



Visual Concepting for Video Games Using 3D Software

Study of Grease Pencil tool in Blender 2.8

Jaakko Takalo

BACHELOR'S THESIS
May 2019

Degree Programme in Media and Arts

ABSTRACT

Tampereen ammattikorkeakoulu
Tampere University of Applied Sciences
Degree Programme in Media and Arts

TAKALO, JAAKKO:
Visual Concepting for Video Games Using 3D Software
Study of Grease Pencil tool in Blender 2.8

Bachelor's thesis 53 pages
May 2019

The purpose of this thesis was to present information on concept design methods that use 3D models in the design process. Another purpose was to study a specific feature in Blender's version 2.8, the Grease Pencil tool.

The goal was to gather information regarding concept art workflows with the use of 3D and to then use that knowledge to create example design work of a vehicle. Another aim was to create adequate portfolio material to showcase the author's skills.

After studying design theory, studying example artworks and examining the 3D software Blender, example artwork was produced using these principles. The example concept design work consisted of a fictitious vehicle design that could be used as reference material in the creation of a video game asset.

As a conclusion, the methods applied by the author resulted in a concept art image that meets the industry standards. The resulting work also functions as portfolio material for future endeavors. Speed and efficiency of the workflow also increased as the methods proved to be effective.

Key words: vehicle design, concept art, grease pencil, game art, 3D.

CONTENTS

1	INTRODUCTION	5
2	BRIEF INTRODUCTION TO CONCEPT ART	6
	2.1 What is concept art used for.....	6
	2.2 Concept art in video games.....	7
	2.3 Overview of fictional vehicle design	10
	2.3.1 Using design theory.....	12
	2.3.2 A few gestalt principles.....	14
3	3D IN CONCEPT ART	18
	3.1 Advantages of 3D in the design workflow.....	18
	3.1.1 Shapes	19
	3.1.2 Perspective and cameras	20
	3.1.3 Light and shadow	20
	3.1.4 Iterations and speed	22
	3.2 Examples of 3D in concept art	23
4	GREASE PENCIL	25
	4.1 A note about Blender	25
	4.2 What is Grease Pencil.....	26
	4.3 Drawing in 3D space	26
	4.4 Features.....	27
	4.5 Modifiers.....	29
	4.6 Case study: Jama Jurabaev	32
5	UTILISING GREASE PENCIL IN A DESIGN PROJECT	35
	5.1 Project details.....	35
	5.1.1 Design notes.....	36
	5.1.2 Using reference material	36
	5.2 Rough sketching phase.....	38
	5.3 Designing using Grease Pencil	40
	5.4 3D modelling and refining.....	42
	5.5 Final presentation.....	45
	5.5.1 Line art concept.....	46
	5.5.2 Final render	48
6	CONCLUSION	50
	REFERENCES	52

ABBREVIATIONS AND TERMS

3D	Three dimensional
Procreate	A digital drawing application for iOS devices
Blender	An open-source application for creating 3D models
CG	Computer graphics
Grease Pencil	A 2D tool in Blender, used to draw in 3D-space
Mesh	A 3D shape
Primitive	A basic geometric shape, such as a cube or a sphere
Gumroad	An online platform used for selling original content
Orthographic view	A view with no perspective
Photoshop	A 2D image manipulation software

1 INTRODUCTION

This thesis studies the contemporary methods of which vehicle concept designs are created with the aid of 3D software. Inspection of the renewed Grease Pencil tool in Blender 2.8 is also studied and then used in the creation of an example design work.

An elementary introduction to concept art and design theory is used as a starting point to guide the reader deeper into the world of concept art turning to look at vehicle design and the use of 3D software in particular. Examples of other types of concept art are shown as well to illustrate the point.

Design theory is extremely important regarding concept design methods. A basic review of a few design principles is provided in order to later use them in the actual design process of a fictional vehicle. All in all, the purpose of this thesis is to find out if, and how much the use of 3D software can aid in the concept design of vehicles, and what the benefits are.

2 BRIEF INTRODUCTION TO CONCEPT ART

According to industry veteran concept artist Paul Tobin (2014), concept art or concept design is an image of an idea, design or a mood. This image is usually a drawing, or an illustration created by a concept artist. A video game character's armour design for example, is something a concept artist might explore using their skill (Tobin 2014). Concept art should not be confused with beautiful looking images, or illustrations such as the cover image of a book. Highly polished artworks that tell or support a narrative are generally the work of illustrators, which differs tremendously from concept art (Pickthall 2012).

2.1 What is concept art used for

Concept art is used in feature films and in video games among other things (Pickthall 2012). All these areas have versatile ideas that need visualising and that is where concept artists come in. Concept artists visualise ideas as quickly and as effectively as possible to create images that will be used to communicate with other members of a production team. For example, concept artwork could be used to visualise a scene from a video game before the actual production begins. As concept designer and educator Michal Kus (2018) puts it, "concept artists are visual problem solvers". That, in my opinion is the best way to describe concept art.

Concept artists can create a multitude of drawings in search of a great design. The design process can be done alone or in teams (Watts 2012), where every designer can work on the same idea. According to Guerrilla Games' assistant art director Roland Ijzermans (2017, 6) doing concept art is analogous to discovering. The final design rarely arrives on the first attempt, so it usually takes a substantial amount of iterations to reach a satisfying outcome (Creative Bloq 2012). The result may be multiple variations of a certain design (picture 1). In my own experience, a lot of sketching needs to be done, and I constantly need to work on small changes with multiple iterations.



PICTURE 1. Concept art by Mark Castanon for the game God of War (Sony Santa Monica Studio 2018)

Concept artists use various methods to come up with designs. Shape language, colour theory and composition among other factors play a big role in concept design. Reference material is often used when creating new designs (Zhu 2008). According to artist Veli Nyström (2016, 11), examples of reference material can be photos, real life and even 3D. A common practice is to combine two elements that are not related to each other and use that as a starting point in the design process to spark new ideas (Zhu 2008). For example, combining seashells with coffee makers to come up with shapes for a fictional spaceship design for an alien race is sure to yield some interesting results. In conclusion concept artists are not really artists in the classical sense of the word, instead they are designers and their job is to come up with new and exciting designs. Art is only the method in which the ideas are being represented (Kus 2018).

2.2 Concept art in video games

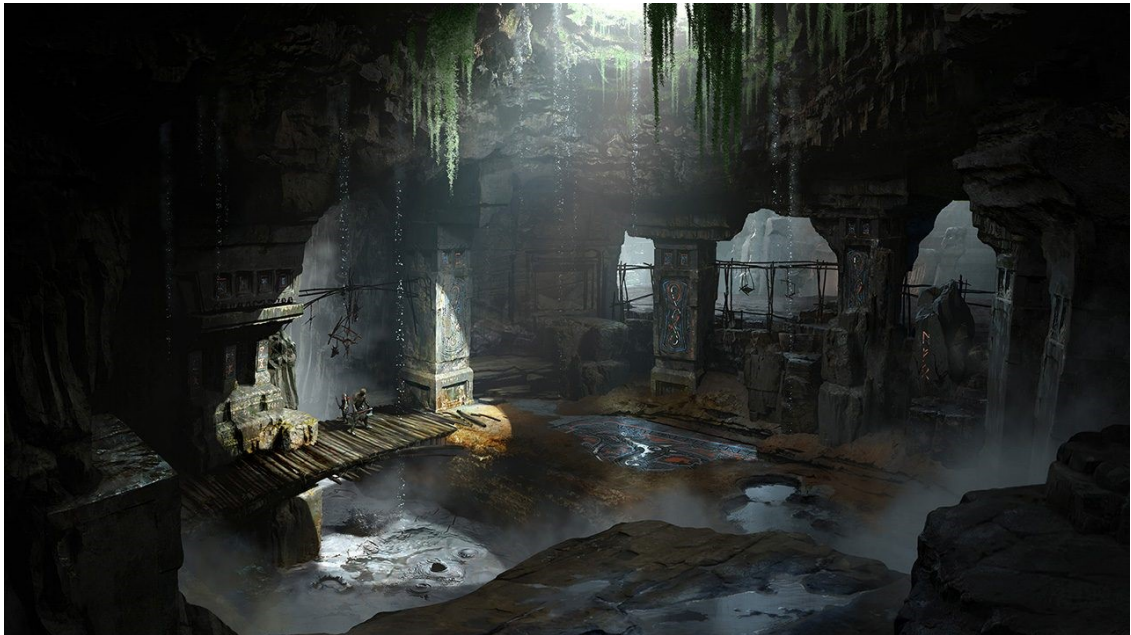
According to the widely known concept artist, Feng Zhu (FZD Design Cinema 2016), concept artist as a job title did not really exist in the video game industry

until the latter half of the 1990's. As video games started to use 3D graphics, the need for more detailed concepts and designs emerged (FZD Design Cinema 2016). Before the second half of the 1990's when games were mostly two dimensional, usually the most artistic person on the team would do the design work (FZD Design Cinema 2016). The actual need for people who would only focus on concept designing would come later.

Video games in the present-day often have extra-ordinary environments and memorable characters, and all those things need to be designed, so concept art in video games is certainly needed. Project costs for video games reaching hundreds of millions of dollars are most often the result of development and marketing (Reuters 2014). Games are getting noticeably bigger and more ambitious, so a lot of work needs to be put into creating unique and exciting worlds filled with unforgettable characters.

Concept artists for video game projects design characters, environments, vehicles, props and everything imaginable. The level of detail can go as far as designing specific types of flora for a location, from huge trees down to the smallest critter hiding in the grass. When designing vehicles for example, detailed views of the design illustrate how a door, or a hatch opens in a spaceship.

Exploration is a significant factor in video games, thus the need for environment design cannot be understated. Level designers plan how the levels work and concept designers come up with the look for them (picture 2). An emotionally impactful world makes for a much more engrossing gaming experience compared to a dull one.



PICTURE 2. Environment concept art from God of War (2018)

Mood plays a big part in environment design. If there is a forest in a game, is it dark and creepy, or is it soothing and filled with light? Concept artists can create mood variations of a particular environment to get a feel on how the place looks in different circumstances (picture 3). Experience and knowledge of the natural world play a significant role in presenting new ideas (Kus 2018).



PICTURE 3. Mood studies by Anthony Eftekhari (2013)

Everything of course is relative to the story of the game and how it is played. The story may require a certain kind of environment or situation calling for a concept designer's skills to come up with a solution. Also, a certain kind of environment might need a specific kind of vehicle to be used as a means of transportation. This is where vehicle design comes in.

2.3 Overview of fictional vehicle design

Concept design shares similarities with industrial design or architecture, where real-world objects are often visualised before the actual production can begin. In this sense, fictional vehicle design is similar to automotive design.

The purpose of automotive design is to create a shape for a vehicle that functions and meets the needs of the manufacturer. The design should also look attractive, but this is highly subjective. Certain kinds of design principles can be used to come up with interesting shapes and this thesis will delve deeper into this topic later. There are rules and regulations that need to be considered when designing real-world vehicles (Walton), but fortunately that is not the case in the entertainment industry.

In the entertainment field, vehicle design is used in the same way as in the real world, but one crucial aspect can be left out. The cars, planes, ships and vehicles of any kind do not need to actually function (Zhu 2012), they only need to look believable. This greatly differs from real life vehicle design for reasons that hardly need to be stated, but some realism is however needed. As the digital painter and concept designer, Craig Mullins states (2018) in an interview, that a lot of people tend to design vehicles where the doors are unable to open, or designs where the driver is not able to see through the windshield. It is good practice to think about the realistic aspect of vehicles and consider all the moving parts and the actual function of the vehicle (Mullins 2018, Zhu 2012).



PICTURE 4. Concept design of the SSV Normandy from Mass Effect. Design by Derek Watts. (Bioware 2007)

The SSV Normandy (picture 4), an interstellar spaceship from the Mass Effect series of video games, is a good example of a fictional vehicle design. In my mind it combines style and functionality well. The Normandy is an integral part of the game since it is the ship the player uses to traverse the milky way and explore planets. The design's sleek and aerodynamic form is convincing, and the shapes are not overstated even though the shape language is simple. It can be said that this clearly is a man-made vehicle, and it is not hard to imagine this sort of a ship existing in the future. In other words, it is not completely out of this world.

Another practical design is the Warthog from the Halo series (picture 5), an iconic military vehicle design sure to leave a mark in video game history. The all-terrain aspect of the Warthog can immediately be identified, because of its wheels and its resemblance to a dune buggy. The open chassis and the cross-country tyres clearly suggest that.

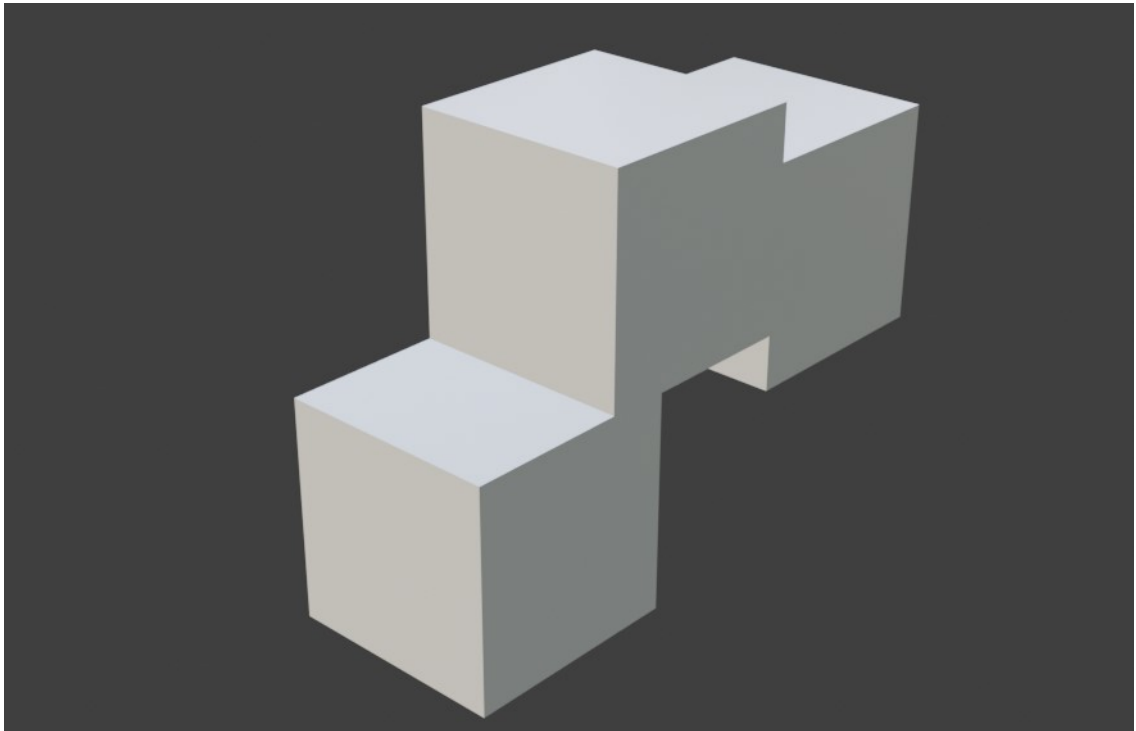


PICTURE 5. Concept drawing of a Warthog (1998) and a picture of a dune buggy

A rich imagination is needed when creating valid vehicle designs. It is essential to know where and how the design will be used, in particular the kind of environment. The above points matter, but how is a design achieved? There are certain principles and philosophies that can be used when designing to help produce convincing and well-functioning results.

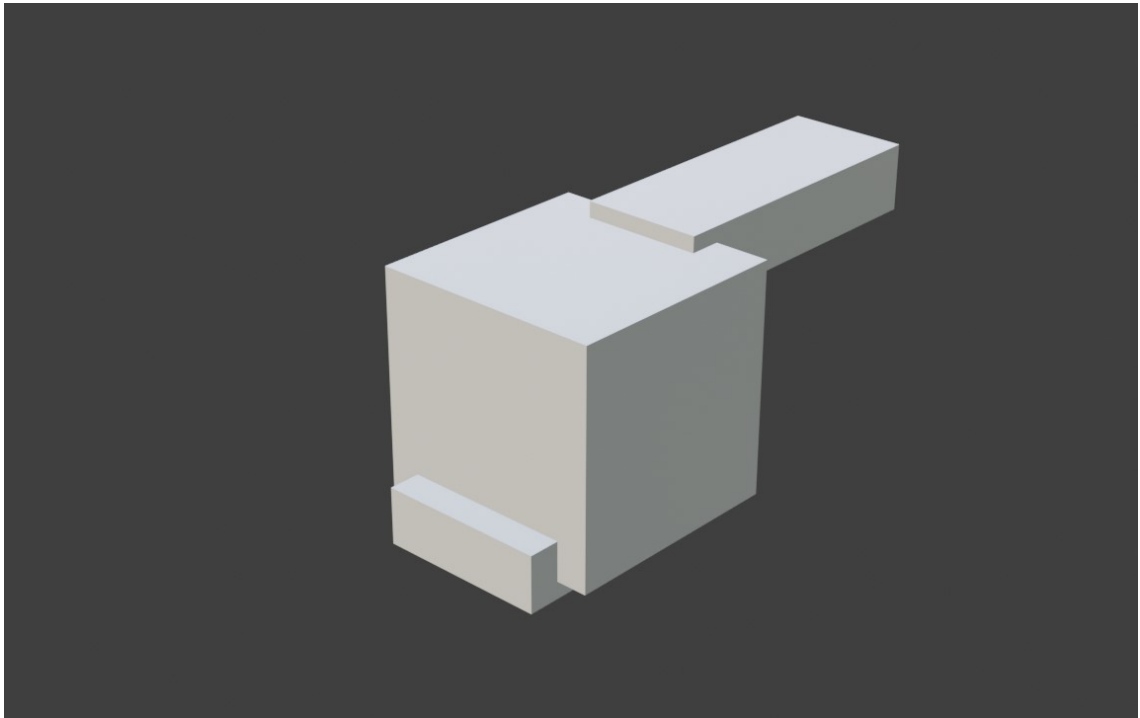
2.3.1 Using design theory

The principles and theory behind the design process is a world of its own and cannot be explained here in its entirety. Instead this part of the thesis will focus on some elementary rules and principles of design and how to use those philosophies in vehicle design. For example, some of the characteristics to consider when designing a vehicle are shape, colour and overall balance. Most important one of those being shape in my mind.



PICTURE 6. Three identical cubes forming a shape.

One simple method of coming up with interesting shapes is to use the so called *big-medium-small* method. The idea is to clearly use one big, one medium and one small element in a design (Stacy 2017). Looking at the cubes (picture 6) arranged in the picture, all of the cubes are the same size. This does not present an interesting shape at all. The combination of the cubes looks bland and pointless, and there is no real thought behind it. Something needs to be changed for a more pleasing appearance.



PICTURE 7. Three different cuboids forming a shape.

Looking at the second arrangement where the sizes of the cubes have been changed (picture 7), the whole setup looks a lot more interesting and may even raise some questions such as “*is this a spaceship or a whistle?*”. In this second version, not only the size has been changed, but the shapes of the cubes have been modified as well.

The point still stands, creating variation with simple size alteration can yield exciting results. Overall, the second arrangement clearly shows a more interesting shape. It is now possible to identify the big, medium and small shapes and no single cube is struggling for attention like in the first image (picture 6). Together they form a bigger uniform shape that is in balance. This is only a single design method, and there sure are other tricks to aid the design process.

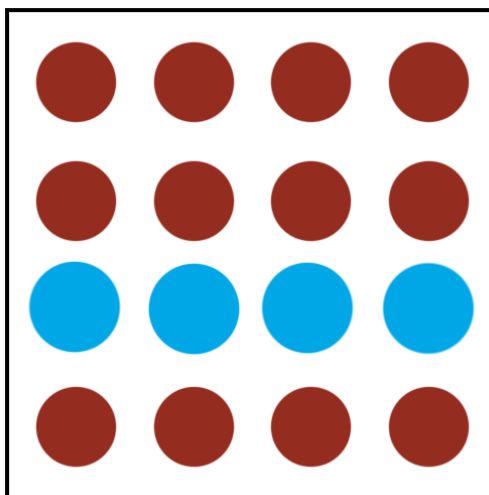
2.3.2 A few gestalt principles

This chapter briefly explains gestalt theory and how its principles can be used in the design process. Minor examples are given of each stated principle with the

focus on vehicle design. These philosophies will then be used in the actual vehicle design project later on.

Gestalt, in the holistic sense means *unified whole*, and gestalt principles are a set of psychological principles about how humans perceive the world and make sense of the ever-surrounding chaos around us (Hampton-Smith 2017). This theory was mainly conceived by Max Wertheimer, Wolfgang Köhler and Kurt Koffka in the beginning of the 20th century. Rudolf Arnheim has written a book about art and visual perception, where he studies how gestalt principles can support the methods of visual design.

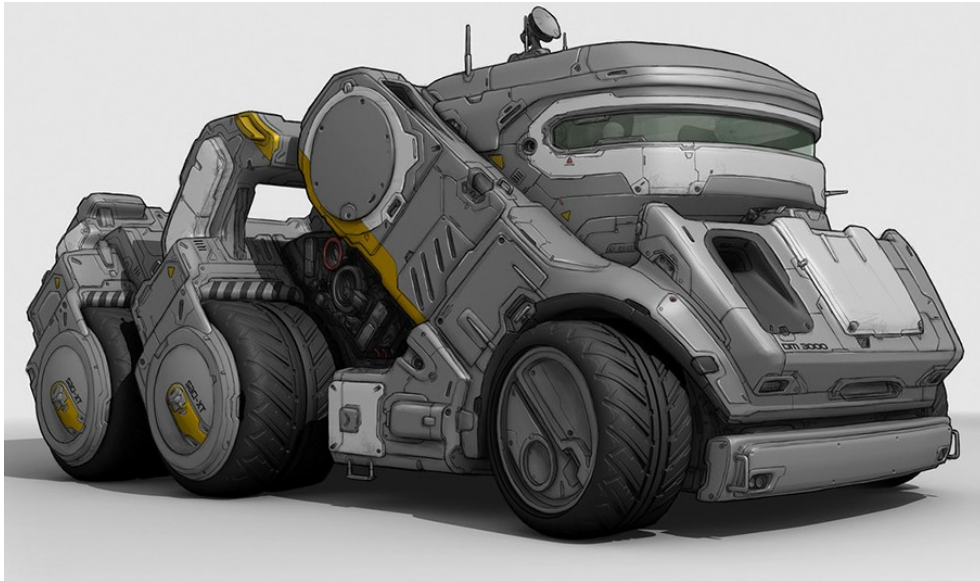
According to Sam Hampton-Smith (2017), six common principles exist. They are *similarity*, *continuation*, *closure*, *proximity*, *figure/ground* and *symmetry and order*. This thesis goes through a pair of them, starting with *similarity*. I think a unified shape language is important and *similarity* can be used in that regard. *Continuation* helps with the flow of shapes so that is why it is chosen as the second principle.



PICTURE 8. Example of similarity.

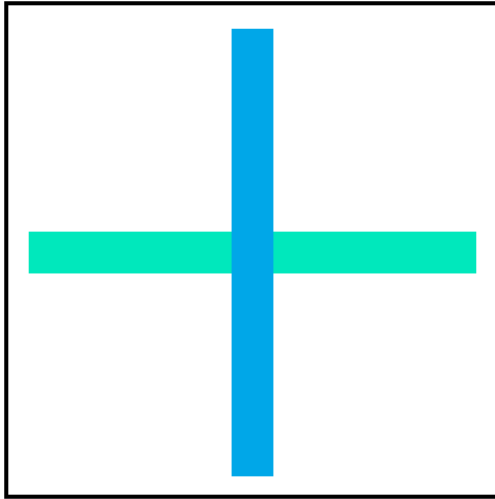
When the same elements are used repeatedly, they appear similar and as part of a group. To make something stand out of the group, variety can be added to achieve this (picture 8). Even though the example image only shows circles, the circles can be divided into two distinct groups because the hue and size are different in some of them. The cube example shown before relates to this (picture

6). At first the cubes were all the same size and therefore similar, later the sizes were altered resulting in a more interesting formation.



PICTURE 9. Vehicle concept by Fausto De Martini.

There are no right or wrong answers, it is all about the desired effect. The repetitive element could be anything like shape, colour, size or value (Hampton-Smith 2017). In vehicle design this could appear as something related to colour. For example, if a vehicle is militaristic by nature and therefore a single colour, a highlight with a different colour can be added to areas where the designer wants to show emphasis. In the example design (picture 9), the rear wheels share a similarity when it comes to design, and it feels like they form a group of their own. The front wheel then breaks this pattern to form a more interesting design in my opinion. The whole design is brought together using round shapes, creating a consistent shape language throughout the design.



PICTURE 10. Example of continuity

Another principle is *continuity*. In picture 10, is it two crossed lines or four lines meeting at the centre? According to Hampton-Smith (2017), continuity or continuation is the principle where the eye can be guided through an image, or a design. This is probably most commonly used in composition, where the viewer's eye is guided through a picture where certain elements form a line of action that leads to different elements in the picture (Hampton-Smith 2017). An example in a vehicle could be a race car with silky smooth curves which represent speed and elegance. These curves could also lead to other smaller shapes in the vehicle to help with the form or to show a minor detail.

Multiple other principles and theories exist as well, but those are out of the scope of this thesis. In conclusion, interesting shapes can be fabricated by following a few simple rules. It is a great starting point and an even better thing to remember before picking up the pencil. The same rules apply when designing in 3D as well.

3 3D IN CONCEPT ART

3D programs have been around for a few decades and can be used in a multitude of ways, but for the past decade it has been increasingly utilised in concept design. Creating fast and simple primitive shapes speeds up the concepting workflow for many and removes useless steps along the way. There is also no need to think about perspective when working this way.

The fact that a designer can now simply draw over a rough 3D sketch, saves a lot of time, and has become a widely used method. Most of the design work that is done today, is done on top of existing 3D shapes. Clients often have pre-existing 3D material that can be handed over to the concept designer to work on. (Zhu 2013.)

3.1 Advantages of 3D in the design workflow

3D is used in concept art to speed up the design process. The ease of use of 3D software and the benefits it brings is an invaluable element in a concept designer's toolbox. Instead of focusing on perspective and light, designers can use 3D software to kick-start the design process (Zhu 2016).

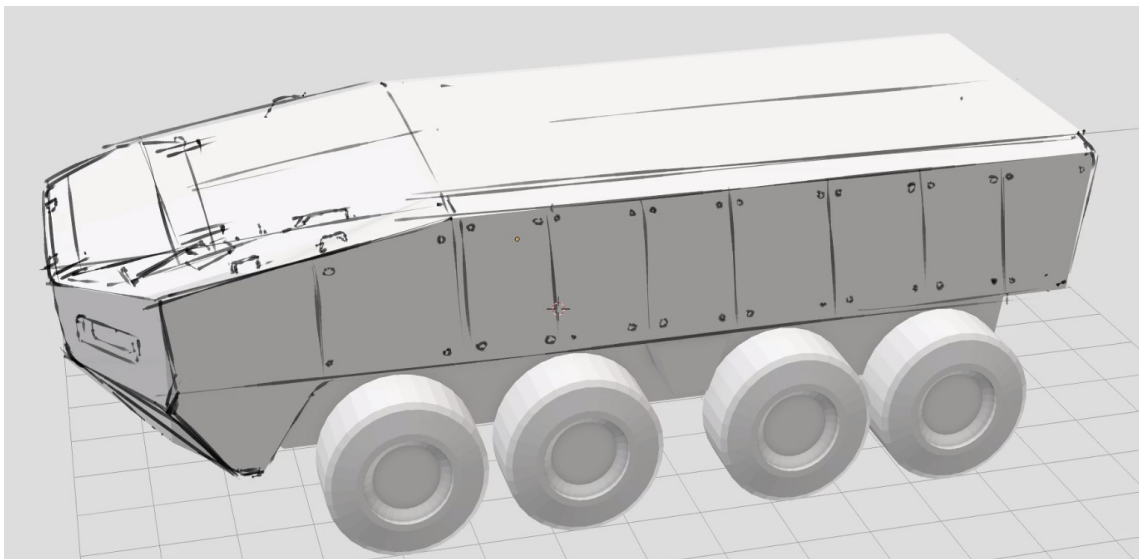
3D software such as Blender or Autodesk's Maya are tools that a concept designer could use. Blender is open-source and completely free to use so it is a great tool to adopt, and that is why it has been chosen as the tool of choice for this thesis. Since time is essential for a concept designer, the need for speed and efficiency in the design process can hardly be overstated. Speeding up the production pipeline also saves money.

In my opinion, designing multiple variations over a simple 3D mesh makes the work a lot faster and more efficient. Iteration is also easier when fundamental parts of a vehicle can be generated and multiplied automatically. Perspective is

a key factor in vehicle design making the design look believable. Proper perspective is a key consideration in all design areas. When the computer makes the perspective calculations for the designer, of the remaining elements the actual design process is the only one that needs to be focused on. In conclusion, time is saved for the designer and money is saved in the production.

3.1.1 Shapes

As established before, shapes play a fundamental role in design. Aiming to create interesting shapes is the goal of every designer, I believe. The use of 3D helps in the creation of shapes and speeds up the process tremendously.



PICTURE 11. Screen capture from Jama Jurabaev's Grease Pencil tutorial. (Jurabaev 2018)

Concept artist Jama Jurabaev uses the 3D base (picture 11) to start and then designs on top of it by drawing. This saves a lot of time helps in a multitude of ways. Here are some of the words Jurabaev says in his Gumroad tutorial video:

By doing this I'm saving a lot of time. 3D block-out gives me a solid fundamental 3D base and perspective for free. Sketching with Grease Pencil gives me the ability to quickly put my idea in a very sketchy form.

The whole design process could be done entirely in 3D as well, but that would last a lot longer (Jurabaev 2018). During the design process, drawing is faster. The block-out shape used in the sketching phase can later be used to create the actual final asset, and that again is a time saver (Jurabaev 2018).

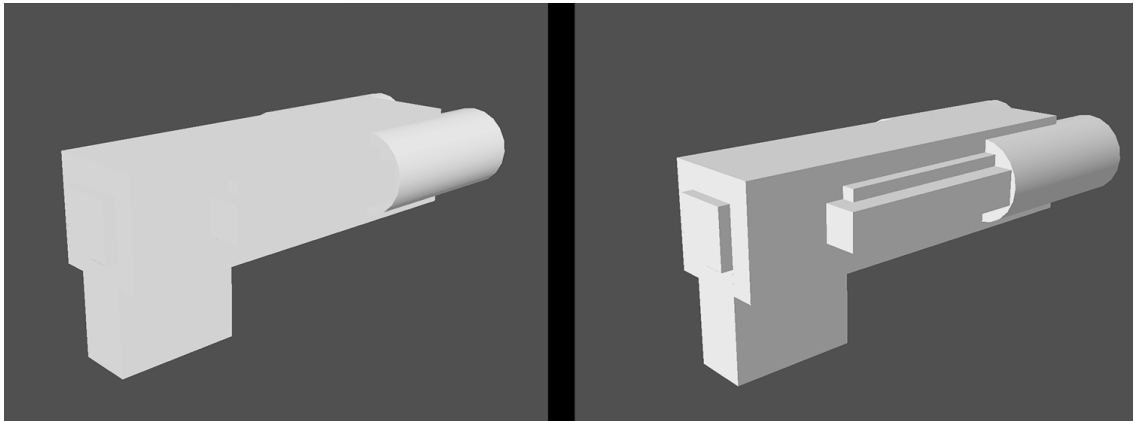
3.1.2 Perspective and cameras

3D makes the use of perspective much easier, since it is automatically correct. Setting up cameras with different focal lengths improves the design workflow by a great amount. The design process is made faster by removing one or two manual steps from the actual process. There is no need to draw excruciating perspective lines and calculate focal lengths. It is effortless to experiment with various camera placements with little to no struggle, to find out what works best for the situation. (Jurabaev 2018.)

Since correct perspective is paramount with believable and functional designs, the importance of using tools to help in that process hardly needs to be underlined. Take the previously mentioned vehicle design for example (picture 11), after setting up the basic form for it using primitives, the designer can now rotate the camera around it and find a desirable angle. Designs can be drawn on top of the forms from the front and back. Even orthographic views can be used to create drawings, making the job easier for the 3D modelers who are going to create the final assets.

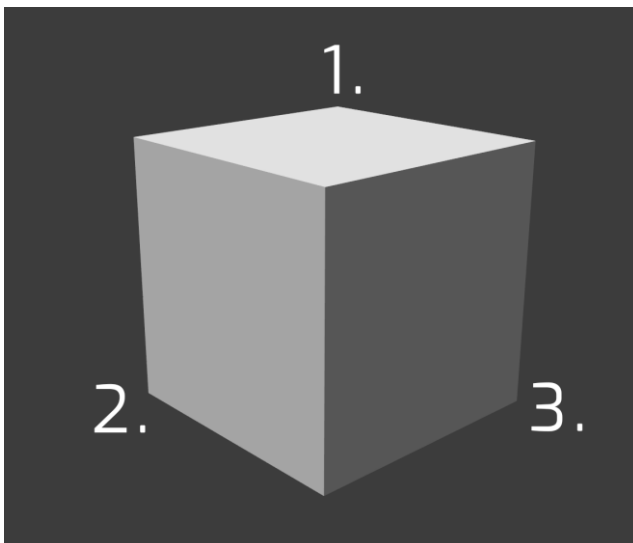
3.1.3 Light and shadow

Although light and the behaviour of shadows can help in the *selling* of a design, it is certainly not the most important aspect of a vehicle design. Light design has more to do with environmental concept art and colour keys, since mood can play a big part in that part of the business.



PICTURE 12. Importance of light in representing form

However, light and shadow are used to represent form, and that is important in all types of design work. If a vehicle has ambiguous form, the shape can be made clearer by lighting the vehicle from a direction which makes understanding of the form easier (picture 12). Functional lighting uses the *1-2-3-read* method as demonstrated by Scott Robertson and Thomas Bertling (2014, 52).



PICTURE 13. The 1-2-3-read

When an object has three clearly different values, the shape can be easily understood (Bertling & Robertson 2014, 52). One can clearly tell that the object represented in picture 13 is a cube. Using well thought-out lighting that gives a shape a good *1-2-3-read* makes it appear three-dimensional and therefore easy to understand (Bertling & Robertson 2014, 52). With the aid of 3D software, these kind of lighting scenarios are easy to reproduce and again, save a lot of time.

3.1.4 Iterations and speed

It is not rare for decisions to change when it comes to concept design. If, and when something needs to change, time is usually of the essence. With the aid of 3D in the process, things can be altered much faster compared to the traditional method of pen and paper (Jurabaev 2018).



PICTURE 14. Helicopter design done in Blender using Grease Pencil (Jurabaev 2018)

The helicopter design (picture 14) looks like any other two-dimensional drawing, but it is in fact the result of a quick Grease Pencil sketch drawn in Blender. The perspective is automatically correct, and all shapes look believable.

Since the focus of this thesis is on the use of 3D software in concept design, the study of Grease Pencil is important. Grease Pencil has features which aid in the concept design process. The quick creation of primitives and drawing of the design can now be accomplished inside one application, making Blender the perfect software for a design task

3.2 Examples of 3D in concept art

This chapter takes a glimpse at a few concept designs from various video game projects and inspects the elements of 3D that have been used in their making. The examples range from environment concepts to vehicle designs and shows clear examples of the usage of 3D. Some examples may be purely 3D and others may have been painted over so completely, that the original 3D mesh is nearly unidentifiable.



PICTURE 15. Concept art from Destiny by Jesse van Dijk (Bungie)

As seen from the concept art piece (picture 15), the concept designer Jesse van Dijk has used 3D graphics as a method for translating an idea into 2D. At closer inspection, the whole design may have been purely created in a 3D environment, which is a great example of the uses of 3D in the concept design workflow.

The finished design can be interpreted clearly. The perspective is perfect and there are no random squiggly lines drawn by hand. Design-wise, the scale is also easy to understand because of the placement of the human models and stairs in front of the building's entrance. This picture could have been imported into a 2D image manipulation software and taken further by drawing and painting more details, but there is no need for further action in my opinion. In conclusion, the concept is purely made from 3D primitives and with no texturing at all, and the design works without question.

Picture 16 shows a ship design created by Paul Chadeisson, another industry veteran who has worked on multiple well-known projects, such as the film *Blade Runner 2047* and the video game *Cyberpunk 2077* (Chadeisson). The ship was modeled first in 3D and then later brought to a finish in Photoshop (Chadeisson). I imagine the 3D base was a tremendous help in the creation of the final design.



PICTURE 16. Ship design by Paul Chadeisson (2017)

4 GREASE PENCIL

This section goes into detail about Grease Pencil and some of its functions and features. Grease Pencil has been a part of Blender since at least version 2.73 (Blender), but with the upcoming 2.8 version of Blender, it will get a tremendous facelift. This will not be a complete guide or analysis of the tool or its features, rather focus will be on features that aid the design process.

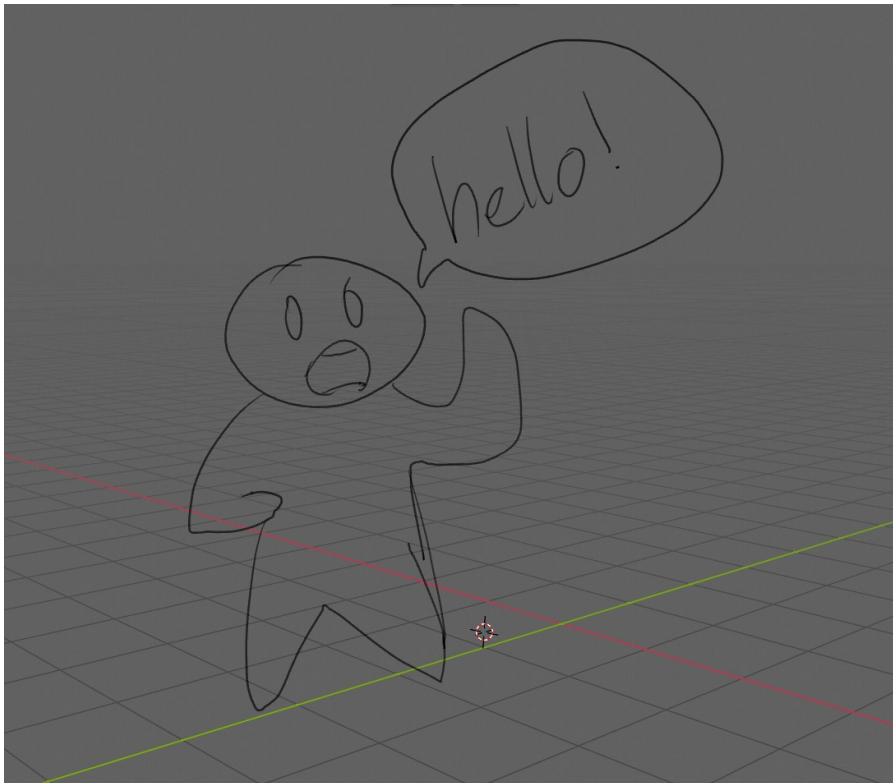
4.1 A note about Blender

Before going into Grease Pencil, a small introduction of Blender is needed. Blender is a free, open-source 3D modelling software with a multitude of different features. It can be used for the entirety of the 3D pipeline, which includes modelling, rigging, animation and rendering among other features (Blender). The cross-platform aspect of Blender allows it to work on Windows, Mac and Linux (Blender). Blender launched open source in 1998 and has substantially evolved ever since. It is constantly being updated, and because of its open-source nature it has a lot of eager developers around the globe (Blender).

As of writing this thesis, Blender 2.8 is in its beta version, which means it is not officially released and is still being developed. It also has bugs and the functions of the tools may change. Blender's 2.8 update brings a great amount of changes to the software and plenty of new features and tools, even a user interface overhaul has been done. Grease Pencil is getting a big-scale update and it is a great aid when it comes to concept design. Blender makes the creation of simple primitive shapes very easy and fast. Once the software becomes familiar to the user, speed in workflow comes naturally.

4.2 What is Grease Pencil

Grease Pencil is a 2D drawing tool in Blender. The main use of Grease Pencil is in 2D animation, but it can also be used to draw in 3D space. It was originally developed as an annotation tool (Blender), but lately its features have improved.



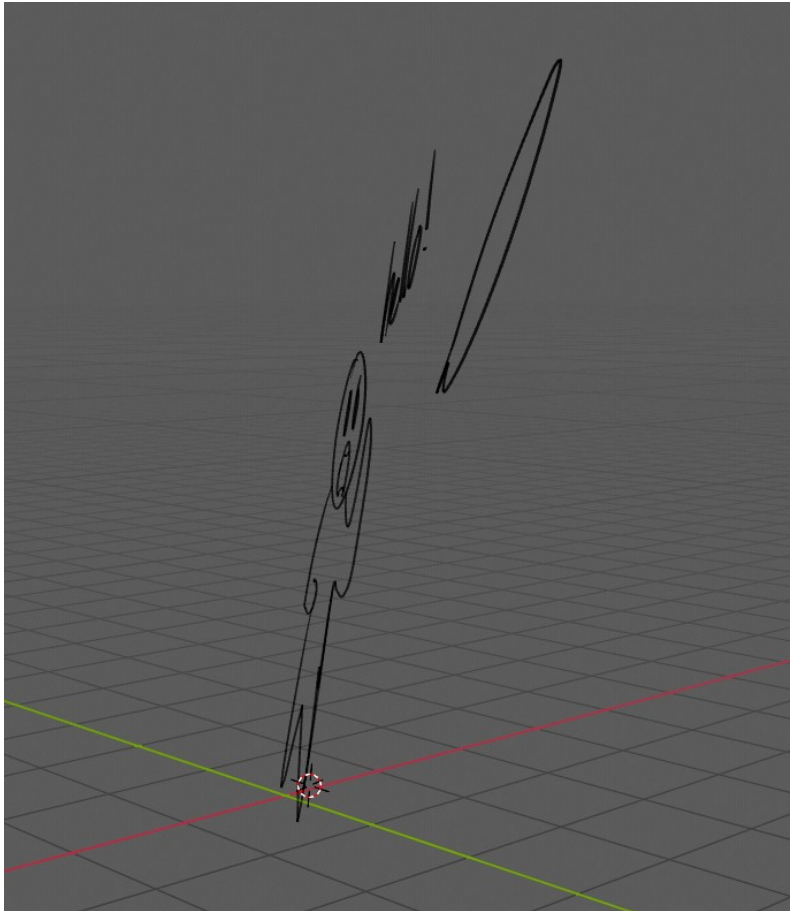
PICTURE 17. Grease Pencil drawing in Blender's 3D space.

Picture 17 shows a character I drew using Grease Pencil. It is recommended to use a graphics tablet since using a mouse brings lack of control, although some people manage that as well.

4.3 Drawing in 3D space

Focusing too much on adding primitives and getting into the modelling aspect can be time-consuming in the end and may lead the designer astray from their main purpose. In my opinion, the design is the goal and the use of right amount of 3D is vital. Once a satisfied block-in of shapes is done, the drawing phase can begin.

Sketching over the rough mesh helps the designer to come up with additional shapes in a more imaginative way.

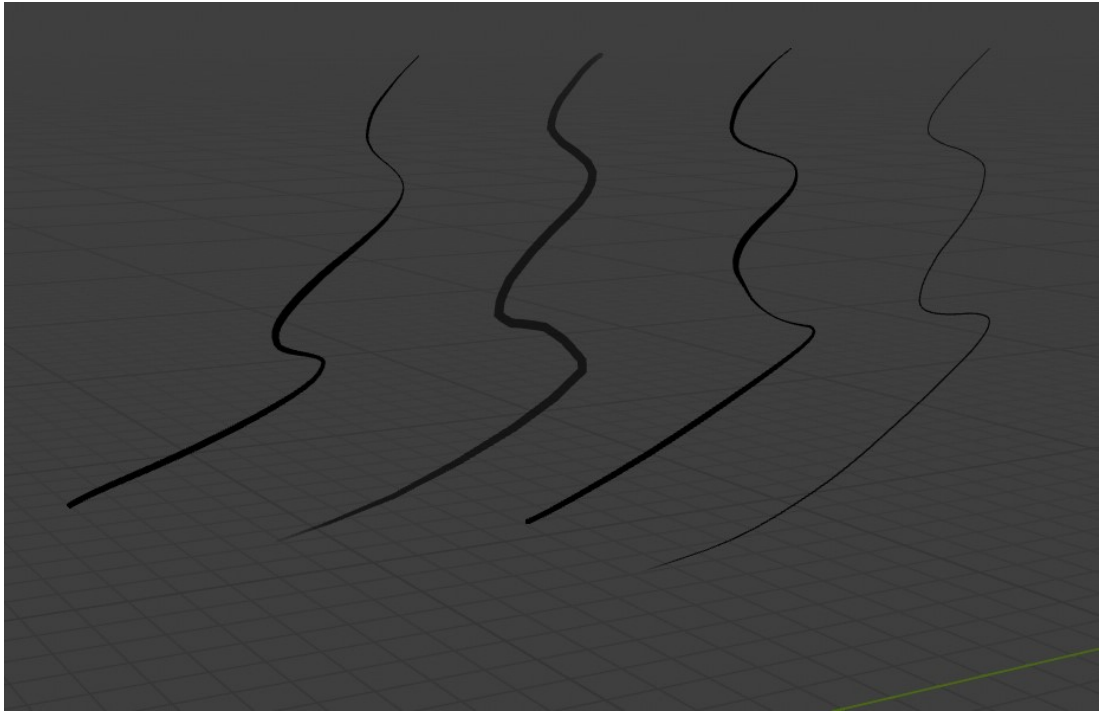


PICTURE 18. Grease Pencil drawing is on a flat plane.

The drawing is done in the actual three-dimensional environment or on a flat plane. If the drawing is done on a single plane, the image can only be viewed from that special angle it was drawn in, compare picture 17 and picture 18. Lines drawn in the 3D environment can be viewed from any angle, thus multiple view-points can be easily shown that helps sell the design better.

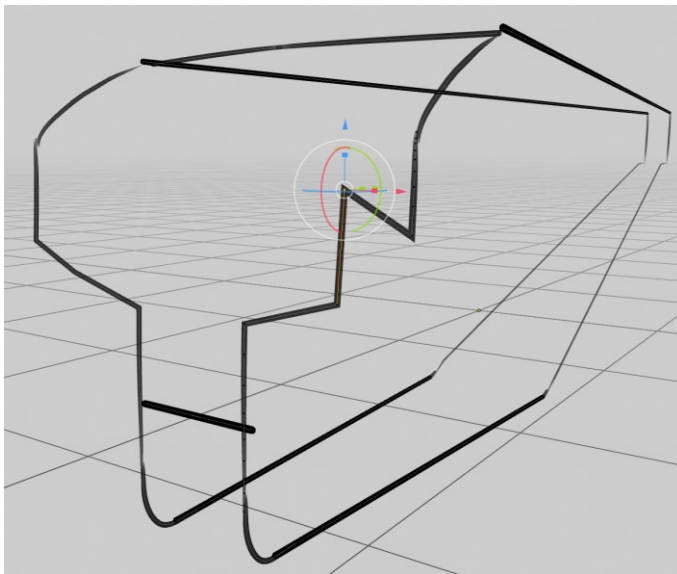
4.4 Features

Grease Pencil has multiple brush variations that yield different kind of strokes (picture 19). Because of Grease Pencil's primary use is in 2D animation, I imagine the different kind of brushes are useful in this area. Clean lines and brush strokes work best in concept design in my opinion.



PICTURE 19. Stroke options of Grease Pencil

An eraser can be used to remove lines or to fix errors. The lines can even be translated or modified in the 3D space like any other 3D object, since they consist of points (picture 20). Closer inspection of the picture shows that the shape is similar on the left and right sides, which be achieved with the help of modifiers.



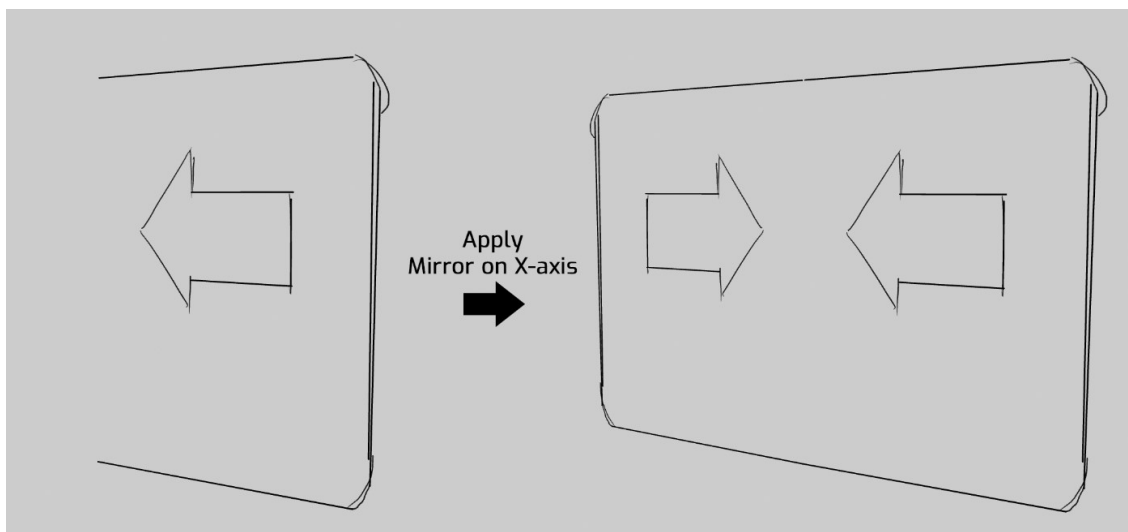
PICTURE 20. Displaying the transform tool after a point has been selected in a Grease Pencil drawing.

4.5 Modifiers

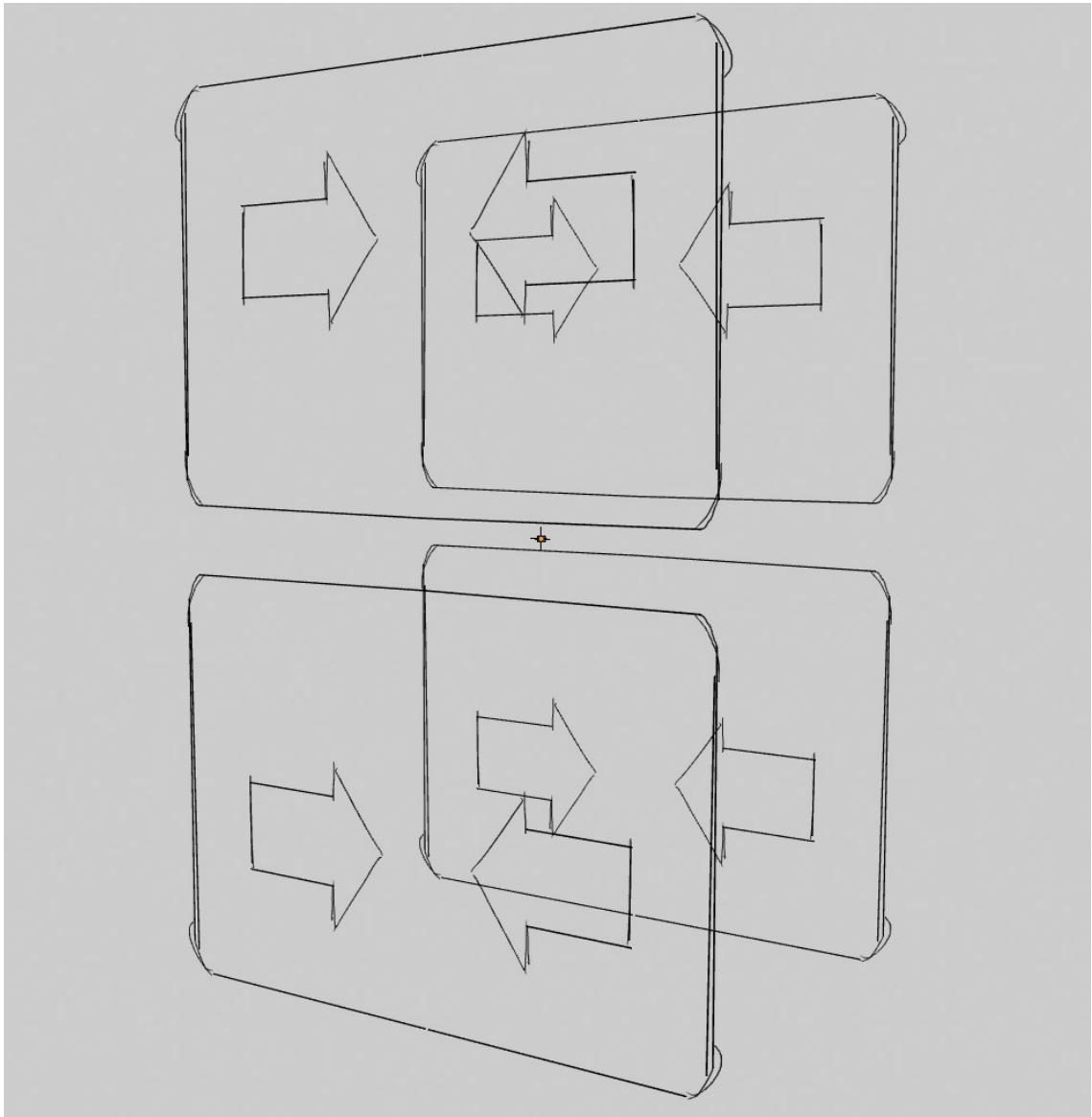
Modifiers are operations in Blender that automatically affect an object. They can be used to automate tasks that would otherwise be time-consuming. Modifiers also work in a non-destructive way, making it easy to revert changes without the need of undoing your work. (Blender.)

In Blender, modifiers come in four different types, *modify*, *generate*, *deform* and *simulate*. Grease Pencil can only use two of those types, *deform* and *generate*, of which the latter is most useful in my opinion. I have found two *generate* type modifiers to be highly useful in my work, the mirror modifier and the array modifier.

To me, the most important modifier is the mirror modifier. It automatically mirrors the object on the desired axis. As can be seen from picture 21, a mirror modifier is being applied on a Grease Pencil drawing on the X-axis on Blender's viewport. The same modifier can also be applied on all three axes (picture 22).



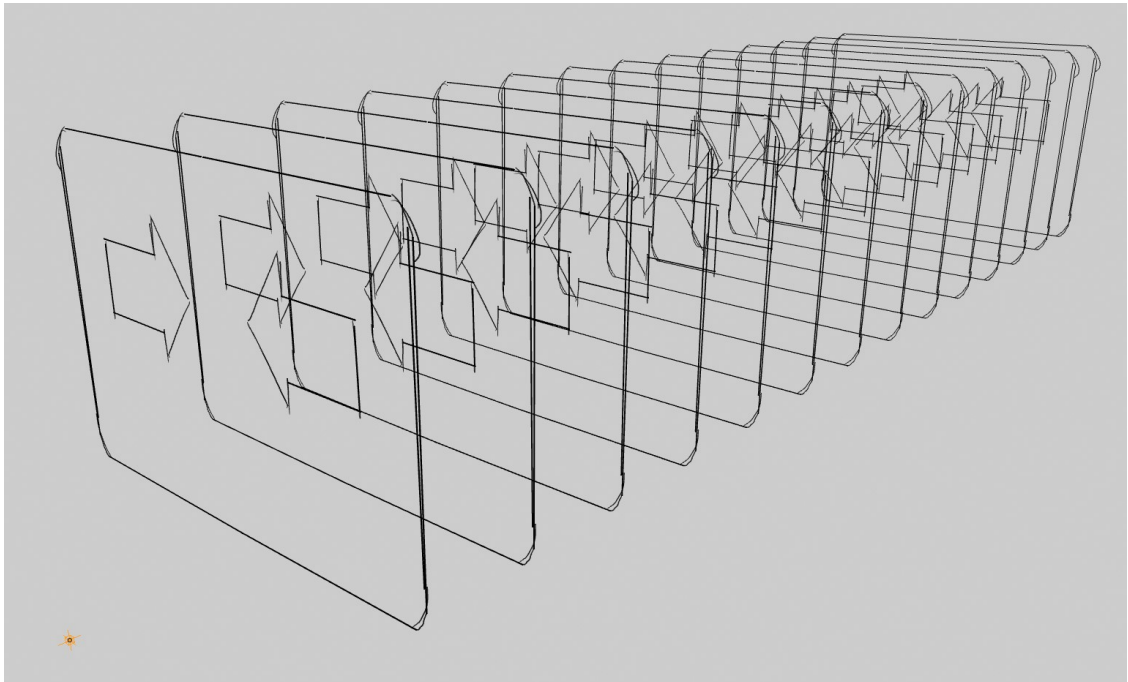
PICTURE 21. Demonstrating mirror modifier on a Grease Pencil drawing.



PICTURE 22. Mirror modifier on all three axes

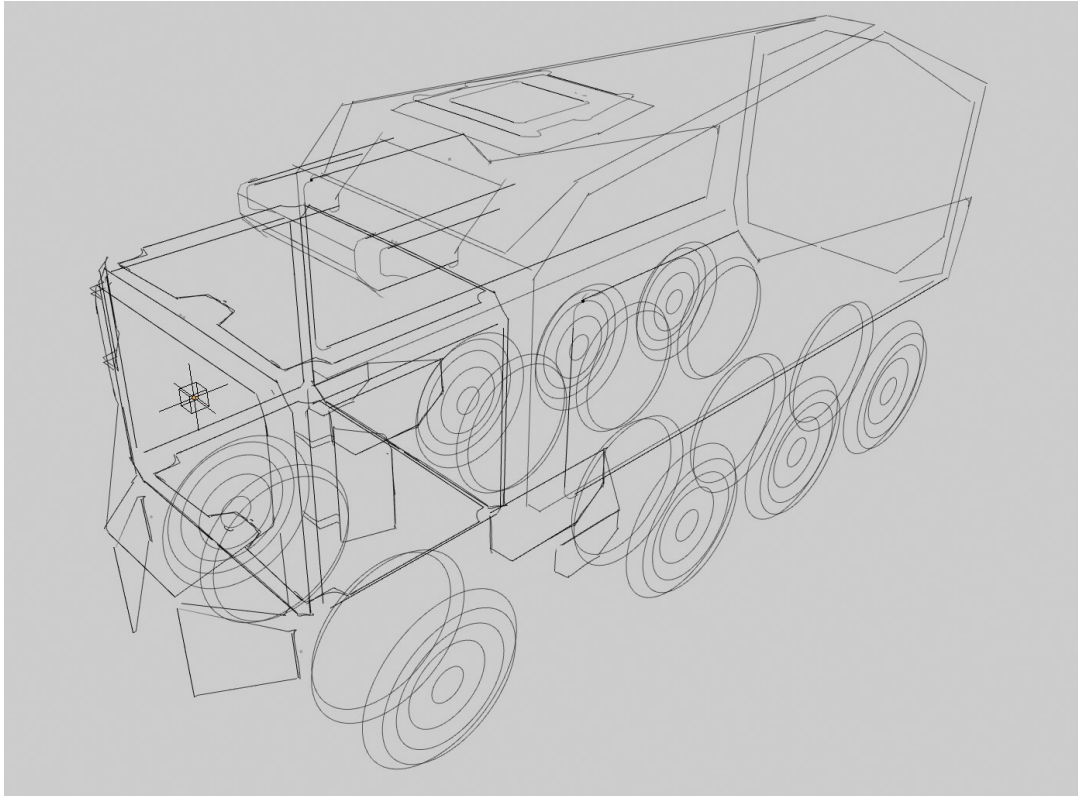
The benefits of the mirror modifier are remarkable as they practically reduce at least half of the total work for symmetrical designs. In regard to vehicle design, this is very helpful because only one side of the vehicle needs to be worked on. Using the other axes as well may result in unpredicted shapes and designs, so experimentation is encouraged.

The second useful modifier, the array modifier, repeats a desired object a set amount on a chosen axis. It is highly useful when a repeating element is needed, for example the tyres of a vehicle. As seen from picture 23, the drawing is repeated multiple times on the Y-axis. The direction and spacing can be adjusted.



PICTURE 23. Demonstration of the array modifier

In conclusion, using modifiers speeds up the whole process and one can quickly come up with satisfying results. Picture 24 shows a sketch made relatively quickly. Granted, the design and the forms can be quite unclear to others but with sketching the goal is to help yourself. I used the mirror modifier throughout the whole drawing so that I would only need to work on one side. For the wheels I used the array modifier to easily multiply them. The sketch (picture 24) is at a pretty rough stage at this point, but it can easily be refined, and the shapes can be altered for a more readable design if needed. I find this method to be a satisfying way of designing and sketching, it also shows similarities to the way Jama Jurabaev works.



PICTURE 24. A quick sketch of a truck drawn with Grease Pencil in Blender

4.6 Case study: Jama Jurabaev

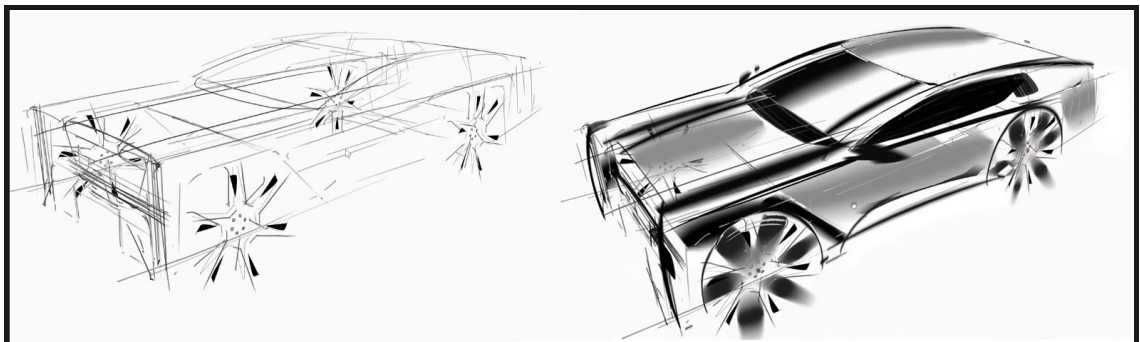
Jama Jurabaev is a concept artist from Tajikistan, currently living in England. He has worked on a multitude of Hollywood blockbusters, such as *Guardians of the Galaxy* and *Avengers – The Age of Ultron*. He is a skilled designer and has been studying Blender’s Grease Pencil a great deal. Jama has released tutorial videos on the use of Grease Pencil and the ways it helps with the concept design workflow. Jama has found blender and the use of Grease Pencil to be a perfect balance of working with 3D and drawing (Jurabaev 2018). His methods allow him to quickly produce designs that are observable in a 3D environment.



PICTURE 25. Screen captures of Jama Jurabaev’s tutorial video

Jurabaev has done a lot of experimentation regarding 3D software and concept art. Picture 25 shows him sketching out a helmet in Blender with Grease Pencil and afterwards refining it in Photoshop, I find this to be a quick way to get an idea across.

Picture 26 shows a similar method. Jama has drawn a simple sketch in Blender, then rotated the camera to a desired angle and finished the sketch in Photoshop. In the next chapter, I will be putting all of this together to create my own designs by utilising all the techniques I have discussed in this thesis.



PICTURE 26. A screen capture of Jama Jurabaev's tutorial video

Jurabaev worked as a concept artist for the 2018 film, Jurassic World: Fallen Kingdom. He created all of his designs (picture 27) using Blender and Grease Pencil (Jurabaev 2018). Jurabaev's workflow saved him a lot of time and made the process easier (Jurabaev 2018).



PICTURE 27. Concept art for the movie Jurassic World: Fallen Kingdom (2018)

As one can clearly tell from the images (picture 27), Blender alone is a very powerful tool with a multitude of functions. A cinematic image can be easily achieved inside a 3D environment, this can be an important element in feature film concept art, because the images already look similar to the end result (Jurabaev 2018).

5 UTILISING GREASE PENCIL IN A DESIGN PROJECT

This chapter is the practical part of the thesis where I show my process of designing a vehicle by using a 3D program, in this case Blender 2.8. In my design process, I use other tools as well, such as Adobe Photoshop and Procreate – a digital painting application for Apple iPad.

I began this task by underlining the details of the project and what the goals are. After that I started the design process by sketching out preliminary ideas and move onto using 3D software, all the while refining the idea step by step.

The final design is a part of my design portfolio and matches the industry standards regarding quality and presentation. How satisfying the result itself is, is of course a matter of personal taste.

5.1 Project details

The goal of this project was to design a truck-type vehicle that would fit into a futuristic science fiction video game environment. What I had in mind was a vehicle that would hold a crew of a few people and the purpose of the vehicle would be exploration and expedition.

I wanted to stay away from adding weapons to the design, since adding weapons can arguably be an easy way to make a vehicle look “cool” and would detract from the main purpose of the exercise. According to Zhu (2012), anyone can add weapons to a vehicle and make it look great without that much of an effort, but to design something functional and useful requires real design thinking. That is what I hoped to achieve.

5.1.1 Design notes

Further thoughts behind the design need to be explained in order to better translate my vision. As stated earlier, I wanted to create a vehicle used for scientific purposes such as expeditions and exploration. Since the vehicle is supposed to exist in a fictional futuristic world, some liberties can be taken in regards of the design and functionality. The resulting design however should still be somewhat believable and functional.

The purpose of the vehicle is twofold. It is supposed to be used as a means of transportation and accommodation for the crew in a remote location and it also houses scientific equipment such as computers and various tools to be used for numerous tasks. The vehicle should also have means of transporting some sort of cargo or heavier equipment if the need arises. This quick rundown of requirements is a good way to narrow down the design, I find. Narrower needs mean less stress for the designer since the possibilities are not endless anymore. In other words, a clear list of requirements shows what is needed in the design.

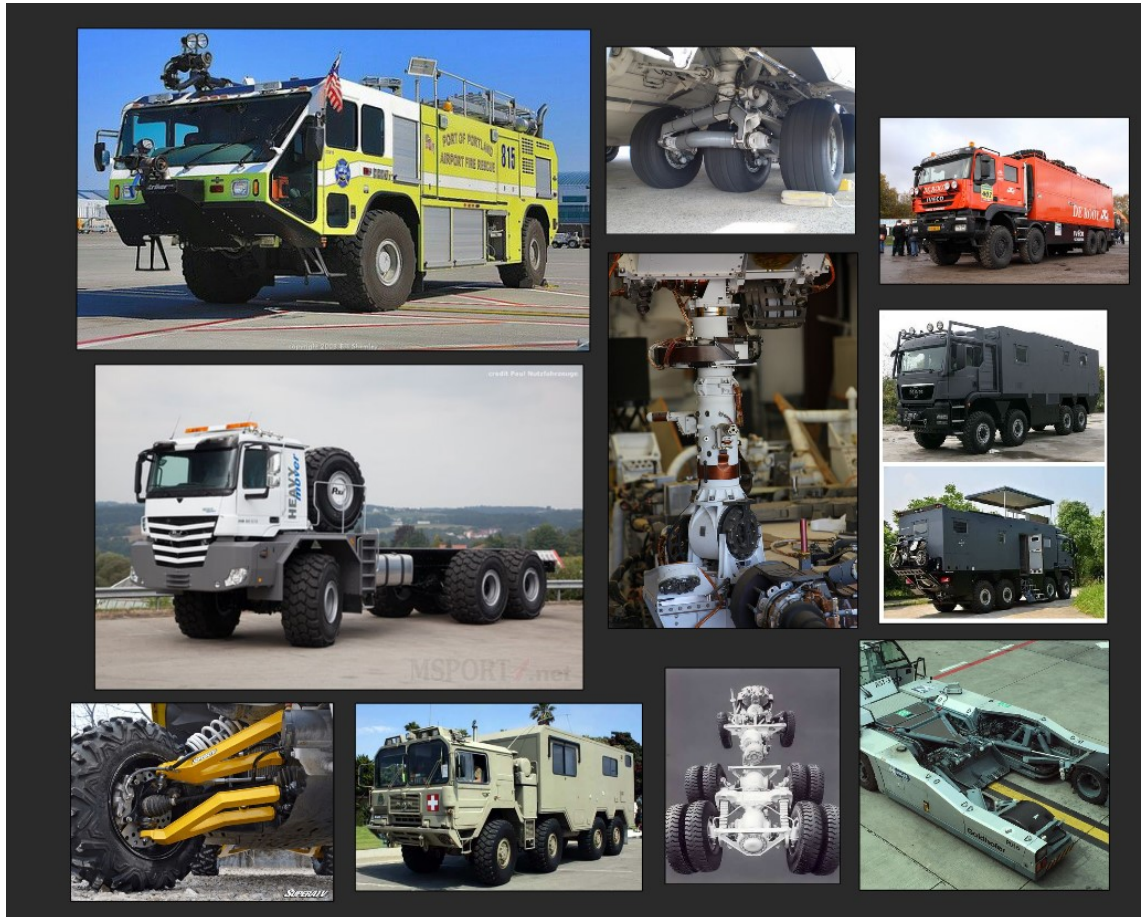
During this step I also wrote down some personal notes and ideas to wrap my mind around the concept. After the requirements are set, a clear problem is established, a problem which a concept designer can solve. But before the problem solving can begin, some reference material needs to be gathered.

5.1.2 Using reference material

Like Nyström (2016, 62) states, using reference material is very beneficial. I collected some reference pictures of vehicles and mechanical parts that I found interesting. I think that using reference material is something that needs to be learned, and for me it has been a long road on which I still struggle.

I have found myself favouring big and bold shapes with clean definition and that was the first thing in my mind when I began the whole process. I gathered photos of mostly real-world vehicles that matched the aesthetic that I aimed for (picture

28). I also collected photos of certain parts of a vehicle such as the location where the chassis is connected to the tyre to help me better understand the functionality of it.



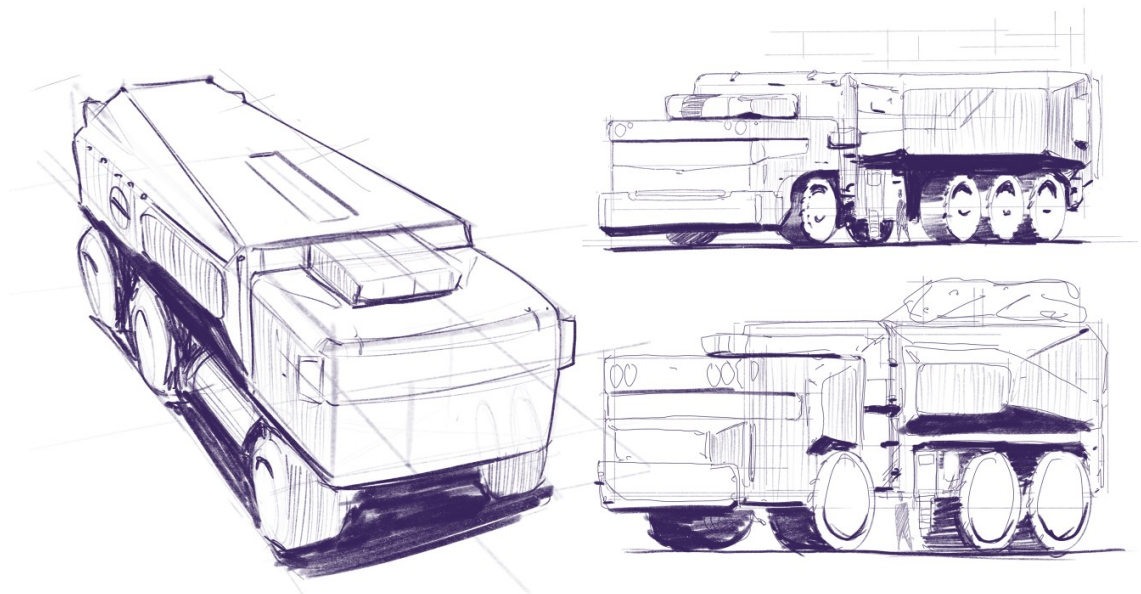
PICTURE 28. Collected reference material (pinterest.com)

Using real vehicles as a reference is a great aid, since everything in them has a purpose, especially the mechanical parts. One can never go wrong when using references from real life. Another artist's designs and works can be used as reference as well, but caution must be exercised: some elements or parts may not be that accurate or functional and also, the result maybe too similar to the other artist's artwork.

5.2 Rough sketching phase

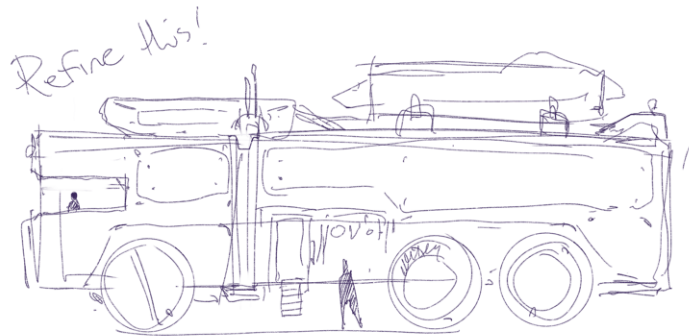
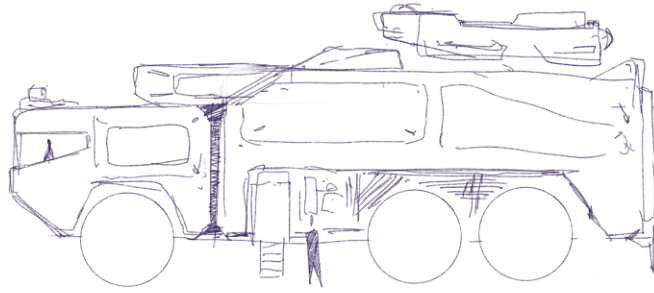
After the preliminary problem was established, I started by sketching out a few rough ideas about the truck (picture 29). During this phase I sketched using Procreate. I found Procreate to be an excellent tool in this phase because of the speed as well as the portability, allowing me to draw with an actual stylus.

With Procreate and an iPad, I was able to work on the project when I did not have access to a computer, specifically Blender. Of course, the sketching could have been done in a sketchbook with an actual pencil as well. I found that digital tools allow more flexibility so that is why I ended up using Procreate.



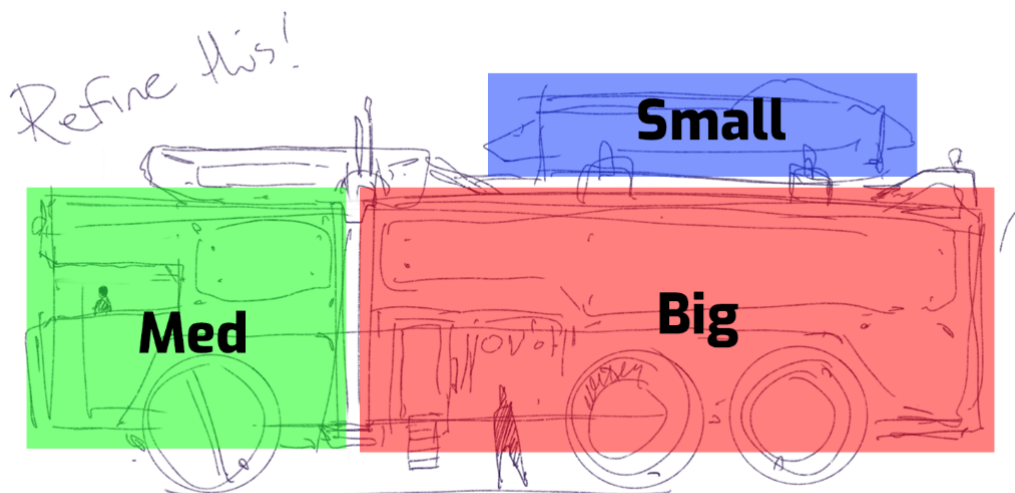
PICTURE 29. Preliminary sketches I did of my design

As can be seen by examining the sketches (picture 29), I ended up with a rather bulky truck style vehicle for my design. I wanted to use clear shapes and not go into detail, since it was not a priority at this point. The overall form looked pleasing to me, so I continued to explore this route.



PICTURE 30. Rough sideview sketches of the truck

I wanted to refine the idea of the truck, so I made some sideview sketches of it with Procreate. It allowed me to put in more elements and it is practically the only view in which the whole design and its significant elements are showing (picture 30). The sideview let me design the tyres, the overall silhouette and some important details such as doors.



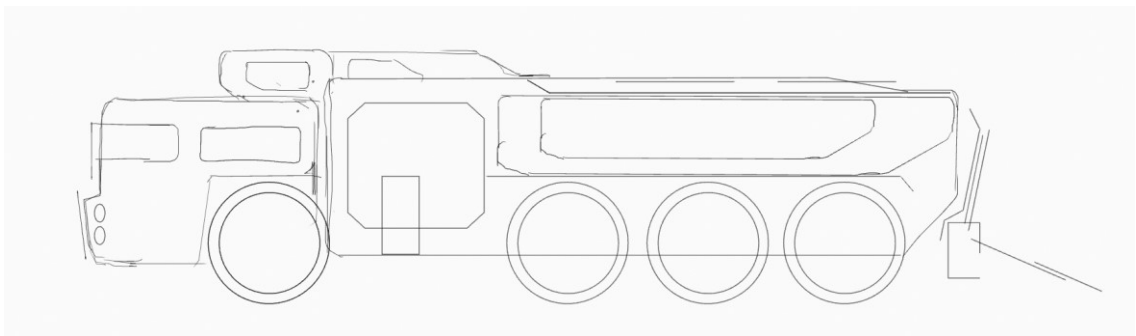
PICTURE 31. Demonstration of the different larger shapes

By inspecting the sideview sketch further, the *big-medium-small* shapes can be found as demonstrated in the image (picture 31). I had the idea that the truck could carry bigger cargo on its back and that would form the *small* shape. Even if the *small* element were to be left out the overall shape would still work.

The resulting sketch was a massive truck with huge tyres reaching higher than a human, making an excellent candidate for fictional vehicle in a video game. After the rough sketch phase I moved to Blender and Grease Pencil.

5.3 Designing using Grease Pencil

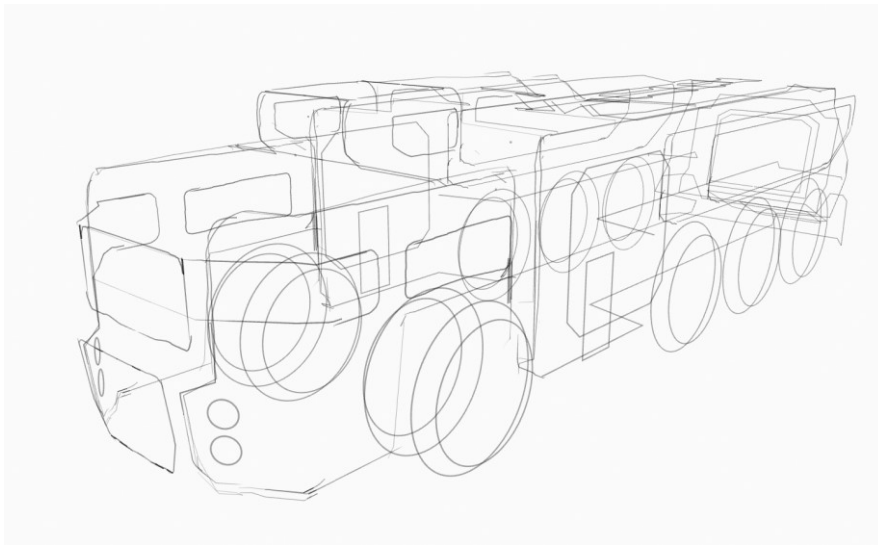
After the rough sketching was done and the principal idea in my head was clearer, I began the ideation process of the truck in Blender 2.8 using Grease Pencil. I started with the most basic shapes in sideview (picture 32) and continued from that. I tried to keep in mind some of the rules of design when creating the shapes. One of the methods I tried to implement was the use of repeating shapes by thinking about a unified shape language.



PICTURE 32. Sideview sketch of the truck in Blender

Simple primitives and clear definite shapes were aimed at. The truck has a cab for the pilot and space for the crew to sleep in. There is also room for the working area and the equipment right after the front tyres. I found this way of working with Grease Pencil to be quick and easy, since I could grab all the points and lines and move them around freely to the desired position.

The $\frac{3}{4}$ view (picture 33) may look somewhat confusing because of the Grease Pencil lines at the back also show through, but an overall form can be understood. The benefits of doing this with Grease Pencil were that it allowed me to look at the drawing from all angles. It helped me get a better understanding of the form and what kind of adjustments needed to be done.



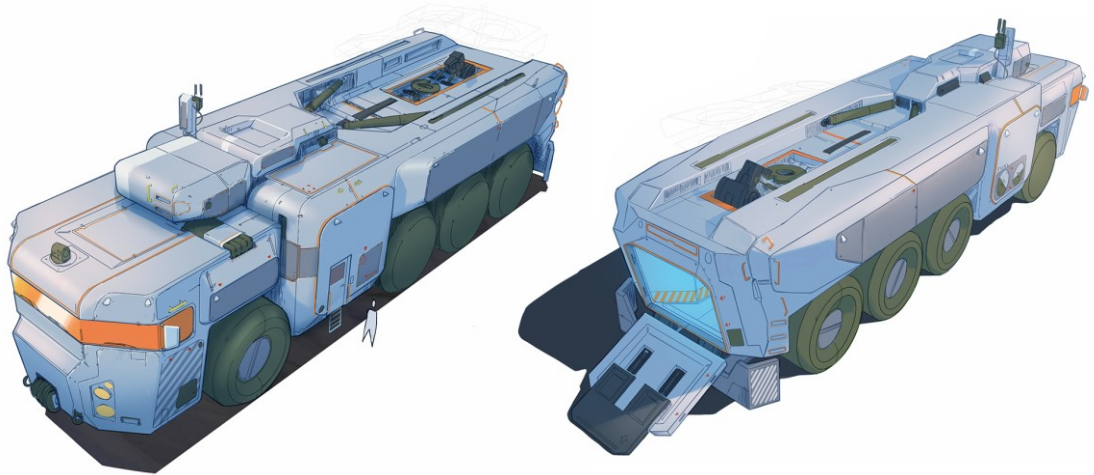
PICTURE 33. A $\frac{3}{4}$ view of the Grease Pencil drawing in Blender

During the Grease Pencil designing phase I used the aforementioned modifiers to help me in the process. The mirror modifier helped tremendously because that meant that I only needed to work on one side. The array modifier helped with the tyres. All in all, using Grease Pencil was a splendid way to come up with a satisfying design.

Using Grease Pencil forced me think about the shape from all directions instead of a single locked perspective. I had to carefully think about the design because I could spot errors more easily when I viewed the truck from a different angle. I think that this helped me achieve a more functional result in the end.

After the Grease Pencil sketch was done, two interesting viewing angles were chosen and the sketches were exported into Procreate, where the Grease Pencil sketches were refined to a presentable level by drawing over them (picture 34). During this phase more detail was added, and smaller shapes needed designing. I thought that this was a job too tedious to be handled with Grease Pencil, so I

chose to draw by hand. I also worked on the colours and tried to think about the overall balance of elements, for example by having noisier spots and places of rest for the eye.



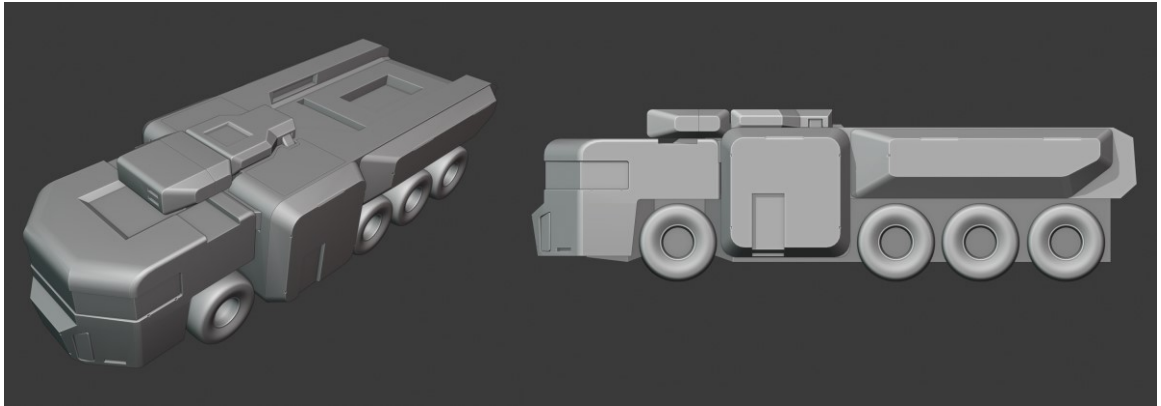
PICTURE 34. The final sketches

The result was a clean $\frac{3}{4}$ view from the front and back of the truck. I think these drawings could be used as functional concepts, but I wanted to go further and use more 3D. I thought that by modelling some of the parts, it would force me to think even more about the design and solve more problems. I also thought it would help me to better understand all the forms that make up the design.

5.4 3D modelling and refining

Now that the actual concept was practically done, by 3D modelling the truck I essentially fleshed out the details and cleaned the shapes even more. Picture 35 shows an early block-out mesh of the model in Blender, where the Grease Pencil sketch was used as a starting point to help with the modelling. By having a 3D model of the truck, a more realistic image of the design could be rendered. Also, having a 3D model meant that the truck could be displayed from any angle, helping a hypothetical production modeller a great deal. Production modellers make the model ready to be used in a game environment and forms its very own field of work within the industry. Once they are finished, concepts such as the one

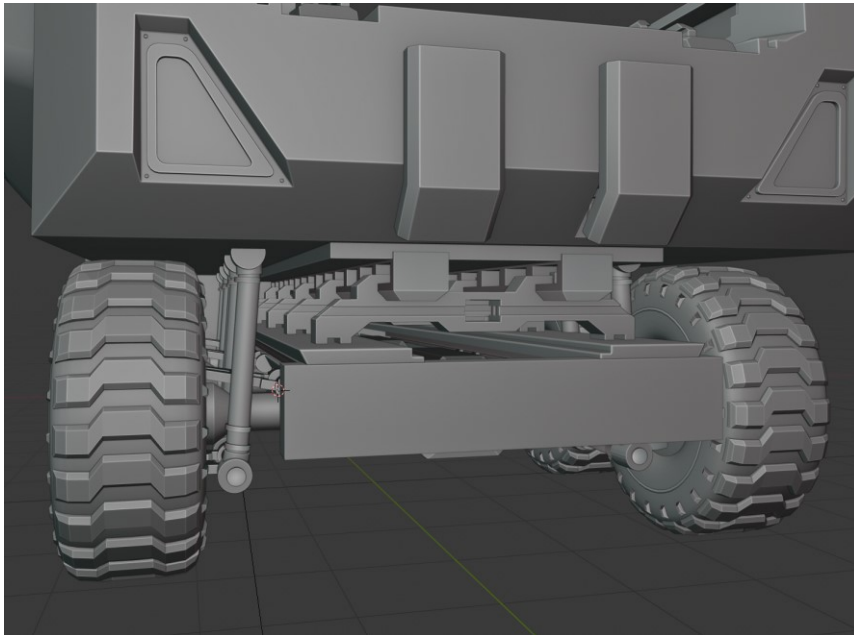
presented in this thesis are handed over to a production modeller or used as visualizations for clients.



PICTURE 35. Early 3D block-out of the model

This type of model should not be confused with an actual production model that would be used in a game. This was merely a 3D model that I used in the production of concept design artwork. Actual in-game models have their own meticulous production methods.

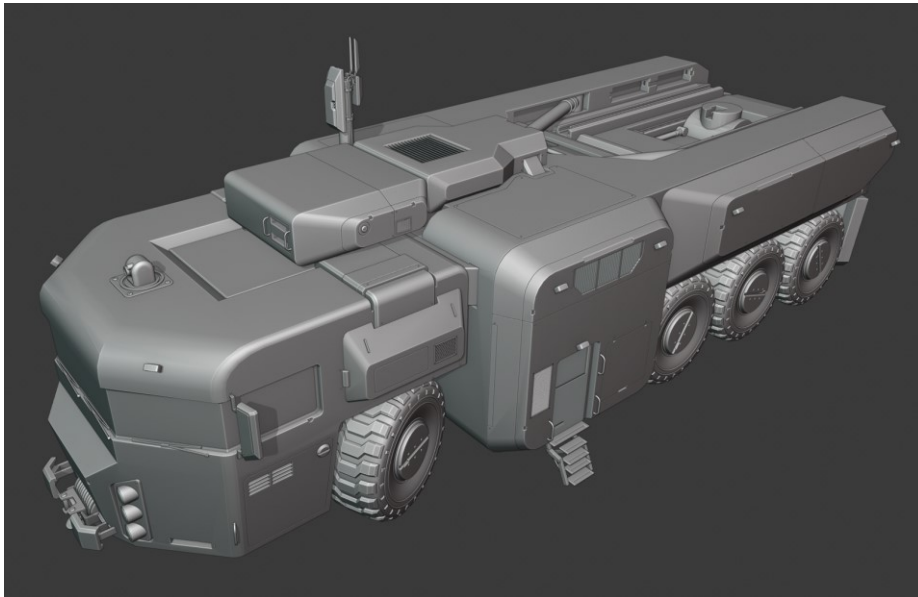
During the 3D modelling phase, some elements such as the side mirrors and the winch were designed by modelling them in place. The base shape of the truck was already designed so it would function, therefore this stage only consisted of adding details. The bigger forms did not need to be changed, thus keeping the overall form intact. Those details could have been left out or even drawn in Photoshop afterwards, but I felt that by actually modelling them they would appear more believable and functional.



PICTURE 36. Rear of the truck, with the bumper removed.

One of the benefits of modelling the truck was understanding the form in its entirety. The design changed quite a bit during this process because I noticed some parts would have not worked the way they were in the original design sketch. In a particular example, the door at the rear of the truck had to be removed, since the space for it was not really there, realistically thinking. In this case I studied some reference pictures and modelled (picture 36) a somewhat believable chassis of a truck. By adding realistic or believable elements, the whole design becomes a lot more convincing, in my view.

In modelling I used an addon for Blender, called *HardOps*. It is an addon that greatly helps in the process of hard surface modelling, such as this truck. *HardOps* enables cutting and merging of meshes by using other shapes, so it streamlined the process a great deal.



PICTURE 37. Final 3D model of the truck

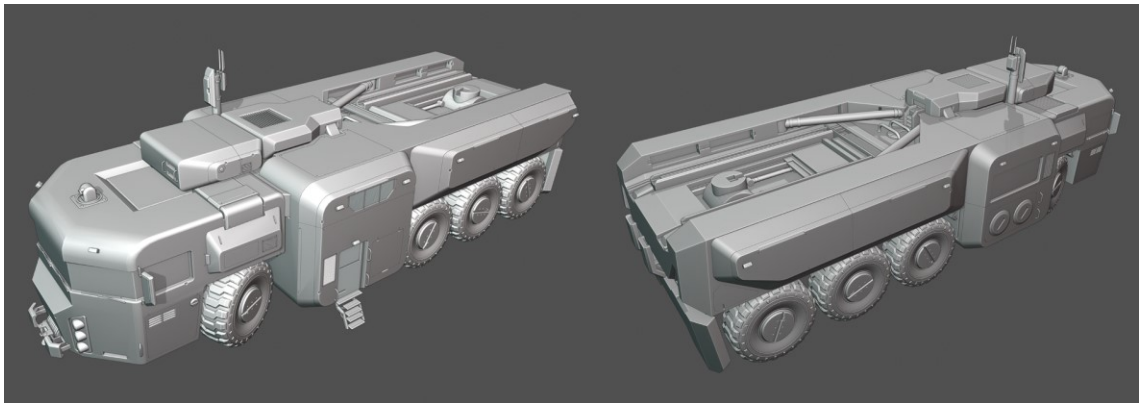
The modelling was time intensive and I am not sure if it is something that would be beneficial for me to use in a real-life situation where there is a tight deadline. Of course, by modelling more, I would get faster and better at it, making it an excellent instrument in my toolbox. All in all, the end result was a decently detailed model (picture 37) of the design that is well suited as material for a concept design piece.

5.5 Final presentation

Now that the 3D model was complete, I used it as a base for a couple of final concept images as well as a more refined visualisation image with noticeably more detail and atmosphere than the pre-model concept sketches in picture 34. I added basic materials onto the model in Blender and rendered an image from the desired angle. Calculations of the lighting, the shadows or the perspective were not needed. Focus was only on creating a satisfactory presentation. For the line art concepts, a result similar to picture 34, but with cleaner lines and clearer presentation was aimed at.

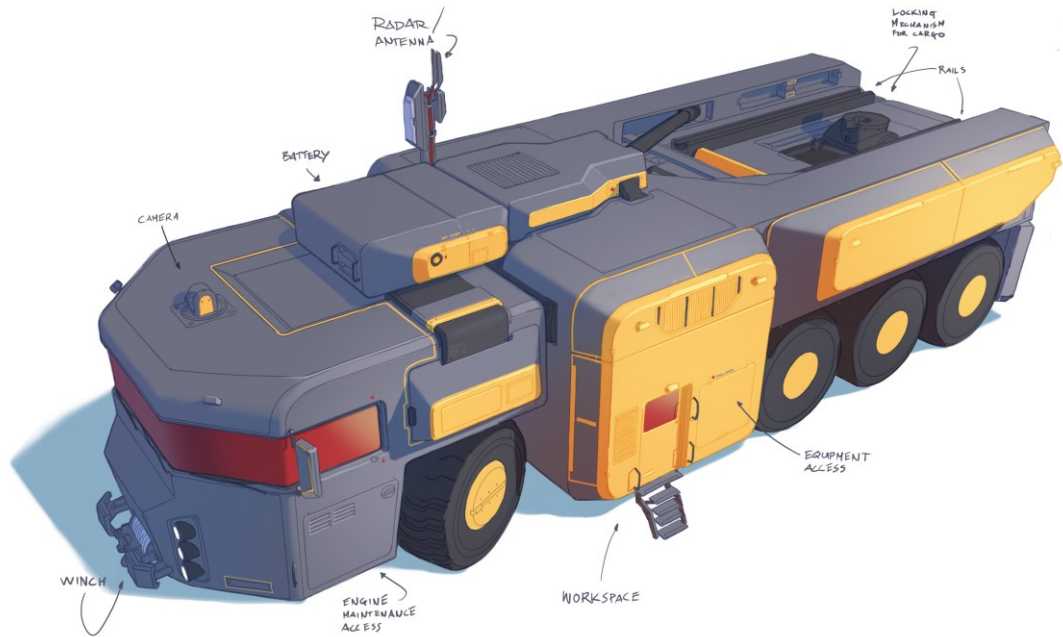
5.5.1 Line art concept

Using the grey clay renders to showcase the concept from different angles was an option, but in my opinion that would not have looked good enough. I wanted to draw them in order to express the idea behind the vehicle better. Clay renders tend to look somewhat dull in my perspective and they do not really explain anything other than shape. I took screenshots (picture 38) of a few angles in Blender and moved into Procreate for the line drawing process.



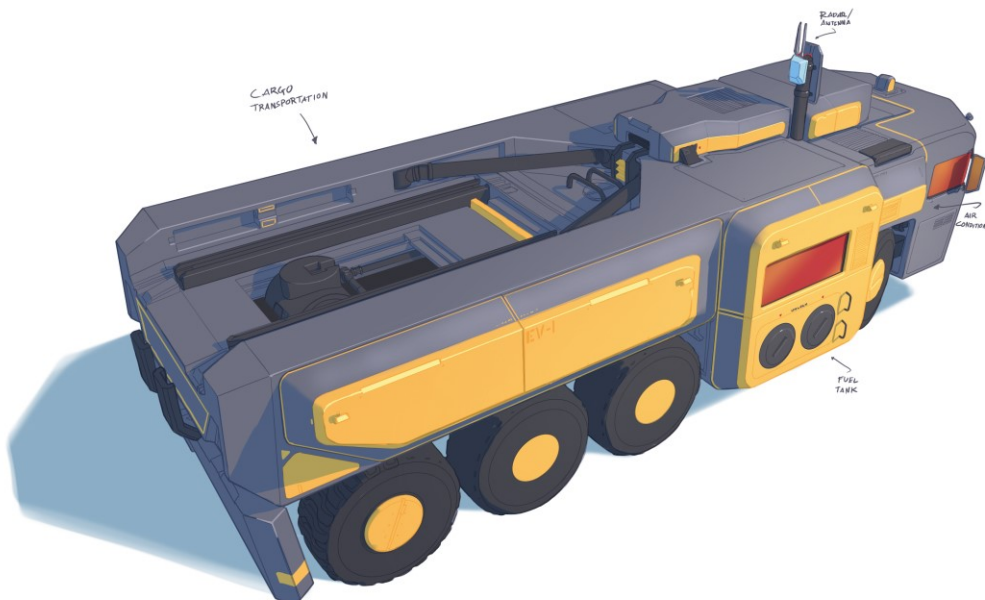
PICTURE 38. Screenshot of the final 3D model from two angles

In Procreate, the opacity of the images were set low enough to be able to still see the forms. The vehicle was then traced in Procreate by drawing on a new layer on top of the 3D model. This was a point where design decisions could still have been made to the general form, but the shape of the 3D model was followed because it was satisfying at that stage. The lines were carefully done, since lineweight plays an important role in drawings. As Scott Robertson (2013, 100) explains it in his book, *How to Draw*, when forms overlap, the shape on the front should have a thicker line. This makes the overlapping shapes easier to distinguish from each other.



PICTURE 39. $\frac{3}{4}$ front view of the truck

After the line art was finished I wanted to add some basic colouring to the truck, but not go as far as to start shading any particular details. I thought that one primary colour with a few accent colours would suffice. After the colouring phase, some light and shadow was added to achieve the 1-2-3-read.



PICTURE 40. $\frac{3}{4}$ rear view of the truck

The final line art concepts (picture 39, picture 40) are enough on their own, since the vehicle is shown from both sides. The design and presentation of the final

design is clear and can be easily understood. Important elements of the truck are also highlighted. This concept piece would be an adequate source in the production of a video game and as a portfolio piece.

5.5.2 Final render

Even though the line art version would have been enough, I wanted to push things a little further by creating a more polished image of the design. This was also a beneficial addition to my own design portfolio.

In Photoshop, I worked by adding more details like weathering and decals. This was a phase where the 3D model and the render really helped, because I only needed to paint on top of an existing model. Yellow colour was chosen because of its industrial nature, since the colour can often be spotted on machinery such as an excavator. Yellow also felt non-aggressive, and that is what I wanted to achieve. The dark blue felt like a good contrast to the yellow accent colour, so most of the vehicle body was painted that way.

For the windshield I chose a dark red colour because I wanted to get the same effect as some astronaut helmets with a golden-coloured visor. In this concept, the darkened, polarized windshield is designed to shield those inside from extreme brightness and radiation. Even though the colour of an actual visor is closer to bronze, I thought a dark red would suit this design better so that it would not be confused with the yellow accent colours of the body.



PICTURE 40. A refined version of the truck concept

I chose to place the truck in an environment that did not have clear definition, as I did not want it to draw attention away from the truck. In my mind I was thinking of a huge hangar or a hall, so the concrete floor is the only visible element in the environment. I also added some volumetric effects to really set the truck inside the location. A lot of this was achieved inside Blender and staying within this one program certainly saved me of time and effort.

The result (picture 40) is a valid concept design of a truck and it could be used as reference in an actual production stage or to spark new ideas and discussion among the designers.

6 CONCLUSION

It is no wonder that the use of 3D software is so widely spread in the concept design industry. The benefits it provides are incredible and it would be a waste not to at least give it a try.

As for my design, I would not have had the result I did if it was not for Blender and Grease Pencil. Even though Blender helped, the design itself was inadequate in my opinion. I focused too much on interesting shapes and occasionally forgot the functional aspect of the truck. It was difficult to think about all the design methods and rules when drawing and at the same time try to focus on a practical vehicle. Those things are definitely something I need to work on. I think better planning would solve the issue.

I now also understand the importance of sketching, because that is the phase where the actual planning is done. I could have set more detailed requirements for the design and I should have figured out those problems during the sketching phase. Instead I jumped too quickly to work on the design with ideas and that were not really thought through.

All in all, the final concept does have some good things in it. I think the overall form is interesting and the colours work as well. There is also a clear shape language to the vehicle and some functional parts modelled on real-life references like a winch and proper suspension. At a quick glance, the design may look inspiring, but at a closer inspection a barely passable design is revealed.

The tools that Blender provided, particularly Grease Pencil was a tremendous help. First and foremost, after familiarising myself with Grease Pencil, it allowed for an easier starting point when I began sketching the vehicle. Secondly, the 3D capabilities that Blender has regarding rendering and the ease of use of the software when modelling, helped significantly.

Using Grease Pencil to design shapes is easy and fast, but I think it has its limits. I would only use Grease Pencil for sketching rough ideas and forms, since a detailed design would take too much time and effort, in my opinion. I think the final details and forms should be modelled or drawn manually after a Grease Pencil sketch is done.

Automatic perspective and symmetry are important when it comes to vehicles, and 3D software provides them out of the box. This, in my opinion, is the greatest aspect of Blender and Grease Pencil. Grease Pencil is a powerful tool and I really recommend it to anyone.

As for the future, I will definitely be using Blender. I must also learn to plan my ideas better so that I can utilise Grease Pencil in a more beneficial way. Time and practice should yield good results in that regard. Strong tools require strong ideas.

REFERENCES

Aarnio, A. 2018. Visualising Ideas – Techniques for Improved Concept Art. Concepting the Elusive Mr. Darcy for Random Potion. Degree Programme in Media. Tampere University of Applied Sciences. Bachelor's thesis.

Art Fundamentals. Color, Light, Composition, Anatomy, Perspective and Depth. 2014. 2nd edition. Worcester, United Kingdom: 3DTotal Publishing.

The Art of Horizon Zero Dawn. 2017. 1st edition. London, United Kingdom: Titan Books.

Bertling, T. & Robertson, S. 2013. How to Draw. Drawing and Sketching Objects and Environments from Your Imagination. 1st edition. Culver City, California: Design Studio Press.

Bertling, T. & Robertson, S. 2014. How to Render. The Fundamentals of Light, Shadow and Reflectivity. 1st edition. Culver City, California: Design Studio Press.

Blender.org. n.d. About the Software. Read 10.12.2018. <https://www.blender.org/about/>

Bouvier, N. Art Director. 2017. Interview on 19.10.2017. Interviewer Kuciara, M.

Chadeisson, P. Paul Chadeisson. Freelance Concept Artist. <https://paulchadeisson.com/resume>

Chadeisson, P. 2017. Paul Chadeisson. Mothershop Escort 02. <https://www.artstation.com/artwork/BR5Zz>

Creative Bloq. 6.11.2012. Just what is concept art? Read on 19.10.2018. <https://www.creativebloq.com/career/what-concept-art-11121155>

Concept Art Empire. n.d. What is a Concept Artist? Read on 19.10.2018. <https://conceptartempire.com/what-is-concept-artist/>

FZD Design Cinema. 2016. Design Cinema Podcast. Episode 1. Podcast. Referred on 10.12.2018. <http://fzdpodcast.com/>

Gurney, J. 2009. Imaginative Realism. How to Paint What Doesn't Exist. 1st edition. Kansas City, Missouri: Andrew McMeel Publishing, LLC.

Hampton-Smith, S. 2017. The designer's Guide to Gestalt Theory. Read 10.12.2018. <https://www.creativebloq.com/graphic-design/gestalt-theory-10134960>

Jurabaev, J. 2018. Blender Workflow for Feature Films – Jama Jurabaev. Youtube 2018. Watched on 04.03.2019. <https://www.youtube.com/watch?v=UpckPJTmqSI>

Jurabaev, J. 2018. Blender Grease Pencil Tutorial. Video Tutorial. Watched on 10.11.2018. <https://gumroad.com/jamajurabaev>

Kus, M. 2018. Quick Art Talk EP01. What is Concept Art? Youtube 2018. Watched on 10.12.2018. <https://www.youtube.com/watch?v=zMzhC-EG0w0>

Mateu-Mestre, M. 2010. Framed Ink. Drawing and Composition for Visual Storytellers. 1st edition. Culver City, California: Design Studio Press.

Nyström, V. 2016. Using Reference in Creating a Digital Painting. Degree Programme in Media. Tampere University of Applied Sciences. Bachelor's thesis.

Stacy, R. 2017. Design Theory. Big Medium Small. Youtube 2017. Watched 16.10.2018. <https://www.youtube.com/watch?v=ZluGXqpdJj4>

Tobin, P. Concept art and concept design. 20.3.2014. Muddy Colors. Read on 19.10.2018. <http://www.muddycolors.com/2014/03/concept-art-and-concept-design/>

Walton, L. n.d. Thoughts on Automotive Design. A Blog About Car Design and Car Styling. The Basics of Car Design. Read on 11.12.2018. <https://autostyling.wordpress.com/car-design-guides/the-basics-of-car-design/>

Watts, D. Art Director. 2012. Interview on 02.02.2012. Interviewer Dark Horse Comics. Transcribed.

Zhu, F. 2012. Design Cinema – EP52 – Visual Library. Youtube 2012. Watched 17.11.2018. <https://www.youtube.com/watch?v=dnflBERf2zM>

Zhu, F. 2016. Design Cinema – EP88 – IP Creation with Design Thinking. Youtube 2016. Watched 17.11.2018. <https://www.youtube.com/watch?v=KBilk-VlzZAq>

Zhu, F. 2019. Design Cinema – EP 95 – Form Follows Function Complete Presentation. Youtube 2019. Watched on 5.4.2019. https://www.youtube.com/watch?v=5R92hhYaX_Q