petit theater d'ombres, a lamp designed by Céline Calmettes Créations

The image that inspired us to cut out the environment from wood, was the lamp shown in figure 6. Therefore, the first idea was to make the fore- and background in two solid colors and letting the background have yet another color, perhaps using LED's to recreate the ambient feeling of this lamp. This three- color design was used in the animation shown in figure 4.3.1.1 of this chapter, and several tests of different color combinations were made which can be seen in figure 4.3.3.2.

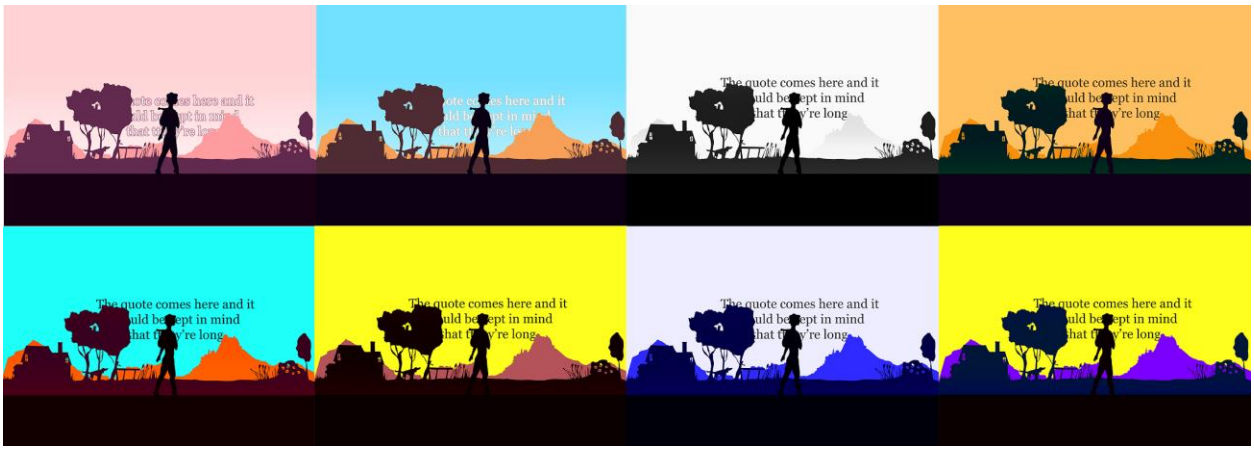


Figure 4.3.3.2 – Several color concepts for the installation

However, choosing only three colors would make the design very flat and repetitive. Therefore a more flexible solution was searched. An alternative would be to paint the chain in several colors, but this would require rather precise painting, something that was expected to look bad. A substitute to painting was using paper. This could be cut into the same dimensions as the wood that supported the chain, and by using several colors a more

dynamic picture could be created. This idea came from the piece shown in figure 4.3.3.3. Here, a landscape is created solely from cutted paper.

Figure 4.3.3.3 – Oh Deer by Atelier voor Twee

However, paper wouldn't quite give the pursued effect neither. A lot of colors would be required, and small pieces as leaves could give problems as they would easily get lost or fold before being glued. Another image found while looking for examples of automatas provided the idea which led to greater flexibility. This image showed a mermaid that seemed to be printed on paper and later cut out. This manner provides great flexibility, as you can create a digital files and use all the colors of the CMYK spectrum. It also provides great adaptability as the digital file can be altered.

Figure 4.3.3.4 – Anna Mello's laser cutted mermaid

In order to test the feasibility of this material the local printer shop was asked if they had mat printing paper at large sizes. Unfortunately they only had glossy materials at larger sizes. However, they were able to print on canvas on a larger size. Therefore a test was held to see if canvas could be cut out. This test, shown in figure 4.3.3.5, was a success. The heat of the laser sealed the fibers of the canvas together so it wouldn't ravel, and the burning marks were very minimal. Another advantage was that the material could be cut to very small detail and stuck to the wood nicely, and if the material was folded on accident, it didn't show any marks. Therefore, printing on canvas was chosen.

Figure 4.3.3.5 – Test of laser cutting canvas

4.3.4 – Choosing a style for the canvas

Although the method of applying color to the chain was close to settled at this point, still no style was chosen. A style was searched that didn't contain too much detail but still conveyed a nice landscape. Several ideas were proposed, ranging from a cartoonish to a more realistic style. Images were looked for that could help us pinpoint the style, and several sketches were made to help get a view of the possibilities.

A first concept was to make the landscape by tightly defined vector shapes, using large surfaces to illustrate the landscape, similar to the images in figure 4.3.4.1, 4.3.4.2 and 4.3.4.3 below.

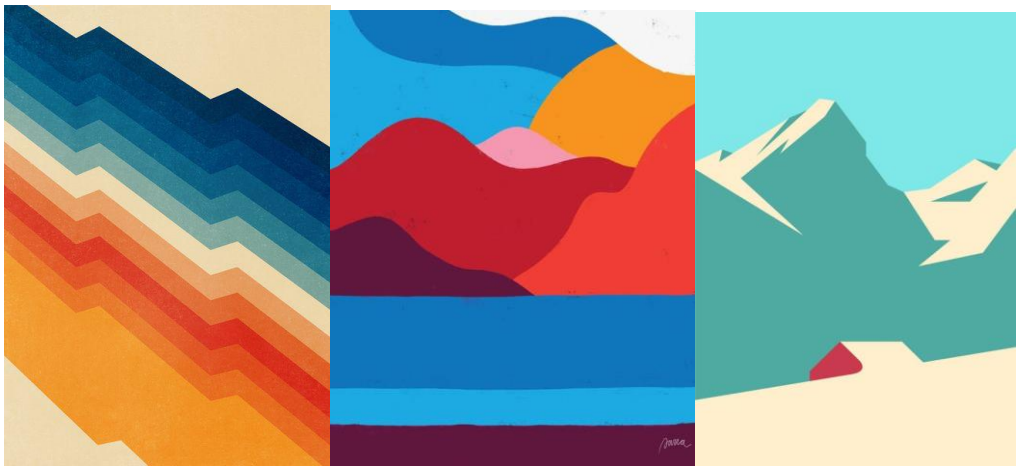


Figure 4.3.4.1, 4.3.4.2 and 4.3.4.3 – *F.L.T.R: Barricade by Tracie Andrews, Landscape study by Piet Parra and Winter by Heyshop*

A second concept was to make the landscape more realistic, leaving the simple vector shapes. Instead, more texture and shading could be added to the shapes. This would also mean that the puppet would have to look more realistic to keep it in style with the background. An example of the style in mind can be seen in figure 4.3.4.4, which comes from a stop motion made by Heather Colbert.

Figure 4.3.4.4– Still from a stop motion by Heather Colbert

The chosen style however was somewhere between the two. Figure 4.3.4.5 shows how one can create a colorful and warm landscape with still a lot of detail, but not too much. This was taken as a starting point while developing the style of our background and automata.

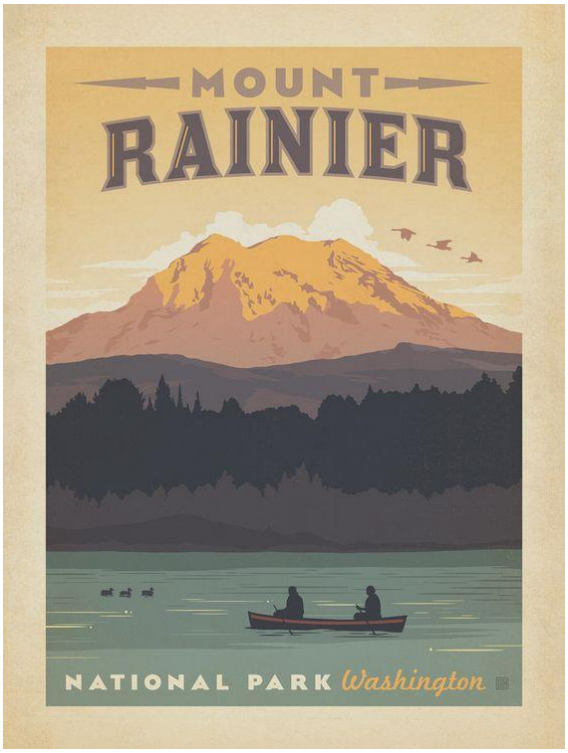


Figure 4.3.4.5 – National Park Poster designed by Anderson Design Group

From this starting point, a couple of sketches were made to see how certain elements could look, and how much time it would take to use such a style. These sketches are shown in figure 4.3.4.6.

Figure 4.3.4.6 – A quick sketch made in Illustrator

4.3.5 – Defining the look of the automata

Once the style of the background was set to this rather detailed warm environment, the automata's look could be designed. A document with elements that could be used while designing the traveler was made by Samantha Galvez. This document was used as an inspiration for the proposed automata.

Several designs were made which are shown in figure 4.2.5.1, 4.2.5.2 and 4.2.5.3. A certain look was aimed for while designing these characters: The character had to look self-confident and well prepared. The self-confidence had to come forward from its pose and gesture, while the amount of preparation had to show from the equipment that the traveler was carrying. Note that not every character is not developed as far. For instance the character on the right side of figure 18 simply didn't look convincing and therefore wasn't drawn out in full detail. However, the idea of making a person of higher age be the automata sounded more fitting for the story. It felt more suited if a person who you might not expect it from does this journey, rather than a young person. Therefore a second version of this character was made, this one looking more vivid and more likeable. In the end, this idea was chosen as being out the design for the automata.

Figure 4.2.5.1 – Concepts for the automata

Figure 4.2.5.2 – Concepts for the automata

Figure 4.2.5.3 – Chosen concept for the automata

4.3.6 – Deciding not to change the initial idea for the casing

One thing that remained almost unchanged, but was heavily discussed, were the looks of the casing. The reason for this possible change was to come up with something that might fit the story better. One idea was to decorate the casing in such a way that it looked like a puppet-theater, as it is in a way a small theater, or add custom lighting to the case to make it look like the "set" of a stop motion video. However, no clear connection could be made to the proposed story and therefore these ideas were not executed. Another concept was to add a third layer of moving physical objects. In a similar fashion to the chains running at the table, wooden clouds could wrap around the TV from the top. This would add another layer of depth, and the wooden clouds could look more stylish than portraying them onto a

screen. However, this would have add a lot of labor for a relatively small effect as there was no spot to connect these clouds to. Keeping the box square and simple could save a lot of time for an already busy project and therefore these ideas were dropped.
The idea was kept to a black box despite us both not liking this idea completely. Such a shape could feel very heavy and present, and might ruin the warm feeling of the rest of the installation.
One suggestion that we received from our supervisor was to keep the shape of a box, but to decorate it with reflective materials such as mirrors. This would quite literally put the aspect of reflection into the project. An interesting idea, but there was fear that this would end up to costly, as well as that it might distract too much from the main event, being the camera and the chain / screen.
Therefore, only one small adaptation was made to the color of the casing. Instead of using a heavy and dark black, a lighter and warmer (compared to the black) Prussian blue was chosen. This color should work nicely with the warm orange tints of Hall B. As well, it should also fit better with the warm and cool colors of the chain, which design had been finished by the time of this decision. As still being a rather dark color, it should not distract from the main two elements of our installation.

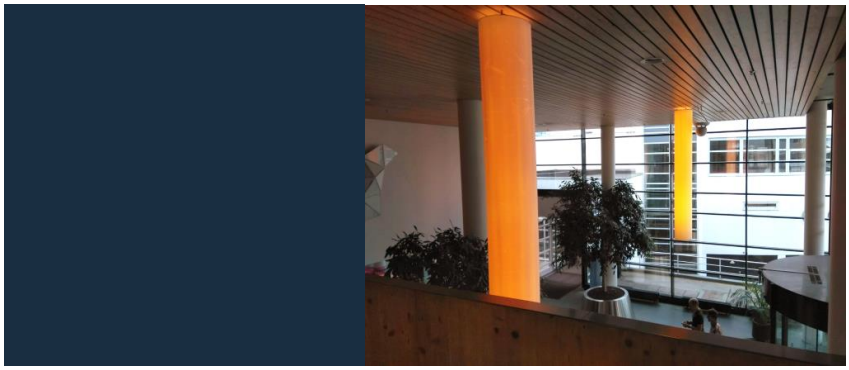


Figure 4.3.6.1 – Prussian blue next to a picture of Hall B, making a contrasting combination

5 – Specification

During the specification phase, the idea presented in the previous chapter was further defined. This chapter will elaborate on the decisions made during this phase, which revolve around specifying the sizes of all the elements to make sure everything fits and works together. Please note that the realization phase and specification phase were not separated during the progress of the GP, for instance, the case was built before the exact measurements of the automata were defined. However, for clarity, these two elements are separated in this document.

5.1 – Size of the chain bits

The size of the chain bits were the most important to define early on, as they affected both the size of the installation and the drawing that could be applied upon it. The design made by Msraynsford was slightly altered, increasing the size of the bits to 6CM, and the width to 3.5. A hole was added into the back of the chain to allow the teeth of the gear to grip. During a second iteration, the front edge providing extra support was removed, allowing the print to overlay the chain from the top to the bottom. As well, the hole in the back of the chain was increased in size to allow for easier alignment

Figure 5.1.1 – First and second iteration of chain design.

During a third iteration of the chain design, one piece in each chain received a mechanism that allows it to be detached. This way the immense chain could be rolled up and moved more easily.

Figure 5.1.2 – Detaching mechanism that was added in a third iteration

5.2 – Size of the case

A that had to be defined early on was were the measurements of the main casing as this would affect a lot of the aspects of the installation, such as the size which the automata could be and the size of the chain which had to be designed. In a file in illustrator the known sizes were laid out. The size of the chain was set to 3,5 CM, and the prototype of this chain gave an idea to what the margin to the sides should be. The other known value was the size of the TV around which the chain had to wrap. From here, several tries and adaptations were made. The size was further increased when the margin between the chain and the top of the casing was too narrow. Figure 5.2.1 was the result, which defines all sizes for the top plate of the installation:

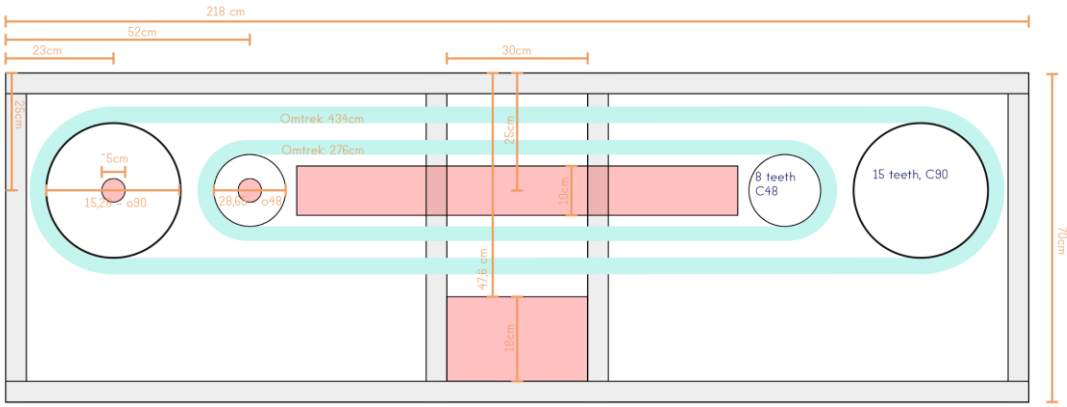


Figure 5.2.1 – top of the installation after many iterations

In grey, the image above shows where the poles should go to both support the television and the top plate. As it was unclear which size the automata would become regarding its mechanism, a space of 30 by 18 centimeters was left blank. This space could be used for the automata's driving, and could be as tall as the installation was high. The height of the case was set to 90 centimeters (excluding the thickness of the top plate), and using this information the frame in figure 5.2.2 was designed. Each side would be sealed by MDF plates, where the backside would consist of two detachable plates as the components inside the case were required to be easy to access.

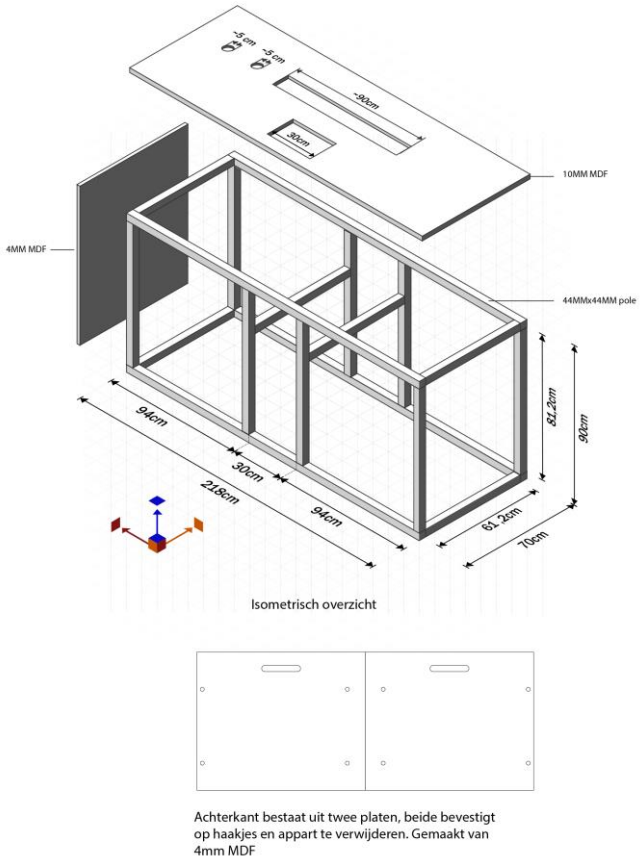


Figure 5.2.2 – overview of the structure of the case

In this design, each joint would be mounted by two corner pieces, each using four screws. The fixed MDF plates are drilled into the poles, and the MDF plates on the back attach with hooks for easy disattachment. The two poles in the middle carry the weight of the television and provide extra support to the center of the case.

5.3 – Size of the chain

Once the size of the case and the size of the bits was clear, the length of the chain could be calculated. The outer chain would consist of 73 and the inner chain of 46 pieces, or chains of 438 and 276 cm ideally. However, the prototypes of the chain showed a small space between every bit, averaging out to 6,1 for each chain piece. Therefore, the actual length of the chain was estimated at 445.3 and 280.6 cm respectively.

5.4 – Driving of the gears

One question that remained was how the chains were going to be driven. These motors had to be very strong, and it had to be possible to control their speed in some way. This

could be by changing the motor's speed or controlling when the motors were running. After a discussion with the technical assistant of our department two options were found: Using the electromotor of a drill, or using stepper motors. This first option would provide us with a well geared and powerful engine, but did require to find and hack a drill twice, as two motors are required. Therefore, the option of choosing stepper motors was taken. These motors are rather strong and easy to control. By using a driver, the motors can be told to move one step forward, which gave the desired control.

5.4.1 – Motor suspension

Once the stepper motors were chosen, a drive mechanism had to be designed. The stepper motors were equipped with a "GT2" gear that allowed for an easy connection. This tooth size is often used for 3D printing parts such as belts, and therefore similar connections were searched on the internet. Using available parts that were found on the internet, the following transmission idea was designed:

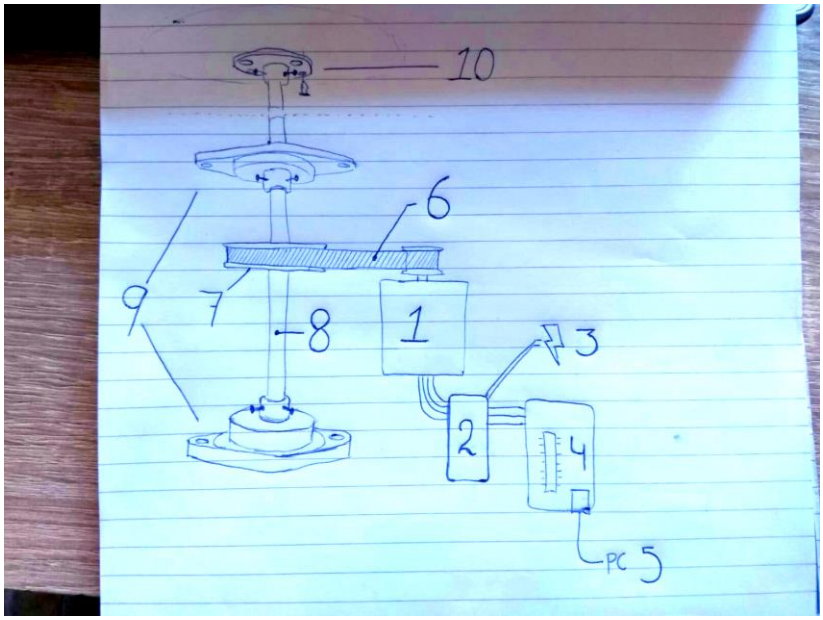


Figure 5.4.1.1 – Initial sketch of driving for the chain

As shown in figure 5.4.1.1, the stepper motor [1] is controlled by a *Sparkfun Easydriver* [2]. This driver is connected to both a power supply [3] and an Arduino [4] which tells it when to rotate. This Arduino is in its turn connected to a computer [5] which powers the Arduino, and possibly controls the speed. The stepper motor controls drives the GT2 belt [6], which fits on the GT2 gear of the stepper motor. This belt connects to another GT2 gear [7], this one being larger than the first, creating extra torque at a ratio close to 1:4. This big gear uses screws to attach a shaft of 8mm [8]. This thickness was chosen as all required

parts were available at a diameter of 8mm. This rod is kept in place by two *flange bearings* [9], which keep it in place with screws. The gear that drives the chain is connected to a *flange coupling* [10] by four bolts. This *flange coupling* attached to the rod by screws as well. Two of these setups will be used to power the chain, using one for each chain. Motors will only be placed on one side of the installation (left side). The other side will not be powered and will lack part 1 up till 7, only keeping a rod with a flange coupling and gear in place. The exact parts that were bought can be seen in the appendix.

5.5 – Automata

In an early stage, very little definitions were made about the automata. Using the size of the television and early sketches of the environment an estimation was made to which size would look right. A height between 15 and 20 centimeters was chosen. As described in chapter 5.2, the automata would get a hole of 18x30 centimeters to be built in.

One decision that was made on an early stage of the specifications of the automata, was which joints will move. It is possible to make every joint rotate and this would allow for a very realistic motion, however also increase the chance of error as more moving parts would require more supports and more points of rotation. As the aim was a simple walking animation, it was chosen to make the knees and the shoulders bend, but leave the other joints as the ankle, elbow, neck and hands fixed.

Samantha Galvez did research on how these joints can be made best, and also developed the gears and construction that makes the automata move. Using an example from the internet as a starting point this mechanism was made. This mechanism was rebuild by her in Illustrator, so the parts could be cut out by a laser cutter.

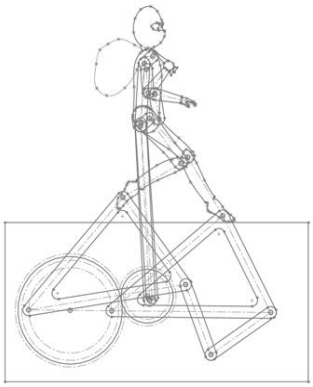


Figure 5.5.1 – Automata design made by Arild Amland, shared on instructables.com

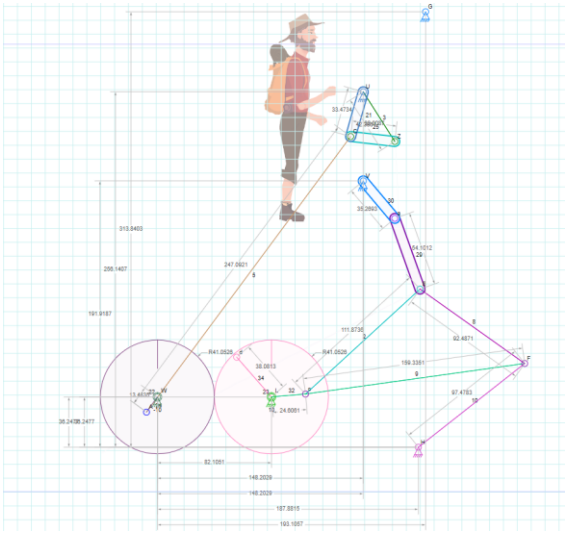


Figure 5.5.2 – Designing the driving mechanism for the automata in Linkage

5.6 – Camera

The goal of the camera is to take both pictures, and show a time-lapse as well. Therefore, the easiest way to achieve this is by putting a camera and a screen together in one casing. This screen can be controlled by a computer which also controls when pictures are being taken. For an actual product a microcomputer such as a raspberry pi can be used, but as we had no experience using one of these microcomputers the decision was made to use a laptop instead. This leads to many components that have to be concealed in this prototype: A camera, a screen, a laptop, the laptop's power adapter, the screen's power adapter and a power brick.

Several ideas were developed on how such a camera could look. Most revolved around keeping the looks of an old camera and playing with the positioning of the legs, however some ideas were rather different and looked more like a display one could find in a museum.

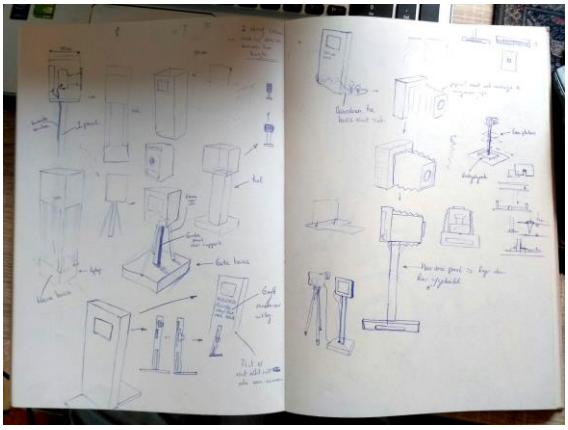
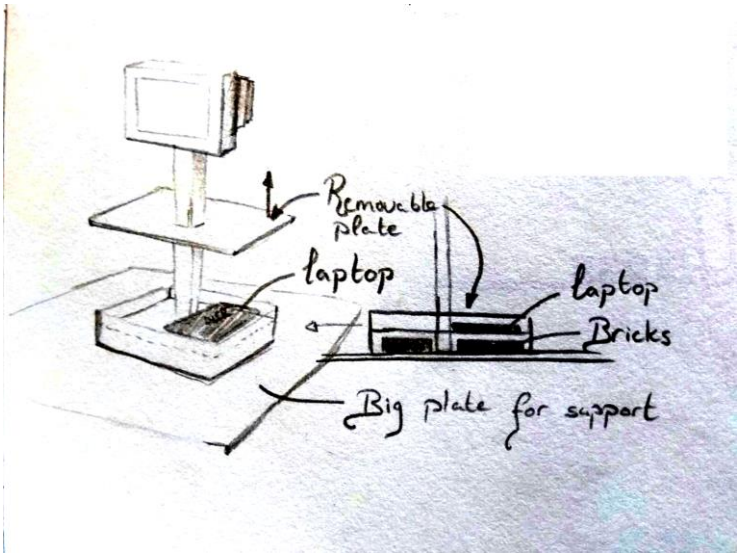


Figure 5.6.1 – Concepts for the camera

As it was clear how much material the casing would use, it was known that there would only be one pole of three meters left. This lead to a rather quirky design shown in figure 5.6.2. One pole would attach to a large MDF plate by corner pieces and glue, which kept it upright. On top of this was a box which held both some weight (e.g. bricks) and the hardware. This box could be accessed by lifting the top of it upwards.



5.6.2 – *Initial idea*

However, this idea felt extremely over the top and unrealistic. When this idea was communicated with mister Davina he suggested to instead make a tripod, as he still had several wooden poles laying around. The connections from the original would be possible, but people would walk on the MDF and make it wobble that way, and it would not be possible to level the camera. These problems would be no issue with a tripod. He suggested

to bend the corner pieces to the correct angle for the poles and use those as support, as well as a screw that would go through the flat surface. One of the fears was if this would be strong enough, but according to him this would be more than sufficient. In this situation, the laptop would be placed in a case right under the center of the tripod. This idea seemed more reasonable, and therefore this was chosen. The required height for the camera was estimated, and the dimensions shown in figure 5.6.3 were chosen. The design of the camera remained a classical look. This simply had the advantage that people would recognize it as a camera and presumably be able to understand the function of the installation better.

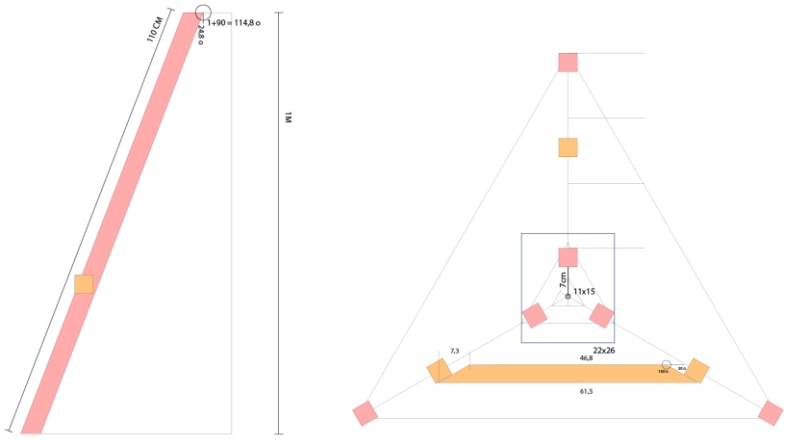


Figure 5.6.3 – Dimensions of the tripod: Pink is for vertical support, orange for horizontal.

6 – Realization phase

This chapter will elaborate on the building process of the installation and describing the changes that were made along the way. It is divided into several chapters and largely disregards the chronological order of the building process, but the chapters are ordered so that they resemble the chronological order as closely as possible.

6.1 – Building of the case

The frame was build according to the plan presented in chapter 5.2. With the help of mister Davina, who was in charge of the wood workshop, this building process went very smooth and the frame was finished within a day. The MDF plates, which were cut to the correct size by the shop, were attached with screws and the result was a very sturdy case.

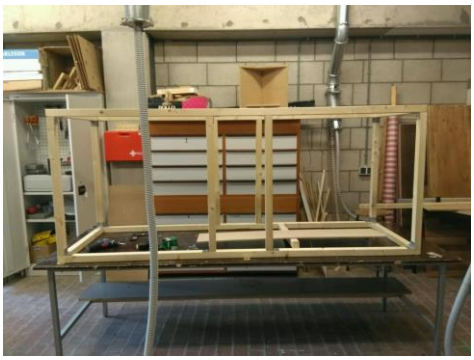


Figure 6.1.1 – Frame still without supports for the television

Holes were added to the top for the television and the automata once the MDF plates were attached. As well four handles were added to the sides to allow for easier transportation. The back plates were attached with hooks which allowed them to be removed easily.

Figure 6.1.2 – Case with holes at the top and handles added seen from the back

The painting required more effort than was hoped. As MDF can act like a sponge when it comes in contact with water, the question was raised if it was possible to use acrylic paint directly onto this surface. Mister Davina advised to first sand the glue layer of off the MDF, and then use a layer of primer to ensure that the acrylic paint wouldn't get sucked into the

paper-like MDF. Therefore, all parts facing outwards were first covered in a layer of primer before applying the acrylic paint.

Figure 6.1.3 – Case painted with two layers of primer

Unfortunately, for both the primer and the acrylic paint held that one layer was not sufficient. Especially with the acrylic paint the results were worrying as the coverage of the paint was rather poor. For the acrylic paint this meant that more paint had to be bought than was estimated. Eventually it took 1,5 liters of acrylic paint to give the casing a good covering layer.

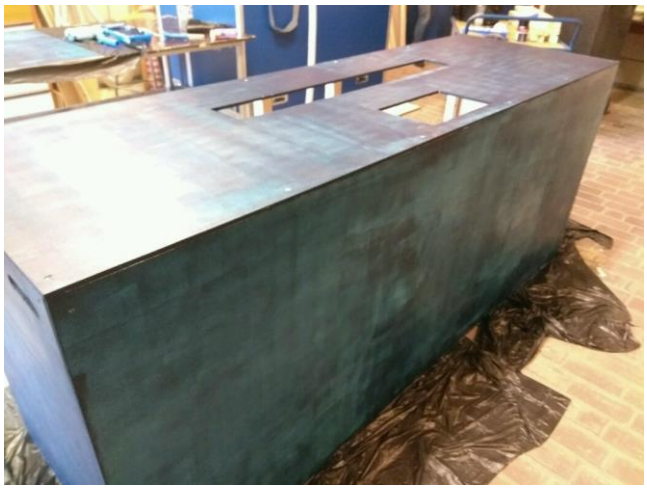


Figure 6.1.4 – Case painted with one layer of acrylic paint

Figure 6.1.5 – Casing painted with three layers of acrylic paint

In a later stage, four holes were added to allow the attachment of the gears to the motors underneath the case. This allowed the drivers to be hidden underneath the table. Due to the issues with the driving mechanism described in 6.4 and 6.5, the drivers had to be relocated from a concealed spot (underneath the gears that drive the chain) to a visible spot. Twelve screws are now visible left to the automata which hold the stepper motor drivers.

Figure 6.1.6 – Large gear painted and in place

6.2 – Building the automata

The automata's design was largely finished in the realization phase. Once the specifications described in chapter 5.5 were finished the design was printed and tested.
Samantha Galvez her solution for the joints were nails, which provided a very smooth rotation. These nails were attached to holes that were slightly smaller than the nails themselves with glue, and rotated around parts that had slightly larger holes. Fortunately,

the servo was able to power all limbs and worked exactly as was hoped. There were several flaws however with this prototype. First of all, the position of the servo was off, and secondly certain nails attached from the wrong side, but the most obvious flaw was that one knee of the automata would bend in the wrong direction. This was due to the fact that the automata would stretch his leg slightly too straight, which made the knee “fall down” due to gravity, instead of staying “up”. This tiny mistake, caused by the play in the joints and the fact that the joint of the hip was moved backwards very slightly to allow for nails from both sides, was fixed in the second version.

Figure 6.2.1 – First automata with leg bending the wrong way

The second version of the automata was built into the frame directly, as there was unfortunately no way to detach him from the case as was the original idea. By the time this was done the canvas print was finished and cut and all parts were decorated with the appropriate piece of canvas. All parts that were easily visible were painted in the same color as the case to make these parts match. The result can be seen in figure 6.2.2.

Figure 6.2.2 – Second automata placed into the casing before placement of the screen

6.3 – Design for the print

In the very first weeks of the realization phase, Samantha Galvez took care of the environment which would be put on the chain. After many hours of drawing she presented the eventual environment which would be put on the chains. The figures below show this design and several snippets.

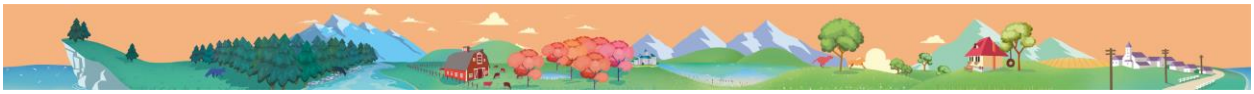


Figure 6.3.1 till 6.3.3 – Design for the canvas on the chain

As can be seen in the figures above, the design translates from colder to warmer colors. The background also has several different colors, and once placed on the chain this can lead to many different combinations of foregrounds and backgrounds. The sky will be projected on the television screen, as was explained before, and the color of the sky can change throughout the day.

The design was handed over and made ready for printing. Some small adaptations were made: The water at the sides was made completely identical so the image would loop perfectly, the third mountain was replaced by a smaller one as these exceeded the size of the chain, and the front paws of the second dog were lifted of the ground so he would fit on one chain piece.

However, at this point the design was not ready to be printed yet as two important things were missing: A bleed, and the shapes for the laser cutter.

6.3.1 – Adding a bleed

As the design will be split up and cut out later on, it is important that the design has a bleed. This is an extra border around the print, which has the same color. The function of the bleed is to prevent the white of the canvas showing when the laser cutter cuts at a slightly wrong position. Each image got a border of at 3mm around all sides.

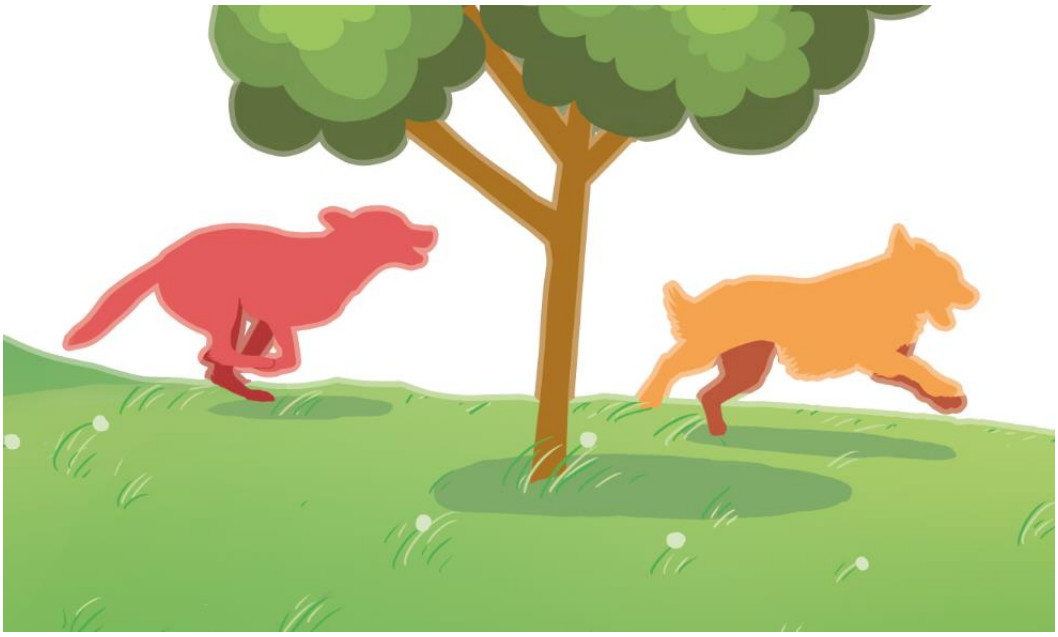


Figure 6.3.1.1 – Dogs with bleed shown at 50% opacity for demonstration

6.3.2 – Tracing the image in illustrator

As the original image was made in Photoshop, no vector files were present which could instruct the laser cutter where it would have to cut. Therefore, the entire image had to be traced in illustrator.

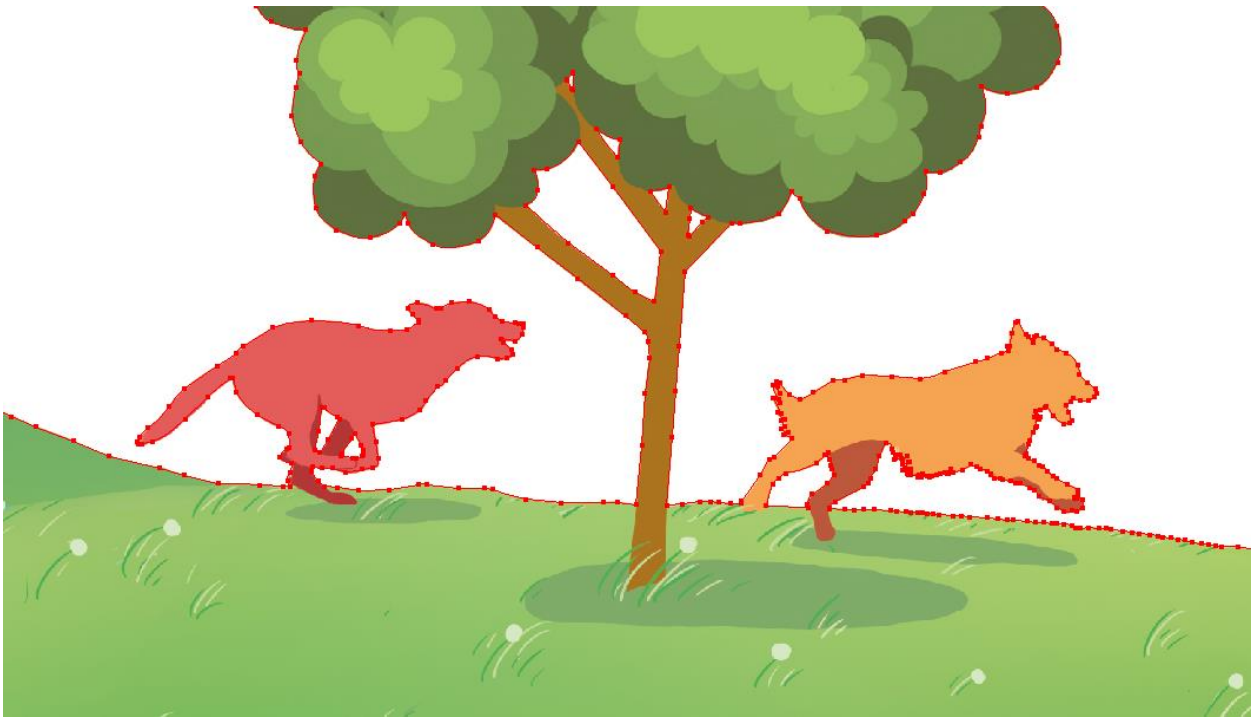
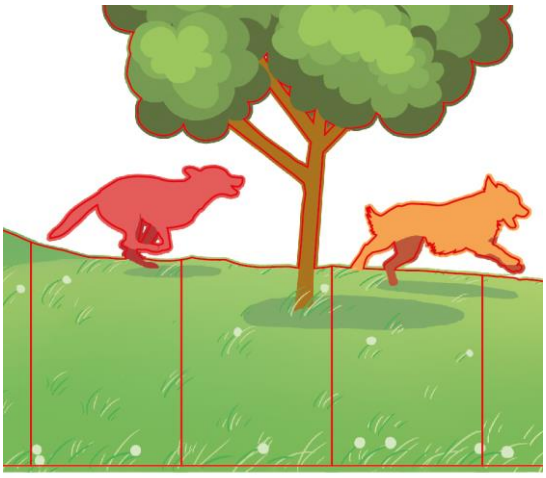


Figure 6.3.2.1 – The image traced in illustrator

6.3.3 – Creating separate boards

Once the image had a bleed, and was traced, it could be divided into separate boards that would fit on the chain. This required to link the images with the vector shapes. For each board, two objects were made: One containing the vector properties, and the other containing the image of that board.



6.3.3.1 – Image of the dogs, separated into several boards by a red vector line.

6.3.4 – Creating the file for printing

At this point, the file for the printing could be made. Two restrictions were kept in mind while designing this file: The largest size that is cutable by the laser cutter is 100x60 CM, and the width of the printer was either 137 or 91 CM. As the initial idea was to put a wooden frame on the canvas print to keep it flat, 100x60 was chosen as the maximum, which allowed us to cut this frame in the laser cutter. Using these dimensions, the canvas of 91 CM would cost the least.

The separated images were distributed over several canvases with the dimensions of 91 x 60, each having a border for both the frame, and a second border to ensure that the laser cutters head would not cross the frame. Each file had several squares which were not part of the background, but allowed us to test whether or not the alignment was right.

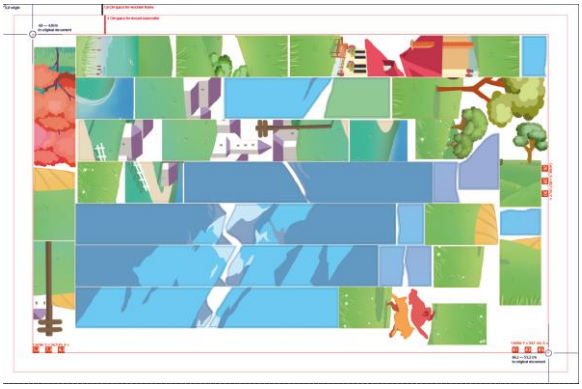


Figure 6.3.4.1 – One of the four parts of the canvas print

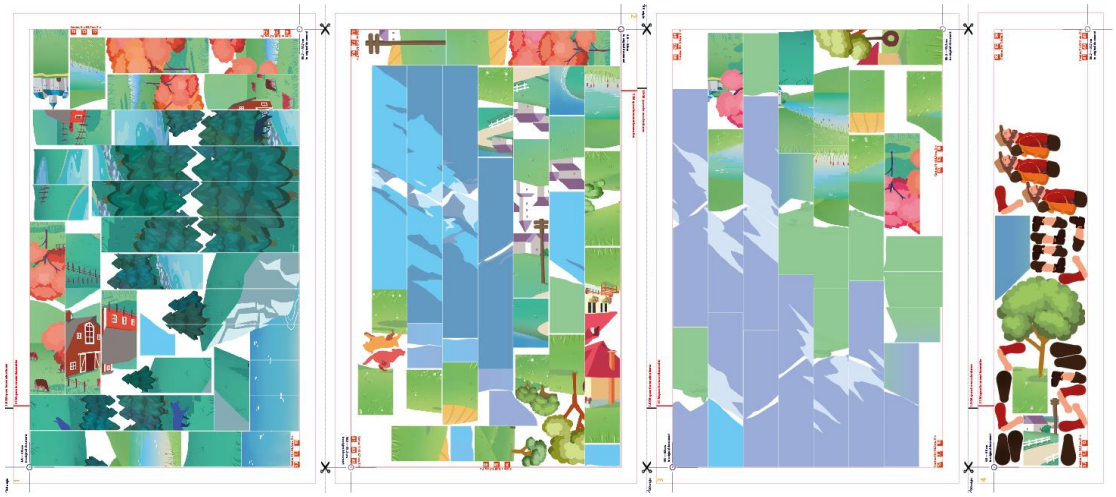


Figure 6.3.4.2 – Complete file for the canvas

6.3.5 – Printing and laser cutting

The file, which ended up being 2 meters long, was printed out on canvas and cut up into four sections. It showed slight color shifts, such as some mountains printing blue instead of purple, and the puppet printing more red then he was designed, but all in all the result looked very promising.

Figure 6.3.5.1 – The canvas halfway through printing

As the position of the vector shapes was linked to the position of the images, all four files contained a detailed map of where the laser had to cut. An example of one of these files is shown in figure 6.3.5.2.

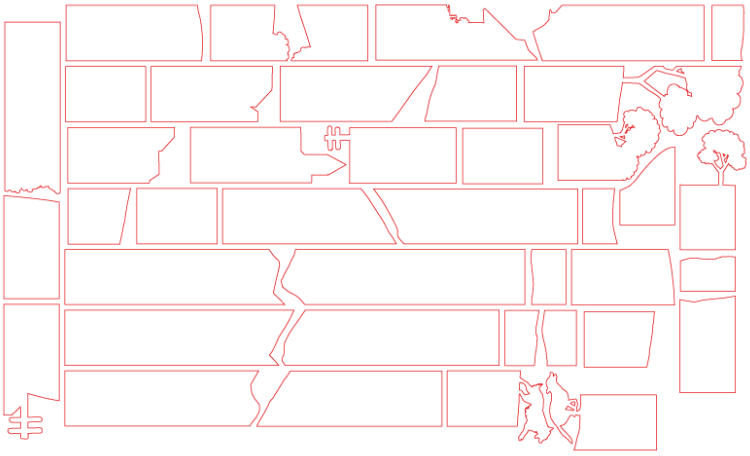


Figure 6.3.5.2 – Laser Cut design for the canvas

By aligning this file to the marks on the canvas, a rather precise cutout could be made. However, this cutout was not perfect, as somewhere along the process either the print or the laser cut file had scaled. This made the laser cut head misalign the more it was moved from its origin. Nevertheless, this was no major issue, as the bleed ensured that no white

was cut out, even though the laser misaligned with 1,5 to 2 millimeters at the bottom right of the image.

Figure 6.3.5.3 – One of the canvas sheets in the process of being cut out

This process resulted in a small stack of canvas sheets, ready to be glued on the chain.

Figure 6.3.5.4 – All parts cut out

6.4 – Creating the chain

After the three iterations described in the specification phase, the chain was about ready to be cut. The same vector shapes used to cut the canvas were used to cut the parts of the chain, with the addition of four holes that allowed to connect it to the other parts. 119 front plates, 119 back plates and 238 bottom/top plates were cut for the chain, some of which can be seen in figure 6.4.1

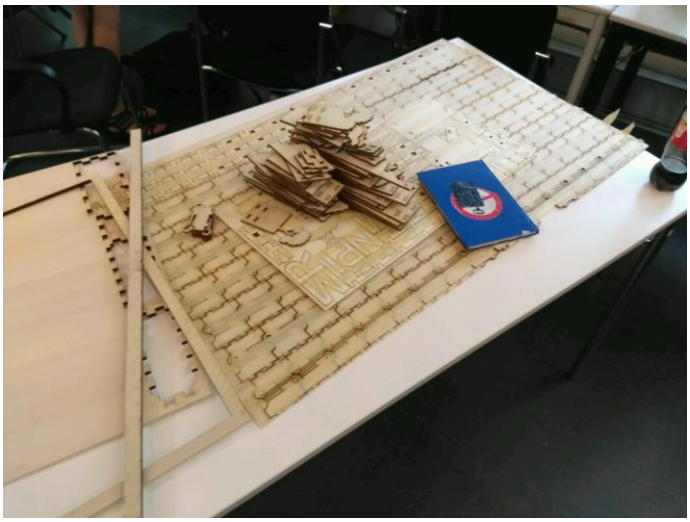


Figure 6.4.1 – Some of the chain parts cut out

The second step was to paint all these parts in the same color as the casing. Once this was done, all parts were glued to each other, and the chain was put together.

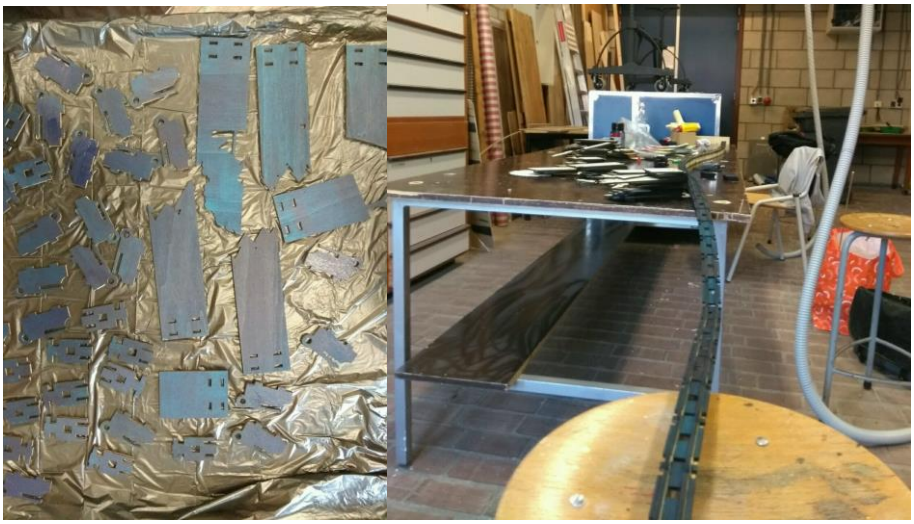


Figure 6.4.2 and 6.4.3 – Parts painted and chain glued together

The final step was to put all the canvas on the correct boards, and glue these to the chain as well. The result can be seen in figure 6.4.4.

Figure 6.4.4 – Chain completed and put on top of case

However, once the driving mechanism was build (see 6.5 for more details regarding this), it revealed that the stepper motors were not strong enough to drag the chain across the table. This chain became heavier and had more drag than was expected. As the realization period was coming to an end, a quick, and not elegant solution was chosen: A quick test with dragging a piece of plywood across the surface revealed that the wood / paint combination created a lot of friction. However, by adding some plastic tape underneath the wood, the friction was decreased drastically. Therefore, tape was added to the entire chain as a quick solution that can still be undone whenever necessary. This solution decreased the drag significantly. For a more durable and elegant solution, acrylic feet can be made, which will also decrease this drag.

Another issue that revealed in the final stages of the building phase, was that the gears for the small chain were still not fitting. After many attempts the teeth of the gear still misaligned with the holes of the chain. The holes for the driving mechanism had already been drilled at this point as we were sure that the correct size had been found. Increasing the size of the holes revealed to be no solution and the size of the gears had to increase further than the chain would allow. Therefore, the right gear was replaced by a smaller circle, allowing for the required play in the chain to increase the gear on the right. This time around, the teeth fitted the gears and the chain was able to move.

6.5 – Building the driving mechanism

When all desired parts that were required for the driving mechanism arrived, the components were measured and a casing was designed which could hold all needed components. This casing had to fulfill certain requirements: First of all it had to be sturdy,

as the stepper motor was rather heavy, and the casing had to deal with the forces from the motor. A second requirement was that it had to be possible to adjust the position of the motor while it was placed in the casing. The case also had to suit a bigger stepper motor if it was required to use one, and it had to be possible to attach / detach this casing rather easily to the casing. Lastly it had to be possible to place / take out all components when the casing was glued together without taking anything apart. Similar requirements held for the casings on the other side, which didn't contain a stepper motor.

The casings, shown in figure 6.5.1 and 6.5.2 were designed. Both these casings can be attached to the main frame by six bolts and nuts. In the casing with the stepper motor, all parts are accessible through the window on the front, while in the other design the side can be taken off to access the flange bearing. To ensure strength, these parts were made out of 8mm triplex.

Figure 6.5.1 – Stepper motor casing

In order to prevent wires from moving around unintended, the microcontroller and the stepper motor driver received a frame as well. This frame also had the function of holding a fan towards the drivers, which could become extremely hot if they were not properly cooled. This frame could be attached and unattached to another part by sliding it on and off.

Unfortunately, these easy drivers could not provide sufficient power to the stepper motors. When an “arm” was connected to the shaft (in our case a gear), the rotation could be stopped by simply putting your pink in front of a tooth. As well, the chain ended up heavier than expected, and the paint that was used seemed to stick to the chain. Therefore, new solutions were searched. One property of the Easydriver is that it can only output 700mA of power, this while the stepper motors are rated up to 2.5 amps. Therefore, the first improvement that was tried was to buy new stepper motor drivers, which could deliver up to two amps. The Easydrivers were swapped out for an “A4988” stepper motor drivers by Polulu.

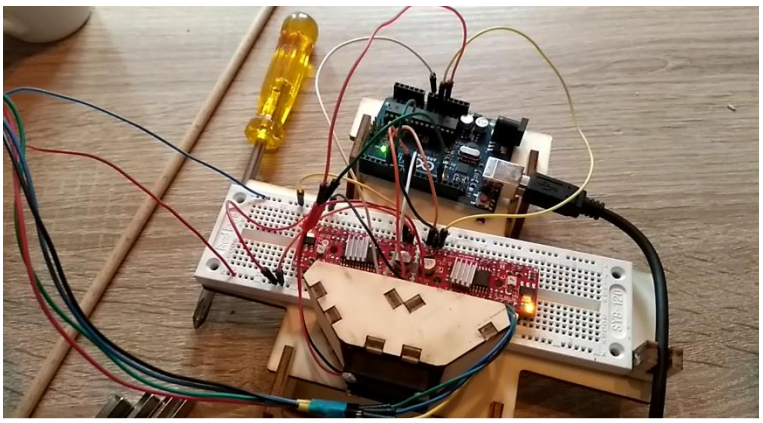


Figure 6.5.2 – Easydriver stepper motor drivers on a breadboard

As the current that they used was far higher than the Easydrivers, these stepper motor drivers were connected to a soldering board instead. As well, the power supply was upgraded from a small wall converter to a power adapter for a screen. This power adapter could deliver up to 4.5 amps and therefore should provide enough power for both stepper motor drivers. A new case was designed so the fan could once again cool both drivers. The first results were promising, as the gears were a lot harder to hold when these were installed.

A second solution to give the driving mechanism more torque was to add another gear system. Until now, the cases provided a gear ratio of 1:4. By adding two wooden gears, this could be increased to 1:20. Therefore, two extra gear-holders were build and extra gears were printed as well as two new casings. More flange bearings and flange couplings were ordered in order to support these new parts. These gears can be seen in figure 6.5.4. After installation, the stepper motor was able to pull the big chain. However, due to the large friction described in 6.4, this movement was very stuttery. The described fix of adding tape resolved this issue, and these new stepper motor drivers and gears solved the problem of the weak drivers.

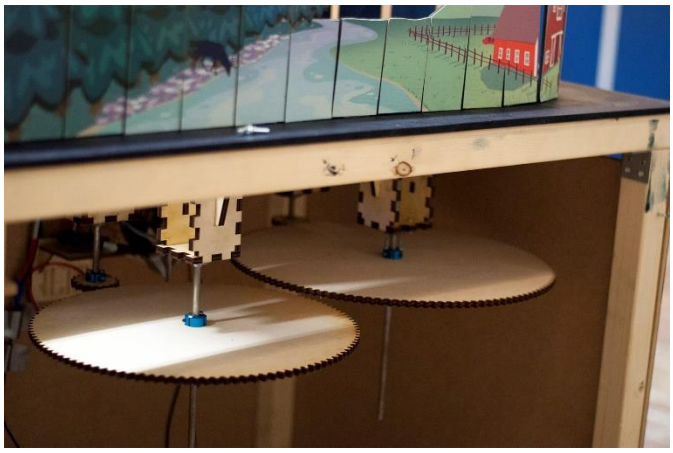


Figure 6.5.4 – Extra gears that were added to the driving mechanism

6.6 – Designing the screen

Samantha Galvez took care of the images that would be projected on the screen. She created a program that could cycle through the quotes, display moving clouds and had backgrounds that changed color. In order to make the transition in colors more natural, a gradient moving from right to left has been changed to a gradient moving in from the bottom. A screenshot of this program can be seen in figure 6.6.1.

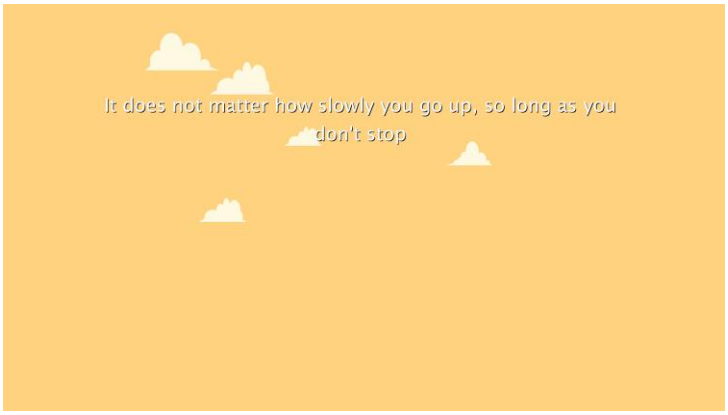


Figure 6.6.1 – Screenshot of the background program

6.7 – Building the camera

Building the camera started with building the tripod. The dimensions required for the camera were estimated and using this the surface of the top plate was fixed. With the help of mister Davina and the experience of building the case, building the tripod was quickly done. Eventually the horizontal supports were not added, as the current structure had proven to be strong enough. What was added were three feet witches height could be

altered, so that it was possible to adjust the camera to be level. The tripod was painted an orange brown to make it fit better with the installation.

Figure 6.7.1 – The tripod

A study mate, Yvon Gankema, was kind enough to let us use her camera, for which we are very grateful. The dimensions of this camera and the screen were measured, and the camera housing was designed. After a test it was revealed that the camera could not be charged by the USB cable that was used for charging. This meant that the casing had to be easy accessible in order to swap the battery if needed. Therefore a casing that consisted of a bottom plate and a top enclosure was designed. The bottom part held the camera and screen in place and guided cables, while the other part was solely for the aesthetics. This case was painted in the same color as the tripod. A paper bellows was added to make it resemble an old camera. The additional flash, which was an idea to indicate to the user when the camera took a picture, was left out due to time shortage.

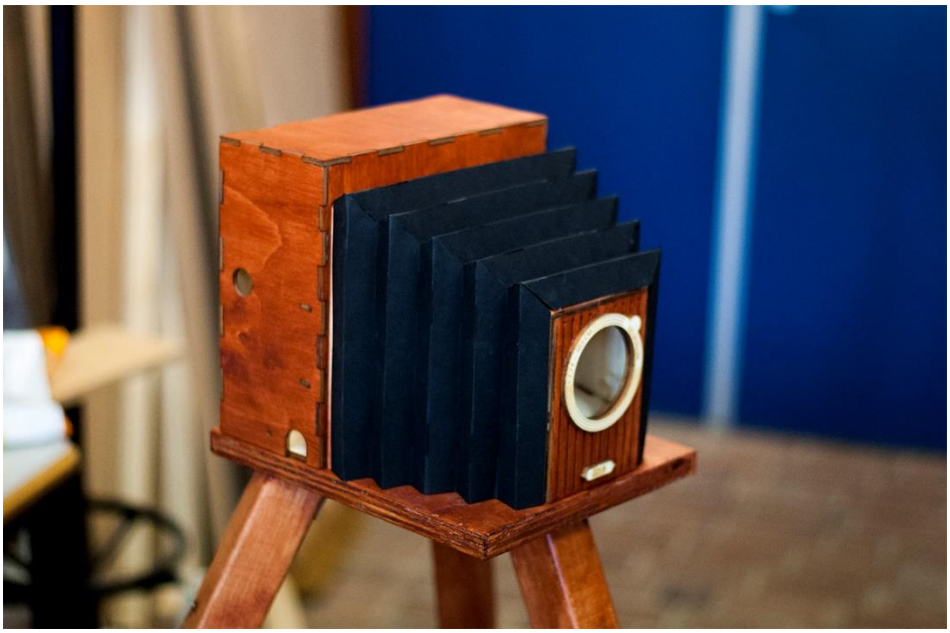


Figure 6.7.2 – Camera housing

6.8 – Program for camera screen

Using the correct software, controlling the Nikon D5000 camera was very easy. After many possible solutions, “DigiCamControl” was found. This program allows the user to control all settings of the camera on the computer, as well as an option to write simple scripts in which you can program when the camera should take pictures. Three lines of code turned out to be enough to achieve the requirements: One loop statement, one instruction to take a picture and one delay. When the camera took a shot, this file would transfer to a chosen folder on the PC.

A processing sketch would cycle through this folder and display all pictures in order on the screen. When a picture was taken, this would be added to the queue of pictures to display. The current sketch does not delete old files, but instead only uses the last n pictures, where n can be set. Other features were added to this sketch as well, such as the ability to apply a digital zoom, move around on the picture and choosing the framerate of the animation. The information about the animation could be displayed or hidden. A screenshot of this program is shown in figure 6.8.1.

Figure 6.8.1 – Processing sketch with information enabled

6.9 – Testing the system as a whole

Once all components were finished were installed, a test run was held. The speed of the chain was defined using the following assumptions: A picture will be taken every thirty seconds, the walking animation will consist of about 12 images for one cycle as this looked proper in a test. It was estimated that it should take four steps (two cycles) in order to walk 6 cm (one chain block). The back chain will run at 1:5th of the speed of the front chain as this looked the best in the early animation made in After Effects. Using this information, the desired speed of the gears was known. The gear driving the large chain had 45 teeth, and therefore had to rotate at a speed of one round per 18 hours. This gear was driven by two gears with a ratio of 45/6, or 2:15, which was lead to another gear with had a ratio of 1:4 which the stepper motor was connected to. In other words, the stepper motor had to rotate 30 times in order to rate the big gear once, giving a speed of one rotation per 36 minutes. As the stepper motor was able to make 200 steps a rotation, and was set to perform 1/16 a step at the time, the stepper motor had to make 3200 steps in 36 minutes, or one step every 0.675 seconds. This number was used as the delay between the signals from the Arduino.

Another number was calculated for the second stepper motor in a similar fashion. These numbers were tested by timing the progress the chains made over half an hour, and adapted later on as both numbers were slightly off.

Using the number of steps it took to make a full rotation for the automata, the delay between steps was calculated.

The camera was connected to the computer and a small time-lapse was made. This revealed that the speed of the chains were correct and fitted well, but the speed of the automata was too quick. These settings were tweaked.

Other issues that arose while testing were that the camera had trouble with the large difference in luminosity between the chain and the screen. Turning the brightness of the television down solved this partly, but if the installation will run in a darker spot or at night, this issue might become more severe.

7 – Evaluation phase

The goal of this phase was to give an answer to the final two sub questions: “Does the realized prototype attract the attention of passerby?” and “Do the passerby understand the meaning and function of the prototype?”. A two day test was held where data has been collected by observing passerby and conducting short interviews. As well our client, Clemens Mensink and Fabienne Heijne from Menperium, were asked about their feedback on the result. A final section is devoted to the changes we would like to see on this product.

7.1 – Time restrictions during the testing phase

Due to the fact that the realization phase took two weeks longer than was expected, and the fact that some parts could only be borrowed during the Thursday and Friday of the final week, a small test consisting of two days could be held. This meant that it was impossible to test the effect of the installation during a longer period of time. In this time frame, most passerby will see the installation twice, once upon entering and once upon leaving. Therefore, it became impossible to conduct a test that would truly answer our main research question ("How can an art installation showing quotes, placed in the hallway of a company, bring out employees' intrinsic motivation in order to reach personal goals?"). The focus was instead put on the last two sub questions. These gave insight in if the installation could in fact help people to bring out their intrinsic motivation and reach personal goals. As listed above, these two sub questions revealed if people noted the installation and were willing to give time to it, and if people understood the meaning of the installation. Our installation requires both to be true in order to let people reflect upon themselves.

7.2 – Changing the testing location

Another change that was made, was the fact that the testing location had been changed during the final phase of the realization. Instead of testing in Hall B, the library entrance of the Vrijhof had been chosen. This decision was made due to several reasons, the first being that the installation turned out to be heavier to transport than expected. As the installation was built in the woodworkshop of the Vrijhof this new location required less transportation. As well, we had close contact to one of the persons working at the Vrijhof, who could help us arrange a good spot. From this location, the installation could easily be seen while walking from/towards the library or the restaurant using this entrance which assured that plenty of people could see the installation. However, the original location would have been even busier which could have helped in gathering even more results.

7.3 – Testing plan

As Samantha Galvez and I both had to use the same period to collect our data, a test was developed that allowed for us both to gather sufficient information.
The original idea was as follows: From 10:00 till 16:00 every participant that would look / not look at the installation would be tallied. For every person that stood still, a timer would be started to get an assumption of how long the installation would interest them. A similar

score would be kept for people who got drawn into the installation by people already looking at the installation. A statistical analysis would be conducted on these data to give insight in the amount that the installation intrigued people. This had close ties to Samantha Galvez's literature research which is included in her thesis. Meanwhile, whenever someone had taken the time to look at the installation thoroughly, he or she would be asked to answer questions, which helped us get a view on the second sub question regarding the meaning. To keep the interviews short and concise, three questions were prepared to ask to the participants. These would be asked in a semi-structured way, meaning that if it seemed necessary other questions could be asked as well. These three questions are listed below:

- What do you think the function of the installation is?
- What do you think the story of the installation is?
- What do you think the link between the quotes and the rest of the installation is?

When asking for the function, the motivating aspect of the installation should arise. The second question should bring forward the aspect of the slowness of the installation, where one shouldn't look at the progress he/she makes during a short period of time, but instead look at the long run. The final question should reveal if the quotes have a clear function. These should resemble the positive thoughts that run through the automata's mind whilst working on his task.
The answers to these questions would be written down, and trends and outliers would be identified using these notes. This should give insight on whether or not people understand the essence of the installation, and provide us with a list of things that should be improved in a later version.
One remark that can be made about this testing method, is that we might influence each others data as the tests were held simultaneously. The option was considered to give each test (the tallying and the interviews) separate timeslots. However, this would give both of us a lower number of results to work with. As the time was limited, this option was chosen, and the precautions of keeping the interviews short and only interviewing people who were done looking at the sculpture was chosen.

7.4 – Setting up the installation

On Thursday, the 28th of July 2018 the installation was set up near the entrance of the Vrijhof. The previous day some preparations were done, such as adding a black cloth as wall which gave the installation its own separate space. Once the installation was set up, it was revealed that the lighting conditions in this corridor were worse than in the woodworkshop, which increased the issues with the camera and screen brightness

described in 6.9 even more. Therefore, a separate theatre light was placed next to the camera which illuminated the chain. The setup can be seen in picture 7.4.

Figure 7.4 – installation placed near library entrance

7.5 – Conducting the test

Setting up the installation and fixing the light issues took longer than expected, and the tests were started around 13:00. This continued till 17:00. We as observers remained out of sight as much as possible by settling in the back of the corridor. The test was conducted as described in 7.3. The second day went more to plan as the test run from 11:00 on. This second day the testing continued till 14:00 as at that time our client came by. In total, the data has been collected over seven hours. During this period, 1536 people passed the installation, of which 18 people were interviewed. Several pictures can be found in the appendix which show the installation during the test-days.

7.6 – Results on the sculptures attraction of attention

Samantha Galvez measured the attraction of attention by measuring the three measurement tools that the literature provided: Attracting power, holding power and average holding time. These three concepts give an indication to the attractiveness of the installation. Attracting power is whether or not an individual gives the sculpture attention

in the form of a glance while passing by. Holding power was measured by timing how long a passerby would stand still to give the installation more attention. It was also measured how many people were drawn into the installation while other people were observing it.

In two days of testing, 1536 people passed the installation. 40% looked. 41 took the time to stand still. Time ranged from 2 to 83 seconds with average of 18 seconds. The amount of people who stood still to watch other people interact with the installation was very low, at a total of six passerby falling into this category.

As Samantha Galvez writes in her thesis, it can be concluded that the installation attracts plenty of attention when it comes to people looking at it while passing by. However, Samantha adds, the average holding time of eighteen seconds is still too short, as one cannot grasp all components of the installation within this period of time.
Personally, I disagree with the conclusion that eighteen seconds is too little to grasp the meaning of the installation. It is not a requirement to see the entire animation to get the purpose of the sculpture. However, I do agree that the number of people that took the time to look more thoroughly at the installation should be increased. In the following sections suggestions are given which could increase this holding time.

7.7 – Results on the purpose sculpture

The results of the eighteen interviews varied a lot, and several new insights in how other people perceive the statue have been learned. This chapter will describe the trends and outlying results that were gathered during the two days of testing.

Looking only at one quote
A very common misconception when participants were asked to guess the function / story of the installation, was the fact that most people looked solely at the quote that was presented on the screen. Using this specific quote, the meaning is harder to find, because you try to connect one sentence to the whole, instead of the concept of motivational quotes in general. One participant tried to find the story of the installation by solving the one displayed quote as if it were a riddle. This issue revealed with four of the eighteen interviewee and can therefore be seen as a serious flaw.
Several assumptions to what the reason could be can be made: The first one being that the quotes on the camera screen could be hard to read then the background color was light yellow. The effect of creating a more dynamic background worked against us when it came to this specific color, as the camera captured it very poorly. The captured color shifted from a bright yellow, to near white, to green in some photos. Someone suggested that this

can be fixed by setting the white balance properly but unfortunately we were not able to fix this on the spot. Some examples are shown in figure 7.7.1.

Figure 7.7.1 – Color shifts presumably due to wrong white balance setting, left is the desired image, center is too green, and right is too yellow.

A second reason why the quotes on the camera got less attention then the quotes on the screen is the fact that the quotes on the TV-screen were larger than the quotes on the screen of the camera. It is simply easier to read the quote on the big screen then on the small one.
However, some of the quotes were also rather confusing, and made finding the purpose of the sculpture hard. One participant guessed motivating as function, but also something with entrepreneurship. This due to the fact that the quote “Pump Up Your Profits: Sell More, Faster and Easier than ever before!” came by in the timeline. This quote seems to be out of the ordinary compared to the others and let this participant miss guess its purpose, even though he was on the right track.
Several solutions can be proposed to solve these issues. The first solution would be to fix the white balance settings on the camera, and perhaps take out the yellow sky color if the issue still remains. A second would be to add a stroke to the text, which could make the text pop more on the small screen. A third improvement would be to display several quotes at once on the big screen as well and let them, for instance, grow big and then fade away. This way it is still possible to cycle through quotes but it’s also clear that there is more than one quote. As well, the list of quotes will have to be filtered to take out those which have less to do with the installation.

Not understanding the purpose of the sculpture
Apart from trying to combine one quote with the sculpture, many people didn’t get too far when it came to figuring out the function or purpose of the sculpture. Three out of the eighteen participants were not able to come up with any purpose or story for the installation. The suggestions written in the section above could help reduce these numbers. A suggestion that we got from our client was to give the installation an appropriate title that was in line with its purpose, and put this title on the installation.

Perhaps a plate with a small description could help as well, though personally these always feel too obvious and forced.
However, not all results were negative, as several of the participants unveiled its. Five out of the eighteen participants were very close to the purpose of the installation. Some described the function as motivating, and another's used teaching live lessons, or giving an inspired mind for the rest of the day which according to him was perfect for the library.

Story of the sculpture perhaps still too distant
The story of the installation was for many harder to guess. A variety of answers was given some of which being very interesting.
Most of the participants (6) tried to find the story in something literal, such as traveling, making a journey, or being on adventure. When a group of three joined the sculpture, the first person guessed that the traveler was lost, where the second suggested that he looks like he knows what he is doing (which is in line with section 4.3.5, where the automata is designed to look well prepared). Their suggestion was that hiking was tough, and that the quote had something to do with it. However, this group got stuck by looking at one quote. Two participants assumed that the installation had to do with slowing down and taking it easy. Someone explained that it could be about the fact that things always seem busy and fast in your head, but that real live can be a lot calmer than the mind makes it seem. Two participants guessed its function to solely be seen as art, or to bring joy. Only one of the people who were interviewed used the words "slow progress" to describe what the installation was trying to show.
Solutions to this problem are in line with the ones listed before. Especially giving the installation a clear title and perhaps a plate with text could assist greatly in understanding the meaning of the installation.

Suggestions
Not too many suggestions were received on how the installation could be improved. However, one participant had a suggestion regarding the lighting of the chain. This participant suggested to put the lighting on the other side, and perhaps higher, so it wouldn't cast a shadow on the second chain and wouldn't block the view. As well, he suggested to keep the angle of the shadow consistent throughout the drawing.
These are things that can be fixed in a following version. Keeping the light from the right side however does make it seem like the automata is walking towards the light, which seems to convey a more positive message then walking away from it, and therefore this was not changed during testing. Nevertheless, a new solution for the lighting will have to be found for a following version, as this seems to be more necessary then was expected.

Positive impression
Even though the function and meaning of the installation were not always guessed correctly, many kind words were received towards the looks of the installation. Its size, and the way it worked with the slow movement / time-lapse impressed many passerby. However, it should be noted that these words often came from people who took the time to stand still near the installation, as those were the people that were interviewed, which makes this result biased.

7.8 – Evaluation with our client

Apart from testing if our sculpture could perform its purpose, it was also important to communicate with our client if they were content with the product that was delivered. Therefore, several questions were asked during an interview which was held after showing the installation. These questions, and their answers, are listed below.

1 – What is your first impression of the final product?
Mensink was especially fond of the way it was finished. The colors appealed him. The size of the installation was surprising in a positive way, as well as the fact that it runs. The screen itself could have looked a bit more luxurious. Mensink also complemented the fact that all the calculations worked out, and that everything fitted.

Heijne was impressed by the visualization, especially the landscape which doesn't look like it was made by two students, but more as a premade image. She liked the implementation of the camera, especially since she had her doubts about this element in the early stages. She also liked the way we included the Menperium logo into the installation.

2 – Does the final product live up to your expectations, once we explained the first concept?
The product exceeded the expectations that Mensink had at the early stages of the project. The idea was clear, but the execution looks more professional than was expected.

Heijne was of similar opinion, and said that this sculpture is closer to a final product, and further from a prototype, than she expected.

3 – There was doubt about the role of the camera in this setup. Is its role justified in the current sculpture?
Mensink replied that a creative assignment needs to have some immersion, and that the camera added to this.

As written above, Heijne thought the camera did add more than she expected at first.

4 – Is the quality of the product sufficient?
For a graduation project the quality is more than sufficient. Of course, for a final, sellable product it is missing some refinement but this is sufficient for a demo product which shows what customers could buy, Mensink replied.

Heijne agreed with this. For a graduation project the quality is above average, and for a final product, this is the 5th prototype in a 6-stage-process.

5 – Did the installation meet all your requirements?
The requirement regarding the installation being interactive was not met, but this was not a requirement that was truly necessary, and Mensink did not miss it. It is possibly interactive by the photos. The requirement of linking the installation to the quotes was not met yet according to Mensink, and he proposed to add perhaps a title, or an explanation to the whole installation of some sort.

6 – Could you name some good aspects about the installation?
Mensink: Colorful and nicely finished, and it works. Good division between borrowed and bought materials.

Heijne appreciated as well that the installation ran. She liked the mechanism which prevented the chain from tumbling over, which we discussed in an early stage, and that we didn't choose an ordinary chain.

7 – Could you name some aspects about the installation that can use improvement?
The installation could have been more dynamic according to Mensink, perhaps making the chains move faster. As well, the content of the screen could have been fuller and more joyful.

For a final and sellable product, the finish could be even better Heijne replied. Perhaps a day and night cycle could be added to the installation, or a timeline.

8 – Do you think our installation will make people think about their future envision, as was listed in your requirements?
With the current setup, you see the quotes on a second glance. However, Mensink added, when you look at it for a while you will notice the quotes. When a title is added, this will probably be clearer, and fulfill this function better.

Heijne replied that the quotes refresh faster on the small screen. As long as you can see several you might take one with you. In her eyes the requirement was met.

7.9 – Our evaluation on the product

Apart from the recommendations that we received from our client, and the problems that surfaced through the user test, Samantha Galvez and I also had several points of critique that need to be solved before such a product could be sold.

Replacement has to be found for borrowed parts
An obvious first suggestion is that the replacements will have to be found for the borrowed parts. Technically, the exact same parts can be bought as the ones that were used in this prototype. However, these will be hard to come by. For instance, both screens that were used were old and discontinued models. It is easier to adapt the design to fit other, newer components, however this is a task that would have to be done.

Add a title or text to explain the meaning of the installation
Both our client suggested it, and it came forth from the interviews: some explanation is necessary to get the meaning of the installation. This could be done by adding a title, by adding some text, or choosing both. A small change, but a requirement for a functioning installation. How this can be implemented best is one question that still remains.

Give chain "feet" that make it slide better over the painted surface
As described in section 6.4, the entire bottom side of the chain was taped to reduce the friction it had over the surface of the plane. This was done as a temporary solution, but even in the three days that the installation ran it showed more issues that was hoped. During the testing the tape let loose and rolled up, this elevated the chain bits which caused it to misalign with the teeth. A permanent solution will have to be found for this issue, which is expected to come from adding smooth acrylic "feet" to the chain bits. These are expected to be more durable than the current temporary solution.

Solve lighting issue
As described in section 6.9 and 7.4, providing the correct lighting for the camera turned out to be more difficult than was expected. Even on the lowest brightness, the illumination of the screen was far brighter than the chain. This went unnoticed when the installation was looked at, but gave problems when photos were taken. During testing, a large theatre lamp was set on the chain, however this was a temporary solution. Several options can be considered to solve this problem. One solution would be buying a cheaper light, which can be put next to the camera / on the corner of the case, and become part of the installation. Another would be to include LEDs witch illuminate the chain from the bottom. A third option would be to have some communication with the camera and the screen, and that the screen can be dimmed even further when a picture is taken. As well, the white balance settings on the camera will have to be fixed, so that the colors do not shift throughout the time-lapse, even when the lighting conditions are proper.

Give top paint layer a protective surface
When this prototype is turned into an actual product, a solution will have to be found to keep the surface of the paint in good shape. During the realization and testing phase, the

chain might have rotated two or three whole laps. Already, it already left a clear mark to where the chain ran. Therefore, a more durable protective layer should be added, or a new paint should be chosen that is more resistant against the wear of the chain.

Find a cheaper camera that can fulfill the same roll
The camera and lens that were used in this prototype could take amazing pictures, but was a complete overkill for the task that it had to perform. In order to reduce the building costs of the installation, we recommend to look for a camera that can still take nice pictures and can be controlled from a computer, but is simultaneously less pricy.

Replace the laptops by smaller and cheaper computers, such as raspberry pi.
As space was no real concern while working on this sculpture, both the big and the small screens were controlled by laptops. For an eventual product this should be replaced by cheaper computers. The tasks that the computers have to perform are not too heavy, and therefore a raspberry pi could be a good alternative.

Test durability chain
One issue that is still unclear to us is the lifespan that the chain has. This should be calculated and tested before any major follow up projects are developed. Perhaps more durable options should be considered.

Test durability automata
A similar suggestion holds for the automata. It is unclear how long the wooden gears could hold, and how long the nail joints stay in place.

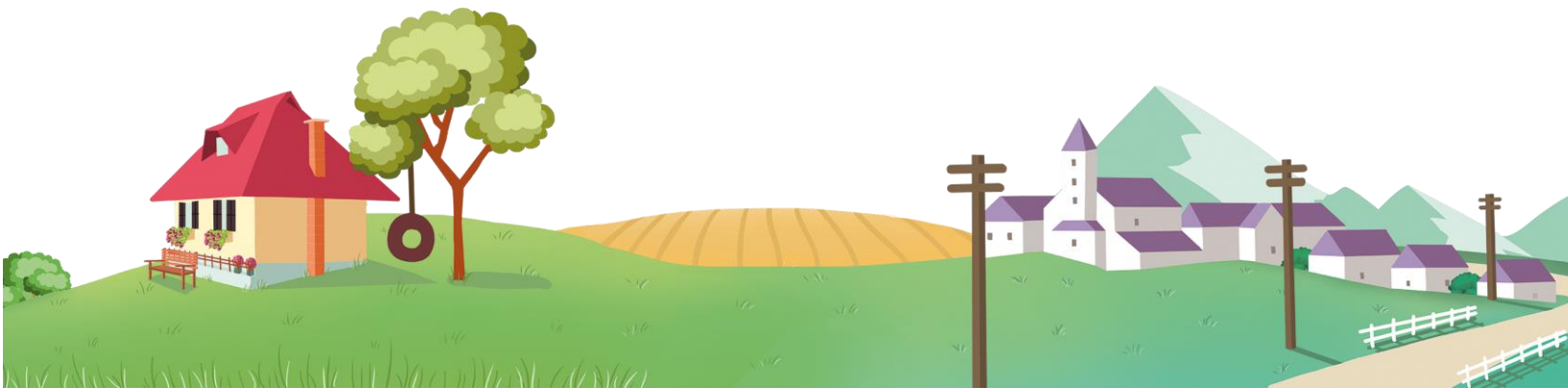
Add wheels for transportation
Depending on the way the installation would be installed into its location, adding wheels might be a good suggestion. The total construction ended up heavier than we expected, and the handles that were added did not provide enough ease to be able to move the installation without hassle.

Replace stepper motors / cancel their noise
The stepper motors that were used were ideal to control the speed of the chain. Their exact steps made the chain run constantly at the desired speed. However, the noise that they made would be very annoying when the installation would be placed in a quiet hallway. The ticking noises of the steps was the least to worry about, but when rotating at slow speed the motors made an R2D2-like beeping sound. Therefore, either this noise has to be canceled, or the stepper motors have to be replaced.

Replace servo of automata
The motor which drove the automata had its own flaws as well. This continuous servo would not deliver sufficient torque when it was put to rotate at a slow speed. Therefore, the servo was set to rotate at a higher speed with intervals. This lead to a stutter motion which was not the desired result. A different motor will have to be found in order to control the automata in a more elegant way.

8 – Conclusion and future research

This chapter contains the conclusion to the research, as well as several suggestions for future research.



8.1 – Conclusion

Over the past 6 months, a kinetic sculpture showing motivational quotes has successfully been build. As well, the sub questions have been answered. The answer to the sub questions which were relevant to the conclusion are given below.

What is the best way to implement non-human encouragement?
The literature review that was performed gave several commonly applied strategies. When "non-human" encouragement is implied, benefit should be taken from the fact that one can give encouragement more often than would be possible through human contact. Boosting the participant's competence, skipping over the starting process and making the encouragement personal seemed to be the most successful approaches. However, the available literature was scarce, and more research in this field is required.

How does one make an engaging interactive art installation?
The second literature research, which was conducted by Samantha Galvez, proposed several manners on how one can make an attractive and engaging interactive art installation. It shows the importance of usability, and how one can design for experience. As well, several measurement strategies were collected which allow one to judge the level of engagement an art installation has. For more information it is advised to read the corresponding thesis.

How do artists create a communication between their art piece and the environment?
A non-scientific state of the art research revealed that there are five ways artists incorporate the environment into their installation. The first method is to communicate with the shape and rhythm of the environment, by including lines and contours that appear in the surroundings. A second method is to reuse materials that are present in the area. Reusing the colors of the area is also a commonly applied strategy. A fourth method is to let the art "interact" with the environment, an example being the enormous toy rabbit by Florentijn Hofman which drapes over a statue. Finally, the art installation can reshape the environment it is placed in, redesigning the area completely.

How do artists embody encouragement into their art pieces?
A similar non-scientific state of the art research was conducted to answer the question on how other artists embody encouragement into their art pieces. Two methods were found: Giving the participant direct encouragement, and indirect encouragement. When using direct encouragement, the goal, or desired outcome, is clear. By looking at the art piece it is clear which behavior is encouraged. With the second group this desired outcome is less

clear. One of the listed examples was “Ice Watch” by Olafur Eliasson, which encouraged viewers to take action against environmental change, but didn’t show in which ways.

How do artists incorporate a story into their art installations?
The examples that Samantha Galvez found during this non-scientific state of the art research show that the story of the installations are very hidden. An explanation is required in order to understand the sculpture’s deeper meaning.

How do artists incorporate interaction into their installations?
This final nonscientific state of the art research, conducted by Samantha Galvez as well, showed that there are two ways artists put interaction into their installations: Through technological ways, and through non-technological ways. One example of this last category is the installation “Just like drops in time” by Ernesto Neto, which interacts with the user through the sense of smell.

During the ideation phase a concept was developed, which was further specified and later build.
Unfortunately, due to time restrictions, it was not possible to test its functionality thoroughly enough to answer the main research question “How can an art installation showing quotes, placed in the hallway of a company, bring out employees' intrinsic motivation in order to reach personal goals?”. Therefore, the research was diverted to test if the created sculpture could perform this task by testing if the installation attracted the attention of passerby, and by testing if people understood the meaning and purpose of the installation.

How well does the realized prototype keep the attention of passerby’s?
The results of the test were promising, but showed that certain improvements are required in order to make a successful installation. The research conducted by Samantha Galvez showed that forty percent of the passerby took the time to look at the installation, however, the amount of people that took the time to analyze the installation more thoroughly were low (2,8 %). This 2.8% gave the installation eighteen seconds of attention on average. Especially the amount of people who took the time to invest the installation should increase as we are of opinion that it is currently too low. Adding a title to the installation should draw more people in as this can give them a clue on what the installation is about, while adding a sign with more information should increase the time people spend near the installation.

Does the realized prototype spark curiosity in passerby while people are still interacting with it?
During the six hours of testing, only six people observed other people interact with the installation. As Samantha Galvez concludes in her thesis, this is far too little. It is again hoped that adding a title and a sign can increase the clarity, and therefore the number of observers.

Do the passerby understand the meaning and function of the prototype?
During the testing period, eighteen people were interviewed. Out of the eighteen people that were questioned, only five were able to guess its function, and only one understood the story of the installation. These numbers are too low currently and show that our installation requires extra information. Suggestions were given to improve these results, again adding a title to the installation, and/or sign with information. This should help people understand the meaning of the installation, and therefore help people to get more intrigued by the installation. These results are in line with what was found during the state of the art, where the installations which had a deeper meaning also required explanatory text.

However, it can be concluded that the adaptations that have to be made in order to make this installation more successful are small. Although it is not yet possible to answer the main research question, it can be said that the installation has the potential to perform this function, and that it is therefore ready to be used in further research.
Even though the results of the test were lower than was expected, our client was very pleased with the results. The product was described as “nicely finished” and exceeded their expectations.

8.2 – Further research

Due to the time restrictions, it was not possible to answer the research question properly. Therefore, the research question will have to be passed on to future research. The changes that were listed in the previous chapters are rather minimal, and therefore the current prototype is close to suited to be used in such a study. As the literature review showed, more research in the area of “non-human” encouragement is needed, as it is a vastly unexplored research area, weather it is with or without the user of the current prototype. This is not solely limited to encouraging people to achieve personal goals through a sculpture, but can be viewed from several fields such as assisting people with their diet through an app, or helping people to quit smoking through an online program.

The current suggestion for the usage of the sculpture is to include the listed changes and perform a long term study to test the effect of the statues encouragement on the person's ability to reach personal goals. This should ideally be a two sided study where the sculpture is tested against a human being giving such motivation in some form. Especially this type of side-by-side comparison is something that is widely missing when it comes to testing the effect of non-human encouragement for any field and unfortunately this study was not able to contribute to this yet.

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4 – Ideation

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10 – Appendices

This final chapter contains the following appendices:

- Parts for the driving mechanism
- Pictures of the installation during the testing, and a link to the full time-lapse video

Appendix 1 – Parts for driving mechanism

#	Description	Image	Costs / Pc. €	Amount	Costs total €
1	Wantai Stepper Motor		None	2	0
2	Easydriver Stepper Cntr		None	2	0
3	Power Supply	?	?	1 or 2	
4	Arduino		None	1	0
5	PC		None	1	0
6	Timing Belt		1,43	2	2,86
7	Timing Belt Pulley		3,29	2	6,58

8	*Massief stalen buis 8mm 1m*		1.72	2	2,44
9	*Flange Bearing*		1,94	8	16,64
10	*Flange Coupling*		1,94	2	3,88
Extr.	*Shipping*				?
					~34,40

Appendix 2 – Pictures of the installation and link to video

This appendix contains several pictures that were taken on the testing location, right after the test was completed.
The complete time-lapse that has been shot during the two days of testing can be found on https://youtu.be/Kc4SlT8QG_E.

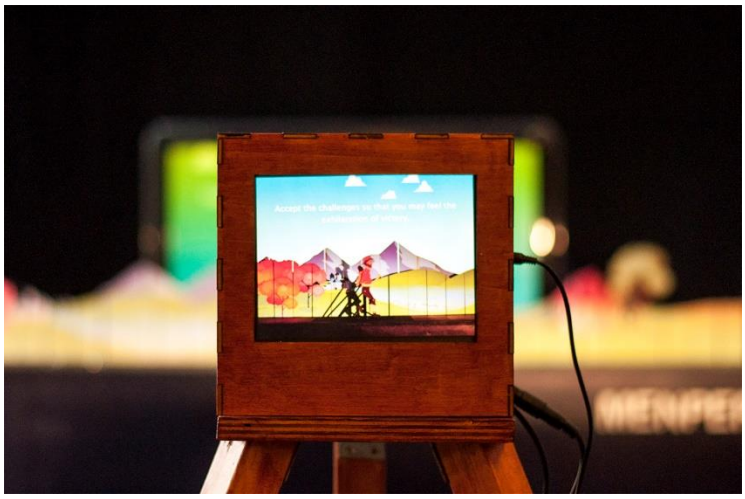

Figure 9.2.1 – Backside of the camera showing the time-lapse

Figure 9.2.2 – Picture of the installation

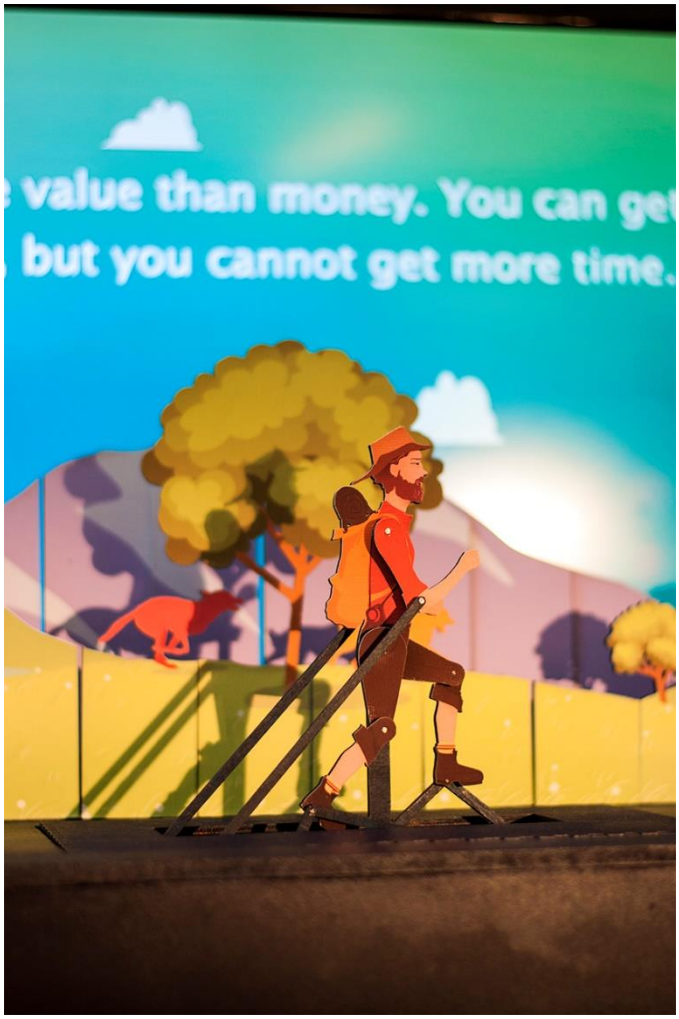

Figure 9.2.3 – Automata

Figure 9.2.4 – Picture of the installation

Figure 9.2.5 – Picture of the installation