Developing a Virtual Monster into Reality

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Työn nimi Virtuaalihirviön tuominen todellisuuteen

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TIIVISTELMÄ

Opinnäytetyön tarkoitus on selvittää, millä menetelmillä saadaan luotua mahdollisimman realistisia ja/ tai kestäviä pelihirviön osia luotua.

Vertailukohtana käytetään hirviöhahmo videopelistä Resident Evil 2. Työssä käydään läpi, mitkä ovat eroavaisuudet, kun suunnitellaan hahmoa peliin ja kun suunnitellaan pelihahmoa oikeaan elämään. Prosessin tarkoitus on kehittää tekijän omaa ratkaisukykyä sekä parempaa ymmärrystä suunnitteluprosessista. Tarkoituksena on nähdä oikean elämän perspektiivistä olento, joka on alun perin suunniteltu videopeliin.

Tutkimusmenetelminä käytettiin osittain haastattelua sekä prototyyppejä laajemman näkemyksen saamiseksi. Työssä haastateltiin peliyhtiö Remedyn, Design Factoryn sekä Hämeenlinnan teatterin henkilökuntaa. Protoaminen tapahtuu erilaisten materiaalikokeilujen ja osien rakenteiden suunnittelussa, oikeassa sekä pienoiskoossa.

Opinnäytetyön tulos on ohjeet ja analysointi siitä, mitkä vaikutteet tekevät osat kestäviksi ja realistisen näköisiksi, mitä täytyy ottaa huomioon ja mitä voitaisiin kehittää. Tietoa hyödynnetään cosplay-harrastuksen kansainvälisissä kisoissa.

Avainsanat smart, otus, virtuaali, cosplay

Sivut 35

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ABSTRACT

The purpose of this thesis was to find out methods with which game monster parts could be made as realistic and durable as possible.

As reference a monster character from the video game Resident Evil 2 was used. The thesis reflects on differences when planning a character for a game and when planning a game character into real life. The aim of this process was to improve the author's problem-solving skills and further understanding of process planning. The purpose was to see a creature that was originally planned for a video game from a real-life perspective.

The research methods were partly interviewing and prototyping for a wider understanding. For the thesis, staff members at the game company Remedy, Design Factory and Hämeenlinna Theater were interviewed. Prototyping was done by testing different kinds of materials and constructing life-size and small-scale parts.

The result of the thesis are instructions and an analysis of what makes parts durable and realistic, what must be taken in consideration and what could be improved. The knowledge will be useful in international cosplay competitions.

Keywords smart, creature, virtual, cosplay

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1 INTRODUCTION

As an introduction to the being which will be prototyped, a citation from the Resident evil fandom site is used.

"On the night of 22 September, Alpha Team leader "HUNK" arrived at the facility with a subordinate to obtain the Golgotha virus. In the standoff, Birkin was gunned down with automatic fire after attempting to resist Alpha team. Alpha Team retrieved a duralumin case containing "t" and "G" samples and left for the sewers to their extraction point. The injured Birkin infected himself with a remaining G sample, but the virus didn't properly stabilize onto his body and the scientist himself was unable to become a G-human, and instead transformed into a large creature simply known as G." (Residentevilfandom, n.d.)

Figure 1. *G-creature phase 3.* (Lucchese, p.1)

Seeing the character design of this monstrosity and how it transforms piqued the authors interest, feeling like this could be interesting to research more about.

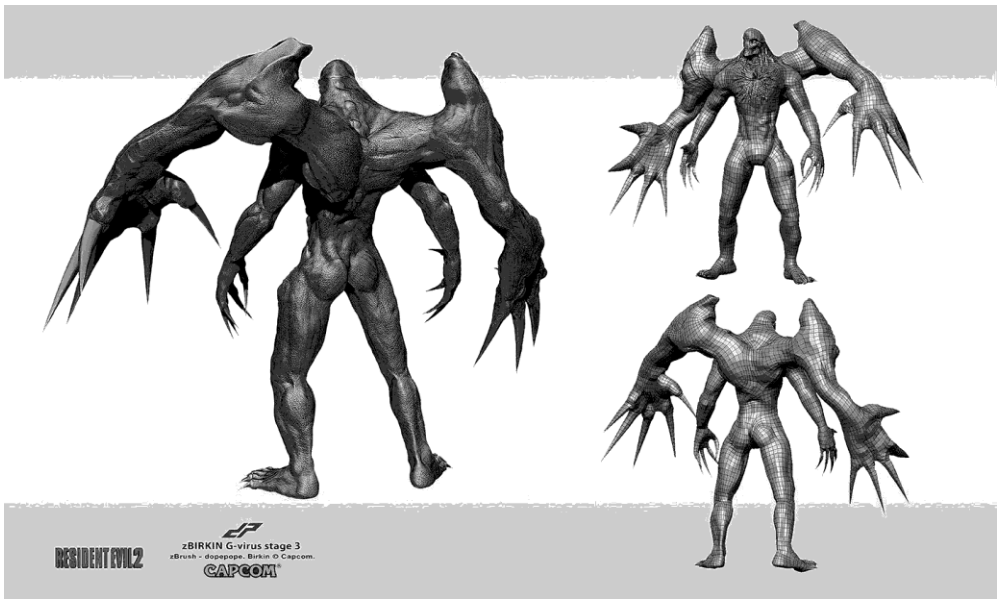


Figure 2. *G-creature 3D modelling* (Lucchese, p.1)

Figure 3. *William Birkin Stage 4* (Steamforged, 2018)

This is a practice-based research, in other words “an original investigation undertaken in order to gain new knowledge partly by means of practice and the outcomes of that practice” (Candy, 2006, p.1)

This is to improve understanding of not only smart design but strengthening craftsmanship, opening new possibilities, testing out various techniques, materials and seeing what will work if it works

1.1 **Objective**

Being creative and creating things have always been a part of the author, in his mind he however sought to tone it down a bit and only do a prototype phase, where it is more about analyzing and thinking what is going on instead.

The challenging part is making this not seem like an ordinary handcraft instruction book, but to reflect through interviews on the differences between a character from a virtual world and a living being.

The result of this thesis will be practical and theoretical knowledge, including work methods, tips, and tricks on how to become a monster.

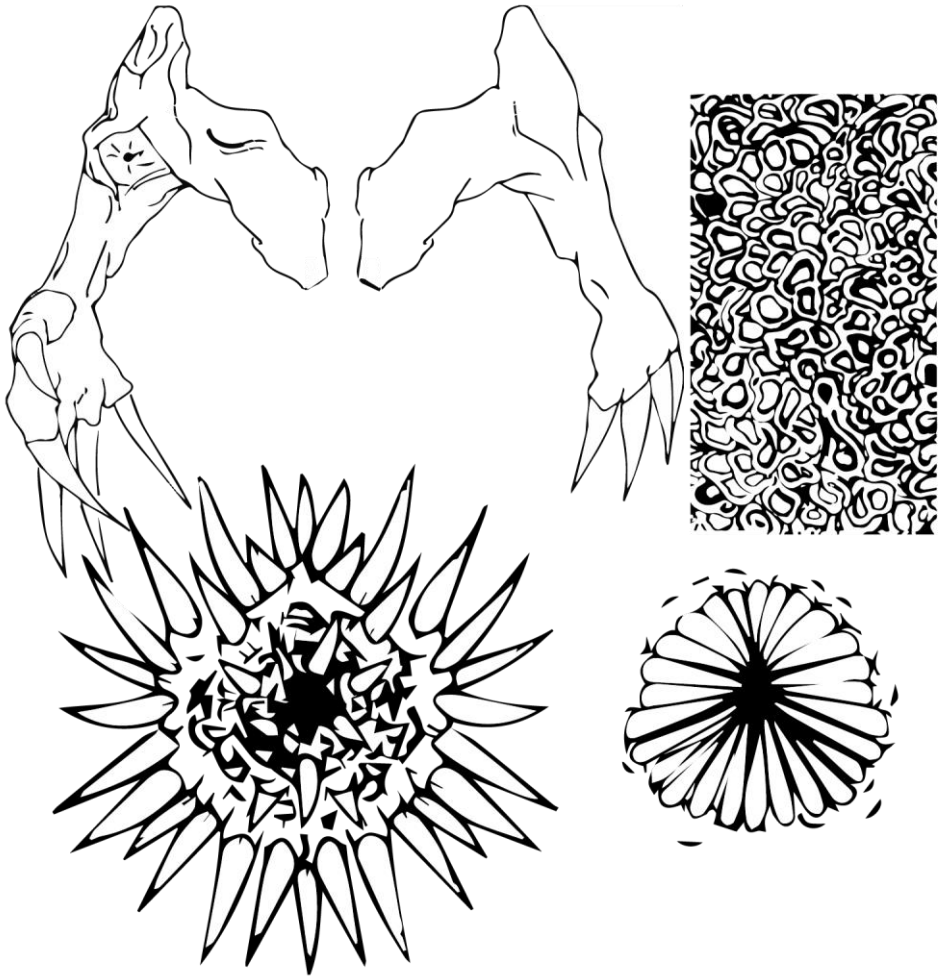


Figure 4. Figure based on the reference pictures Figure 1. *G-Creature phase 3* (Lucchese, p.1). and Figure 3. *William Birkin Stage 4* (Steamforged, p.2).

The research will be limited to the texture, chest mechanics, the eye, and the giant arms of the creature.

2 FRAMEWORK AND PROCESSING

2.1 Framework

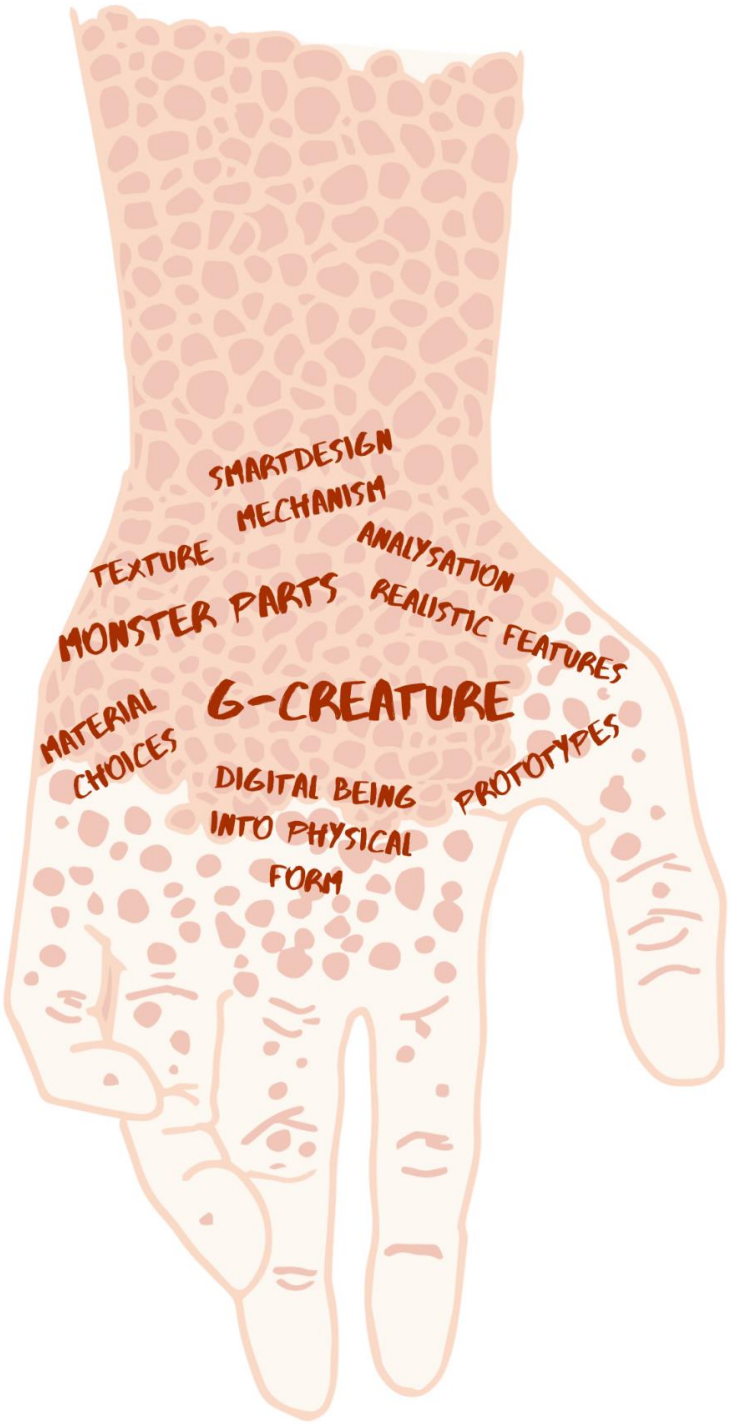


Figure 5. Picture reflects the main parts of the being's creation

2.2 **Design Process**

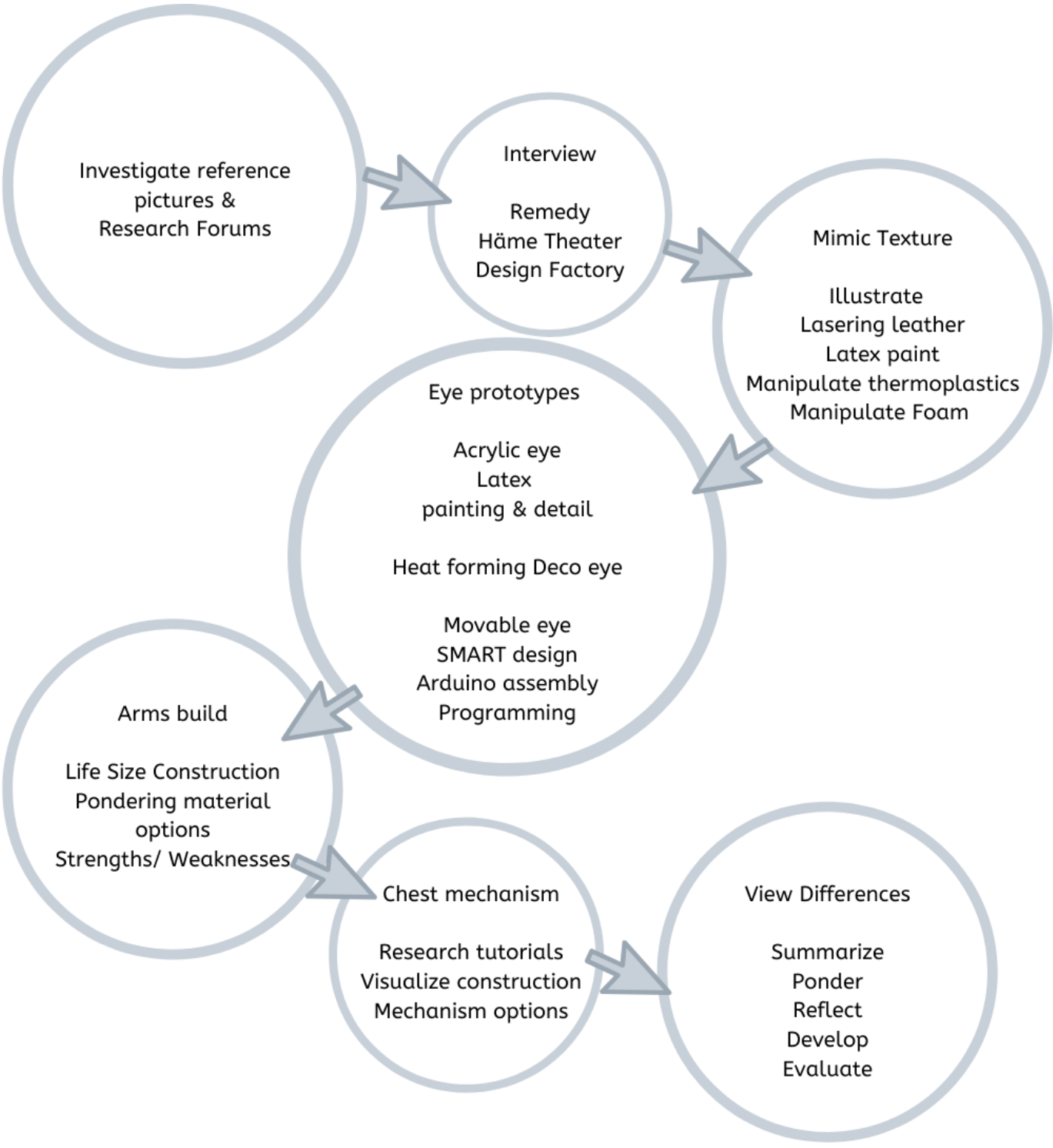


Figure 6. A step by step on the research itself

2.3 Questions

Since this creature is not something that game developers even thought that anyone was going to create into real life, the aim is not to build this being into its full glory, it is more about what methods one might get the best results with.

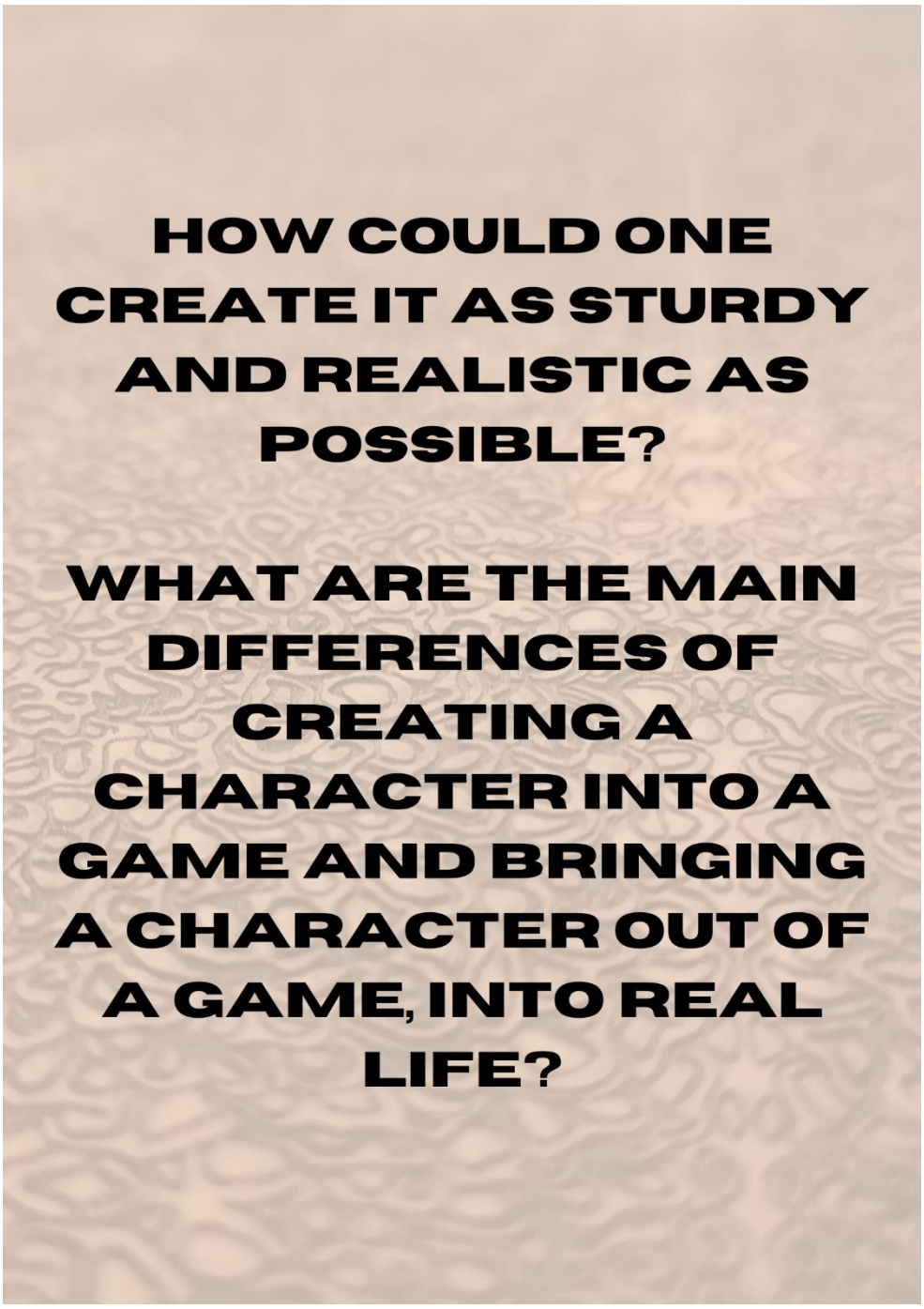


Figure 7. Main Questions of this thesis

The answers will be analyzed in (5.1, Factors which you must take in consideration, p.31.).

3 INTERVIEWS

3.1 Creating a Character

For the character creation process into a game, Antti Puomio, Lead Character Artist and Character Artist, Heli Salomaa from the game company Remedy Games, are interviewed. Their expertise help getting a larger understanding of what is required when creating a character into a game.

“Remedy creates story-driven, visually stunning games featuring trademark stylized action. They are storytellers at heart and aim to build franchises that last. Remedy’s games have been made into books, comics, concerts, TV-series and a Hollywood movie.” (Remedygames, n.d.)

For the construction and mechanism, aid is provided by Emmi Vainio, Wardrobe Master working at Hämeenlinna Theatre and Atte Partanen, Project-Engineer from Design Factory. These interviews help with the prototype phases, concentrating mainly on material choices, the build, and mechanisms.

“Design Factory is an interdisciplinary product and service design and learning platform uniting students, teachers, researchers, and industry. Our goal is to build passion-based learning culture at HAMK.

As product and service design platform Design Factory brings HAMKs education facilities and equipment as well as research units’ expertise to industry use. In Hämeenlinna the product development laboratory of Degree Program in Design offers design expertise and services for 3D-scanning, modeling and printing (clay&plastic), digital paper and textile printing as well as laser cutting.” (HAMK, n.d)

3.2 Character Creation Process

When creating a character, what does it include and what do you take in consideration? Is there a difference between creating a main character and a side character?

Lead Character Artist Antti Puomio (interview 13 December 2019) - "For the character creation there are different starting points depending on the games features. Visual style (art style), which means the abstractions level, is probably the ruling factor. McCloud, S. abstract/ The Big Triangle Figure 7. Understanding Comics, the big triangle (McCloud, p8.) is a good example of this subject.

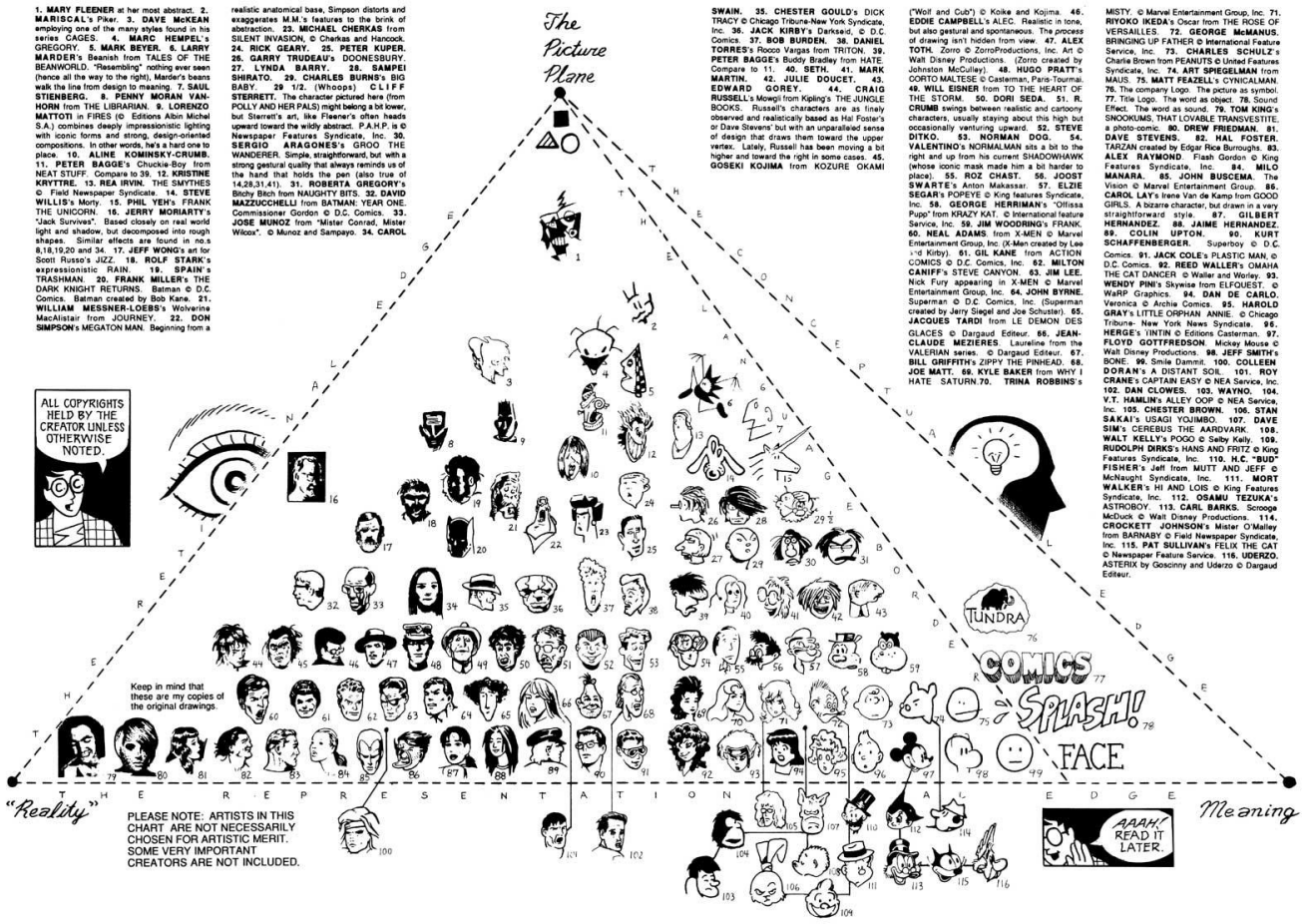


Figure 8. Understanding Comics, the big triangle. (McCloud, 1993)

Character planning can also be a story or a character source. In this scenario the character appearances affect personality, character story, temperament, profession etc. Researching is an important part for the beginning of the work process.
The characters are a part of the game world so the game's narrative and character's appearances must be fit in seamlessly for them.

Other things we ponder about the characters are the shapes that differ from each other, colors and materials (especially in action games), camera placing and mobility, marketing (most commonly the main characters) and technical things such as clothing simulations, hair rendering and special materials.

With the main characters you usually take in consideration a seemingly longer development time, especially in planning we can iterate teeny tiny details for a surprising long time. To add on top of it all, we balance between the different sections and lead persons opinions and priorities."

How much time does it take to create a new character and how many people are there usually in your staff?

"For Remedy, time for planning goes from a few days to weeks, for the modelling it changes from a week to three months. Mainly concentrating on the characters, we have two concept artists, but the character modelling team take part in planning and creating a big part of the designs." - (Puomio, interview 13 December 2019)

What makes a game character interesting, do the characters necessarily have to be provided with unique and intriguing personalities?

"The main characters (due to the story) of course benefit from a long-built personality, but for example, enemies or nameless first-person gaming characters do not necessarily need that. Other game qualities drive through priorities. This is of course from my own perspective and reflecting Remedy's released games. There are so many different games, there is no unequivocal answer." - (Puomio, interview 13 December 2019)

Is the character designed for the context of the game or the other way around? When creating a character, how free are your hands and how much do you need to consult with other artists?

"The characters are almost always created from the game sources. Of course, we take in consideration the needs of the whole project, and we all listen to the feedback that we receive." - (Puomio, interview 13 December 2019)

Creating a character into a game and reality, what are the biggest differences and is one harder to do than the other?

Costume Artist Heli Salomaa (interview 13 January 2020) - “Biggest difference is already in the pre-production; in the beginning of the project you must take in consideration the boundaries of technology. For example, in Control, you could not create fluttering hems nor transparent simulations, skirts were difficult and capes, depending on the characters movement. The process power limits the details of the clothes, for side characters there is no room for too complicated designs.

For the creation they can be very much the same or completely different. In Control, the main character’s clothes were produced for real, for the side characters most commonly digitally.

For real human beings, comes the laws of physics into play. This depends of course on the company, for example, with Remedy’s techniques we could not do everything we wanted due to the limit of the processing power. The challenging part is texturing certain materials, or making clothes move, (rigging).

For myself, a huge difference was also the interaction with an actor in live arts and missing a physical body in digital productions. When creating a game character, you do not need to make compromises on how comfortable the clothes are nor their functionality. A real human being most commonly has their own opinion, and preferences which must be taken in consideration, whereas a digital character does not complain.

The level of difficulty between creating a real character and a game character, depends completely on the design. Digital creation saves time and material, but it is easier to use a real piece of clothing and sewing structure, as live reference. If a character is created digitally, you must create detailed boards for the characters modelling staff, which is time consuming.

A huge difference when comparing game to reality, is the perspective of the user. For example, when looking at an Opera singer on stage from a 10-meter distance, you need to consider the clarity of the silhouette and form, but for the details in a movie you must take in consideration even the smallest of details. In games you often think of both, depending on the style. For example, Control, which is a realistic, third person game with 3D-graphic characters, you can adjust the distance to the NPC’s (non-player characters). There you must take in consideration both the character’s silhouettes and details.”

What are the most challenging things in a virtual project and how long do they usually take? How are they organized and how is the workload shared?

“I can only speak for Control. The most challenging parts have been the limits of technology and communication. In the beginning there were around 50 in our team but in the end all together around 300, about 120 from our own company. Everyone had to know about everything at all time.

The game Control was created under 3 years, Quantum Break in 4 and Alan Wake in 7. Every process area had their own professionals, for realistic games there was an insane amount of people needed. The time for each project, of course always depends on what you are creating.” - (Salomaa, interview 13 January 2020)

3.3 Attachments and Material Choices

How could the arms be created, attached and do you have any suggestions on the materials?

Wardrobe Master Emmi Vainio (interview 14 January 2020) - “The huge arms could be made as a backpack with a sturdy Plywood base on the back, where the arms would then be attached. As of the materials, the inside of the arms could be sturdy PVC pipes covered with Polyurethane, which could be then carved into shape with a knife.

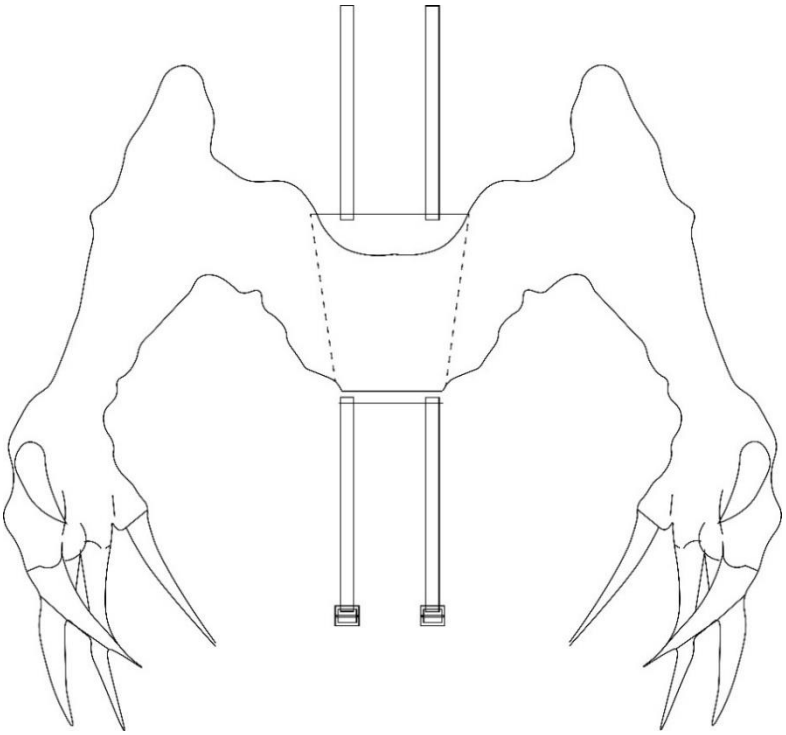


Figure 9. Arm Design, based on the information from the interview

The inside of the arms could also be thought as being hollow, it would be even lighter. However, the structure would be fragile and would not be able to take a lot of damage. Nylon filled with cotton could also work, since it is possible to mimic the texture with paint.”

How about the chest area and its opening mechanisms?

“I come to think of an exhibition I once saw in Heureka, where a flower opens and closes. My advice is contacting a puppet school where they have more experience in mechanisms.” - (Vainio, interview 14 January 2020)

3.4 **Smart Design**

Is it possible to make the eye in the arm move and how? reference picture Figure 1. *G-creature phase 3* (Lucchese, p.1).

Project-Engineer Atte Partanen (interview 24 January 2020) - “For the arm it is possible to create a moving eye, but it must be thought out well, before doing so. If say for example the arm will be created out of urethane foam, there must be a placement for the eye component, the Arduino board, servo, power source and the wiring.”

How could the mechanisms be thought of working?

“For the mechanism with the Arduino board, there are a few options which come into my mind, such as sensors, buttons or a string engine which would open close the eye lids or move the eye. to get more of a dimension to it, the eye and the lids would need to be separate components. For this you could even think of an automized system, where the parts would move within a time limit, or a servo which would follow the movement of your hand, requires however a big enough movement for it to follow.” - (Partanen, interview 24 January 2020)

Which parts are the most challenging with these components?

“The chest area is very challenging; the biggest questions are where you could add the engine and how the wiring could move freely. Also programming a control board from scratch could be a pickle, but with the Arduino board it is quite easy to use, since you basically just need to plug it in to the computer.” - (Partanen, interview 24 January 2020)

How do you assemble the components?

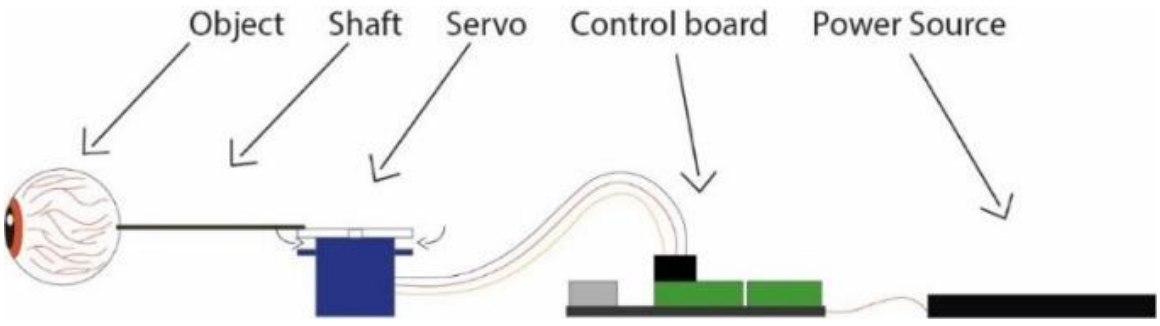


Figure 10. Servo board, construction based on the interview

“Attach a stick on the head of the servo axel, which you fasten for example with an iron wire, hot glue the other end of the stick to the eye. The stick works as the shaft and twists either to the sides or up and down, if created with an engine it needs a reel which rolls open/loosens and closes/ tightens. - (Partanen, interview 24 January 2020).

4 MONSTER PARTS

4.1 Leather Texture

Leather seems like the closest to not only the look but also the feel of the monster's skin itself.

A laser cutter is used since with this method a more finished look will be accomplished. For the texture, it is first drawn by hand while paying close attention to the reference picture Figure 1. *G-creature phase 3* (Lucchese, p.1). First with a regular pencil, then with a sharp permanent marker. The picture is scanned and transferred directly to Gravostyle, which is a computer software directly connected to the laser Gravograph 900 fiber.

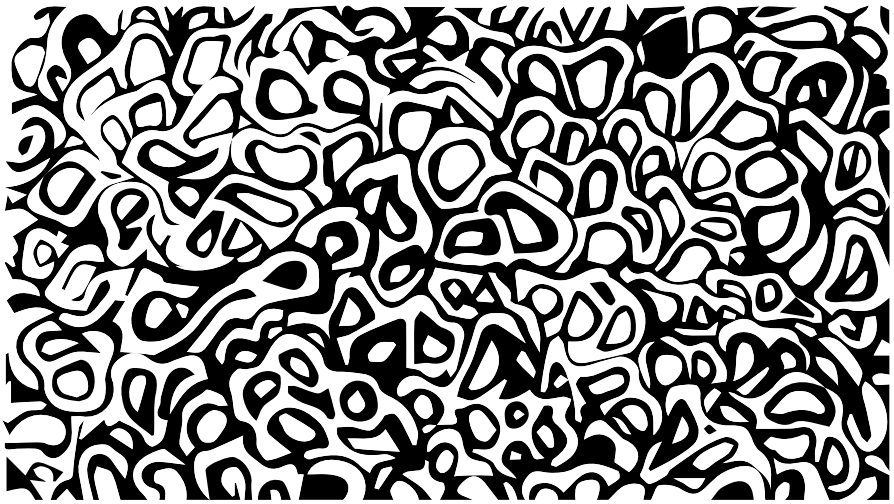


Figure 11. Vectored Texture

The texture is vectored, and any unnecessary lines are cleaned, pattern is then mirrored and made continuous.
Leather is a very difficult material to get right settings with, since its thickness is always different, meaning the cut or burn marks will always be on a different level.
Quite a few tests are made in order to get a standard setting which would work on most leathers, of all the tries, this proves to be the most valid one.

Raster: Dpi X and Dpi Y 300

Power: 80, Speed 50

There are quite a few different kinds of leather out in the world, so for this thesis it was restricted to pig, cow, horse, moose and Faux leather, since they feel and look like they could give the best result.

What is found is that the smoother the leather surface, the neater the texture but in order to get a more mutated skin, it needs a bit of texture already. Too much gets messy, but the cow leather was quite perfect for this. Not only because of the texture, but it also stretches a bit compared to the other leathers.

Figure 12. Texture Testing on Leather

In order to get a more lifelike look, a simple color does not suffice. Leather paint is a valid option, but a personal mixture of PAX paint is tested. It is a blending of ½ pros-aide body glue ½ acrylic paint, mixture provided by (Jansen, 2018)

Figure 13. Coloring Tools

This is mainly used when painting latex, but out of curiosity a test is made with leather. After powdering it to get the stickiness away, no matter how much the leather was scratched, wrinkled, stretched or washed with water, it does not wear off.

By adding the paint, it gives the leather a realistic touch and depth of a mutated skin, which so far is closest to the truth.

Figure 14. Lasered leather, left side clean, right side painted

Examining the creature closer, it seems to have two kinds of texture. Using the same methods as the first one (leather texture, p.14). A second pattern is created.

Figure 15. Second Pattern, “Mutation”

For a cleaner look, making a form and pressing it with a punch machine will also work. With it you could not only save time in the end, but you can also make a continuous pattern with ease, without being inside the laser’s frame.

4.1.1 Thermoplastic Texture

For this test, Pearl Worbla is used. By heating it up you can not only form it, but you can also press details into it, with a pencil for example.

Figure 16. Forming Thermoplastics

It will be sturdy enough for small impacts and by painting you can get a melded look with the costume itself. The material can also be lasered, but it lets out fumes, gas mask is advised.

Figure 17. Blending

Figure 18. Thermoplastic Copy

You can also copy it direct from the leather, but for a richer texture making a form out of for example plywood, would be a more valid option.

4.1.2 Foam Texture

As a test piece, 2mm EVA foam (Ethylene-vinyl acetate) also known as craft foam, is used. It is heated up to a point where it feels a bit sticky, then applied directly on top of the leather. Around 2-3mm foam is max for copying texture like this, anything above is just a bit too thick for the job.

Figure 19. Foam Copy

With a deeper grooved form, the texture will come out even better, even so it is quite a nice copy. The problem with such a thin piece of foam is that it is very fragile and should not be stretched too much.

4.2 **Acrylic Eye**

For this (Rosander, 2015) and (Anthony, 2019) tutorials on how to create a realistic fake eye, are used. First approaching with sculpting clay forming it round and flattening it a bit on the center where the iris will be glued on, a sharp knife is used for the smaller details.

After being satisfied with how it looks, it is air-dried for a few hours, sanded with 140 grit sandpaper then with 300 and lastly with a sponge. Latex is used to cover the eye and make a more gruesome look to it.

Three layers of Gêde latex is used for the surface of the eye, which is then painted with PAX paint and powdered with chalk. For additional details, such as the “blood veins”, a split-up knitted thread is used.

The iris is painted by hand on a piece of paper, it is however suggested to use a picture of a real eye, scale it, and print it out. This way you will get a more realistic look.

Figure 20. Acrylic Eye

The iris is glued on to the eye and transparent nail polish is poured for a watery effect, blood veins are added as many, as necessary. An acrylic ball is added on top to get even more depth into the eye. This is however found not to be the best option. The iris should be on top for a more lifelike look.

4.2.1 Worbla Eye

The next test is creating an eye out of “Worbla’s Deco Art” which is a non-toxic thermoplastic. It works by either submerging it into boiling water or by heating with a heat-gun/ oven. Gloves that resist a bit of heat, are advised. It can be re-heated as many times as necessary. For a quick cooling you dip it into cold water.

Figure 21. Deco Eye

For this test, the iris is printed and cut out for a more realistic feel. Since the thermoplastic base color is white and has a smooth surface, directly applying the iris with clear nail polish, is possible.

4.2.2 Eye Mechanism

The third option for creating a moving eye is by reference (Kilic, 2017) YouTube video. Having an eye blink and/ or look from side to side, will take the overall look to a whole new level.

After discussing with Atte Partanen (interview 24 January 2020) the interest in creating a moving eye with the Arduino board grew, since it is quite beginner-friendly.

The author is a certified electrician in high voltage, experiences with programming components are however very limited. Atte Partanen (interview 24 January 2020) from Design Factory was kind enough to provide with a beginner's kit which includes the necessary components and instructions for this experiment.

Figure 22. Toolbox provided by Design Factory, Project-Engineer Atte Partanen (interview 24 January 2020)

For installing Arduinos software, the instructions are by (Patel, 2016)

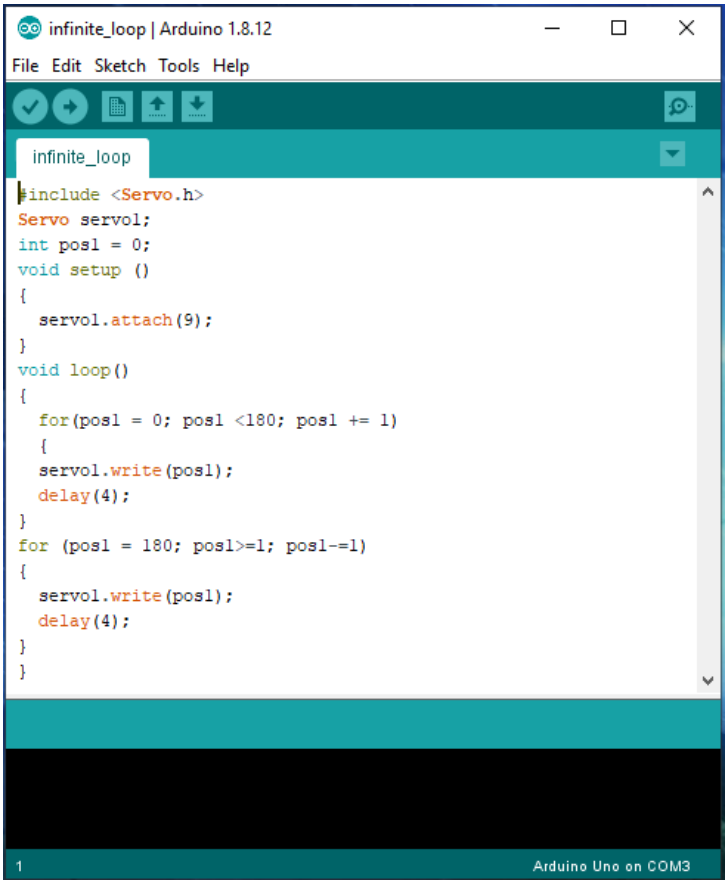


Figure 23. Arduino Programming

A simple setup is used, just to see how the mechanism works. Instructions on how to program an infinite loop are found on YouTube, programming by (Romanov, 2014)

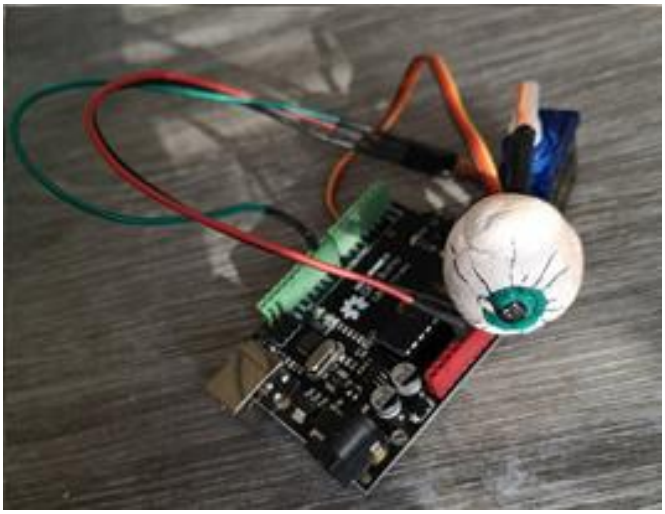


Figure 24. Eye Setup

Even with no knowledge of programming, with a little bit of internet searching you can find all kinds of setups and instructions which you can modify to your liking.

4.3 **Arm Construction**

At the beginning the idea was to make the two arms separate, where it would have a sheath inside the “muscles” of the costume, where you could then slid/ clip fasten them.

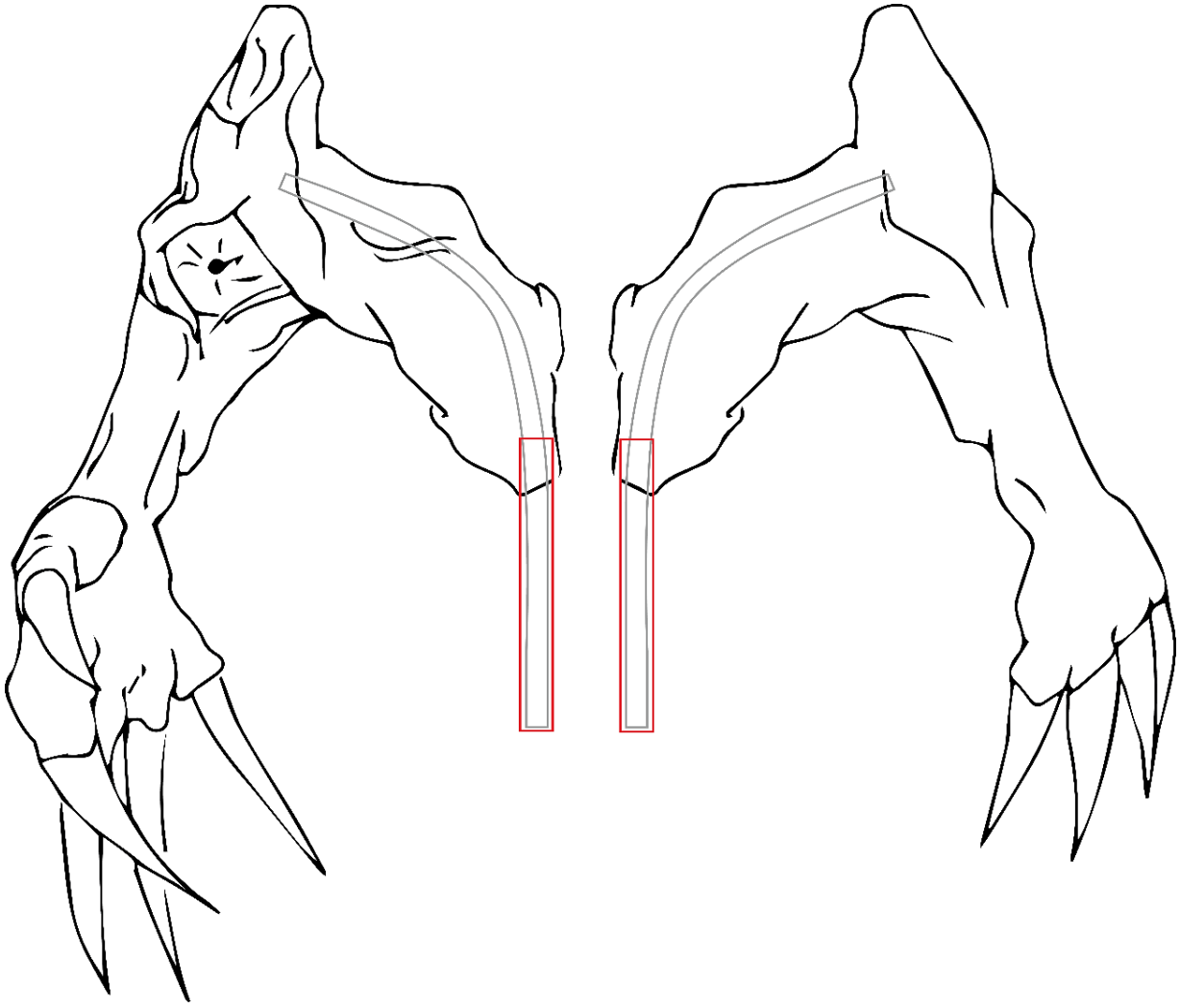


Figure 25. Arm Visualization

After the interview with Emmi Vainio (interview 24 January 2020) this seemed like a very unstable solution. The arms are so massive that these would wiggle around a lot and without a doubt fall out after the slightest impact.

Out of sheer curiosity, a prototype is made from urethane foam just to get a feeling of the weight. The interview is being taken in consideration and a backpack version is created, Figure 9. Arm Design, based on the information from the interview (Attachments and Material Choices, p.12).

Figure 26. Baseline

For the base PVC-pipes are used for a sturdier build, which are then covered with Pattex urethane foam.

Before applying the foam, the area should be properly protected, since the foam expands quite a bit. The room temperature must be around 5-30 Celsius, otherwise it will not dry properly. Estimated time, 2-4 hours.

Figure 27. Foam Structure

First can amounted to only a small portion of what is required.

Figure 28. Foam Form

After three cans it gets the right amount of thickness, next step is to carve them into shape. Since the point is only to create a rough prototype, a quick version was made to see how it would look like overall.

Figure 29. Attachments

Arms and backpack straps are then got-glued to a PVC board and fastened with screws to hold them in place.

Figure 30. Fitting the Arms

Considering the size of them they are surprisingly light, around 3kg making the weight on the back barely noticeable.

Once it has been shaped to the desired form, the covering can be decided.

When thinking of a melded look, going with the same material as the body itself is highly recommended. However, if leather is applied to them, they would probably be around three times heavier, which could be quite a struggle at the end of the day.

By painting, you can create an illusion with which you could work with even lighter options such as thermoplastics or latex. Working with these materials however are more time-consuming and require dedication in order to get a finished look.

4.3.1 Arm Materials

The material choices in order not to strain the wearer too much and for the arms to be as stable as possible. The base must be made from very light material with a strong pillar. Options would be Styrofoam, urethane foam, fabric filled with cotton, thermoplastics or EVA-foam, inside could be strengthened with PVC or aluminum pipes.

Styrofoam and urethane foam are very light, mainly used for isolation inside buildings. As a single piece, it can be quite fragile but taking into consideration how thick the arms are, it should be sturdy enough for the task, but of course, there will still always be the slight chance of it cracking/ breaking. Best adhesive for this is hot glue. Other glues tend to either not stick together or melt through. Styrofoam can be cut and formed; a utility knife proves to be the best tool for the job. For a finishing touch it needs some sort of coating, any material really that gives the foam a bit of protection and a smoother look.

EVA-foam in such a large mass will be a lot heavier but has a smaller chance of breaking since it bends. Contact glue is a great option for attaching foam parts together. For the sanding, a Dremel (power tool), is the best when forming the shapes. Breathing mask and working clothes is a must. Breathing in the fumes is toxic and will affect your health. For a smoother look, heat the surfaces carefully with a heat-gun. The surface has a risk of melting otherwise. For a hollow version, this could also be used as a base for thermoplastics.

Figure 31. Bun created by Myrskyvuori, M and Mankki, V at Hämeenlinna Theatre

Emmi Vainio (interview 14 January 2020) mentioned that they had created a bun made from nylon filled with cotton for a play at Hämeenlinna Theatre. The materials are very lightweight and with a quick glance, quite realistic.

Figure 32. Texture of a bun

This would work when looking from a distance, but it will lack the feel of texture.

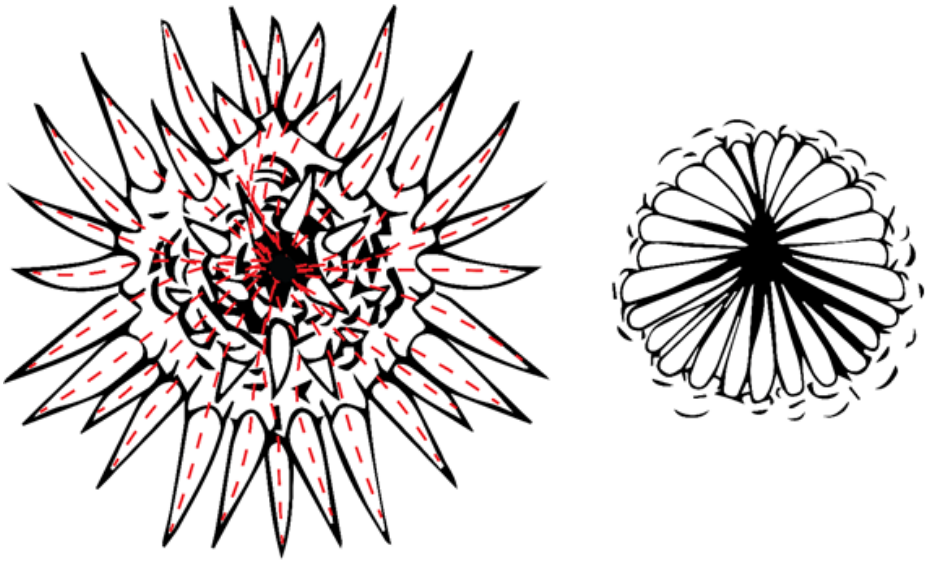
4.4 **Chest Mechanism**

The chest mechanism is like that of the opening and closing eye (Kilic, 2017) visually it could be thought as the mechanical dome (Polk, 2017) which resembles the metamorphosis of the G-creatures chest from phase 3 into phase 4. Figure 1. *G-Creature phase 3* (Lucchese, p.1). and Figure 3. *William Birkin Stage 4* (Steamforged, p.2).

The parts need to be of light material with a strong fastening, where it will not strain the bodysuit from either tearing or stretching too much. For the servo system, according to Project-Engineer Atte Partanen (interview 24 January 2020) it could be created so that the lines would go through a muscle suit and the motor resides inside a "muscle".

Another option is to use a similar method as in the YouTube tutorial made by (CARACARA, 2017) where a mask with an opening and closing mechanism is created, using a demon as a reference from the series "Stranger Things".

You could create this chest piece with the same elements, however, it requires more precision and time, since the bones are not only thin but also large in numbers. The base should be high-density foam, for not only can it be shaped with heat, it is light, can be sanded, primed and painted to look realistic. The fishing line is visible. but due to its transparency, not that noticeable.



Illustrated chest in free form and closed, based on Figure 3. *William Birkin Stage 4* (Steamforged, p.2). and *G-Creature phase 3* (Lucchese, p.1).

In free form the mouth is open, when pulling the lines, it closes.

5 CONCLUSION

5.1 Factors which you must take in consideration

When thinking of the difficulty of creating a character into a game versus reality, they both have their own challenges. When the character creation process begins, it takes time in order to decide how the character should be since there are many factors which must be taken into consideration before the actual character can be created.

When creating a character from said source into reality, the difficulty lies in the physical properties and common sense of gravity. This, in particular, being one of the most uncomfortable type of clothing you could wear. If this were to be made for a movie, the base would either be created with latex or even more likely CGI (computer-generated imagery).

When thinking of creating this as a “realistic being”, the definition can take in many forms and we can all see it from a different perspective. It is possible to create it with realistic features, but that is as far as it goes. Is there a right answer on how to do it? Yes and No. It all depends on the skillsets we have in our possession, which determine the outcome.

(4.1, Leather Texture, p.14). Leather seemed like the closest to not only the look but also the feel of the monster’s skin itself.

A laser cutter is used since with this method a more finished look will be accomplished. For the texture, it is first drawn by hand while paying close attention to the reference picture Figure 1. *G-creature phase 3* (Lucchese, p.1). First with a regular pencil, then with a sharp permanent marker. The texture is vectored, and any unnecessary lines are cleaned, pattern is then mirrored and made continuous.

(4.2.2, Eye Mechanism, p.22). A moving eye, referencing (Kilic, 2017) YouTube video. Creating an eye with a 3D printer, requires however a lot of priming and sanding for it to look good, harts or nail polish should be added to get a glossy look. Having an eye blink and/or look from side to side, would take the overall look, to a whole new level.

(4.3.1, Arm Materials, p.28). The material choices in order not to strain the wearer too much and for the arms to be as stable as possible. The base must be made from very light material with a strong pillar.

Options would be Styrofoam, urethane foam, fabric filled with cotton, thermoplastics, or EVA-foam, inside could be strengthened with PVC or aluminum pipes.

(4.4, Chest Mechanism, p.30). The chest mechanism is like that of the opening and closing eye (Kilic, 2017). Visually it could be thought as the mechanical dome (Polk, 2017) which resembles the metamorphosis of the G-creatures chest from phase 3 into phase 4. Figure 1. *G-Creature phase 3* (Lucchese, p.1). and Figure 3. *William Birkin Stage 4* (Steamforged, p.2).

The parts need to be of light material with a strong fastening, where it will not strain the bodysuit from either tearing or stretching too much.

Figure 33. Prototypes

This works more as a baseline on how to give a little bit of extra detailing into a creation overall and how it could possibly be made.

5.2 Reflection and Evaluation

In the beginning of this thesis, the biggest concern was getting the right contacts since it was essential for the core questions.

One of the most difficult parts when thinking of creating something realistically is the part when you begin to question what, exactly, does it mean? As a person who is more of a chaotic creator with a lot of things going on in the head, it was difficult from time to time to keep the pieces together long enough to analyze them in the proper manner. It feels as if only the surface was scratched on some parts.

Comparing from the starting point and to where it led, it is pleasing to see how some skills have developed in the grey areas, where the research was out of the comfort zone. One of those was programming the Arduino board; it is not directly part of the Design degree program, but it has still been one of the things which has been of an interest for quite some time. It felt like it opened a few new opportunities as a designer.

During this process various parts were tested and prototyped, it gave time to think what would be interesting to do in the future. SMART design started to seem like a necessity for the author, since as a designer, detailing is an important process. With the aid of software, it can strengthen precision and open new possibilities.

Hopefully, this thesis could be an asset when creating something which requires more depth and detail into it, whether it be a monster or a construction of something needing a hint of more life into it.

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