

3D Modelling for Realism

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Mood Board



Figure 1.1 Helmet mood board

When picking an idea for this project, I wanted to go with something that would help develop my hard surface sculpting skills for characters. It's because of this that out of my ideas, I chose to go with the close helm.

As well as improving my hard surface skills, this project will also help in further developing my texturing for realism and will teach me how to create engravings in Substance Painter for armour.

Close Helm

The close helm is a fully enclosing helmet used by knights and men-at-arms in the late medieval period into the renaissance period¹.

Out of the references from my mood board, this is the helmet I will be taking forward. I have opted to go with this helmet as the engravings are clearer than a lot of the others and will provide a good opportunity to learn about making them, the helmet also has a plume holder and the strap around the neck that is used to keep the bevor plate in place which were aspects I was looking to include in my model.

Visible on the comb of this helmet (*fig 2.2*) are 2 holes, the smaller of the 2 is used for mounting crests on the helmet, the larger hole appears to be damage, I will not be including this hole in my model.



Figure 2.1 Italian Close Helm in $\frac{3}{4}$ view
Source: [The Metropolitan Museum of Art](#)



Figure 2.2 Italian Close Helm side view
Source: [The Metropolitan Museum of Art](#)

Research & Planning

Process Overview

For this project, the blockout and high poly was done in ZBrush, the retopology and unwrapping in 3ds Max, the texturing was done in Substance Painter while the alphas for the engravings were made in Clip Studio Paint. The completed model was presented in Unreal.



Figure 3.1 Greenwich armour, armet with its visor lifted and open cheek plates
(2025) source: [Adam Savage's Tested](#)

The lining seen in the Greenwich armour (*fig 3.1*) differs a lot to how the linings of other helmets would look², as a product of the royal armoury so I will not be replicating this specific look for my helmet, however, it is still useful for understanding how the lining is incorporated into the helmet.

I will instead be referencing more commonly produced linings, an example of these can be seen in (2016) Knight Errant's video on medieval helmet linings.

The helmet is constructed from several pieces (*fig 3.2*) which create its distinct look. When modelling this helmet these separate plates need to be considered, not just for accuracy, but for design purposes as well, for example, if its in a game, can the visor be opened?

For this project, the intention is that both visors should be able to open, this also means that the interior of the helmet will be visible so will also need to be accounted for.

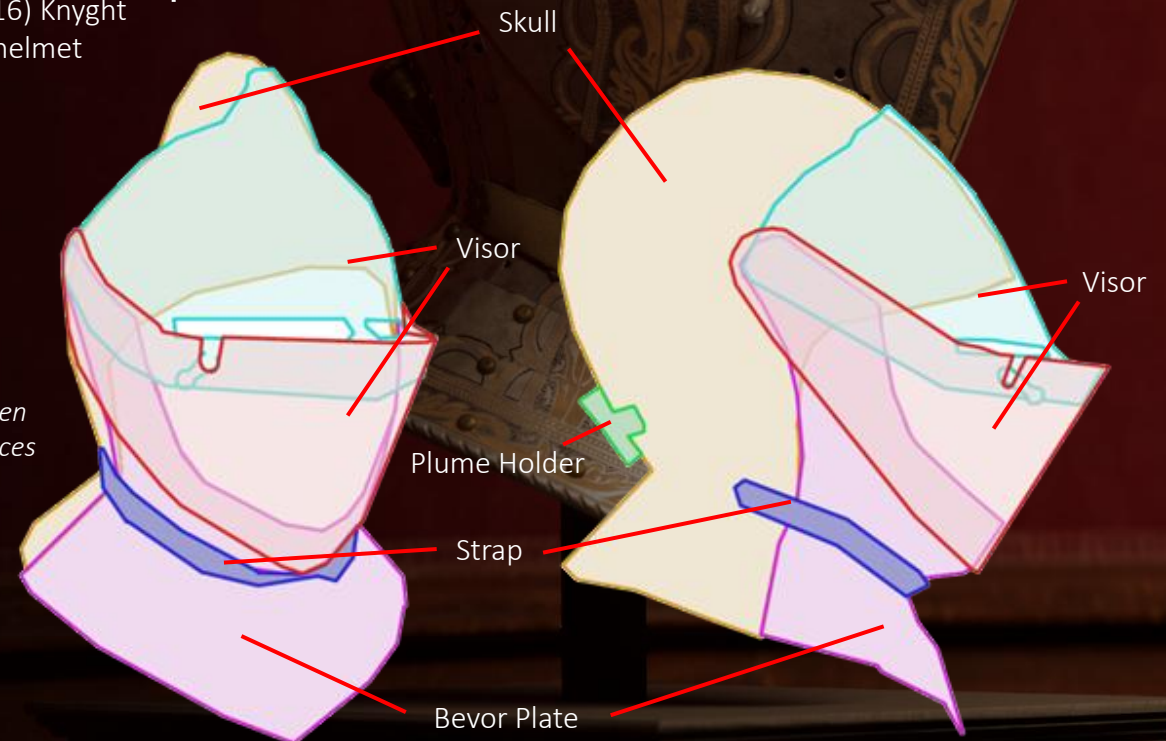
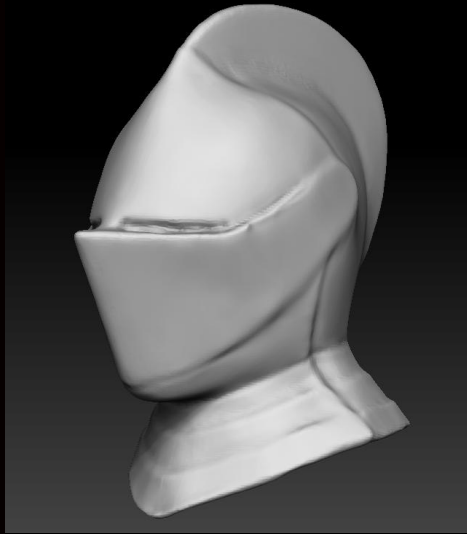


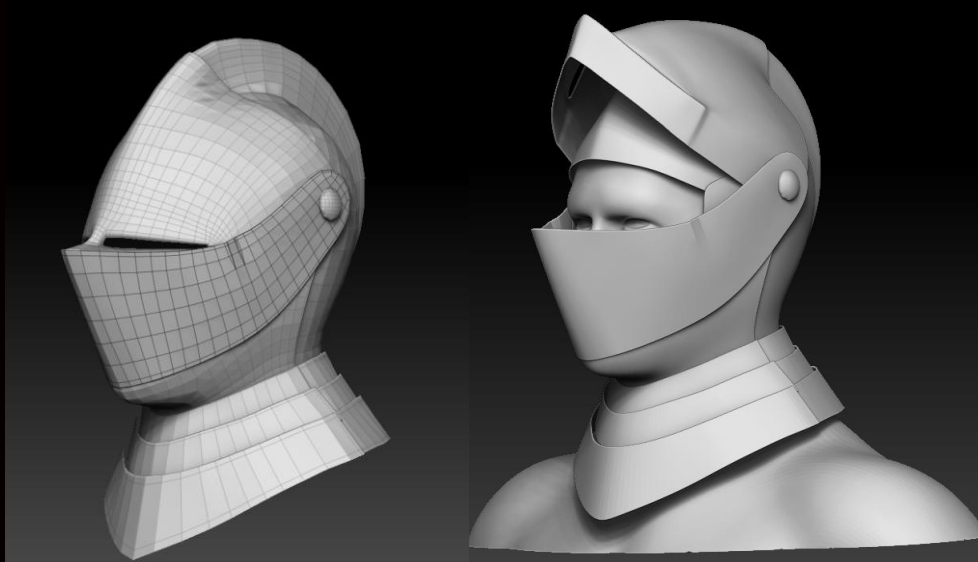
Figure 3.2 Close Helm Broken down into its individual pieces

Blockout & High Poly



The initial block out focused on getting the general shapes and proportions correct and did not focus on making sure that the helmet could be opened. Attention to details such as that came when each plate was extracted out. Extracting the plates separately allows for the helmet to be opened but also using ZRemesher creates much cleaner that can mostly be reused for the low poly.

ZModeller is used to add reinforcement loops to hard edges and bevels as well as create some smaller elements.



*Figures 4.1, .2, .3
Helmet high poly
process*

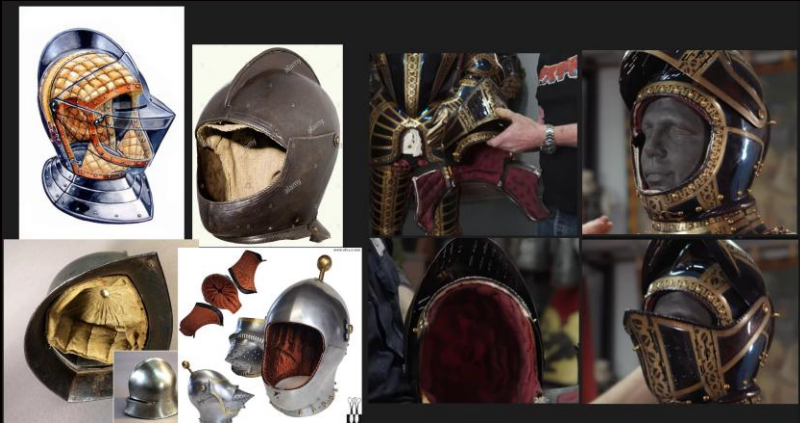
When it came to making the clean model, videos from the art of Haf and Abe Leal 3D were key in understanding how this process can be done within ZBrush. The videos can be found [here](#)³ and [here](#)⁴. While this is not my first time doing hard surface in ZBrush, these videos were a good refresher on the methods available.



The feathers here are currently a placeholder that will be swapped out for feather cards later in the process. To create the feathers, I used a plane with a high subdivision and used the dam standard brush to build up the feathers before extracting the feather and placing it in the plume holder.

Figures 4.1, .2 High poly feather on helmet and isolated

Figure 5.1 Helmet padding references



As the helmet is planned as having openable visors, interior padding needed to be created, this was done by flipping the faces on a sphere and sculpting the padding using dam standard and inflate.

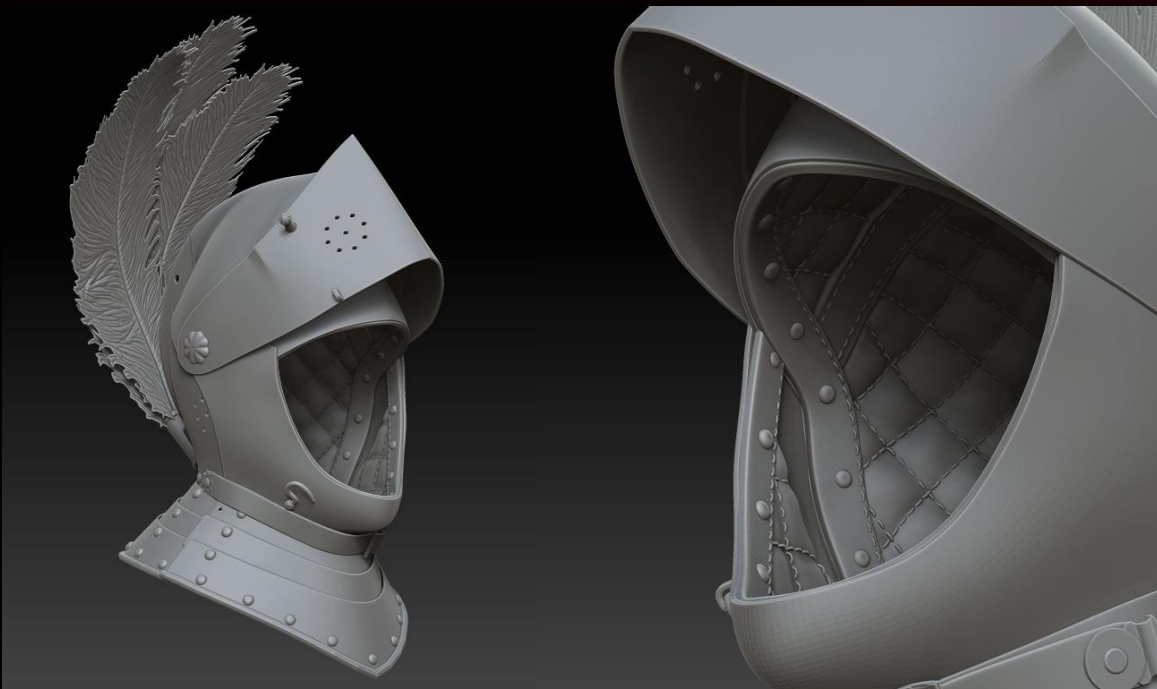


Figure 5.2 Render of opened helmet showing interior padding



Figure 5.3 Close up of helmet showcasing small texture elements

There are many finer element of this model that can be left to the texturing stage of this project and it is important at this stage to decide what will be done in Substance Painter. The finer elements that make up the material will be left to texturing, this includes all the scrapes, small dents and similar details. The leather strap and padding are likely to be the only elements that I will add details to in Zbrush.

High Poly



Figure 5.1 Render of final high poly asset

Final High poly in Zbrush. For creating the line engraving along the crest of the helm and the bottom of the neck lames I made a custom alpha and adjusted the stroke settings.

Retopology

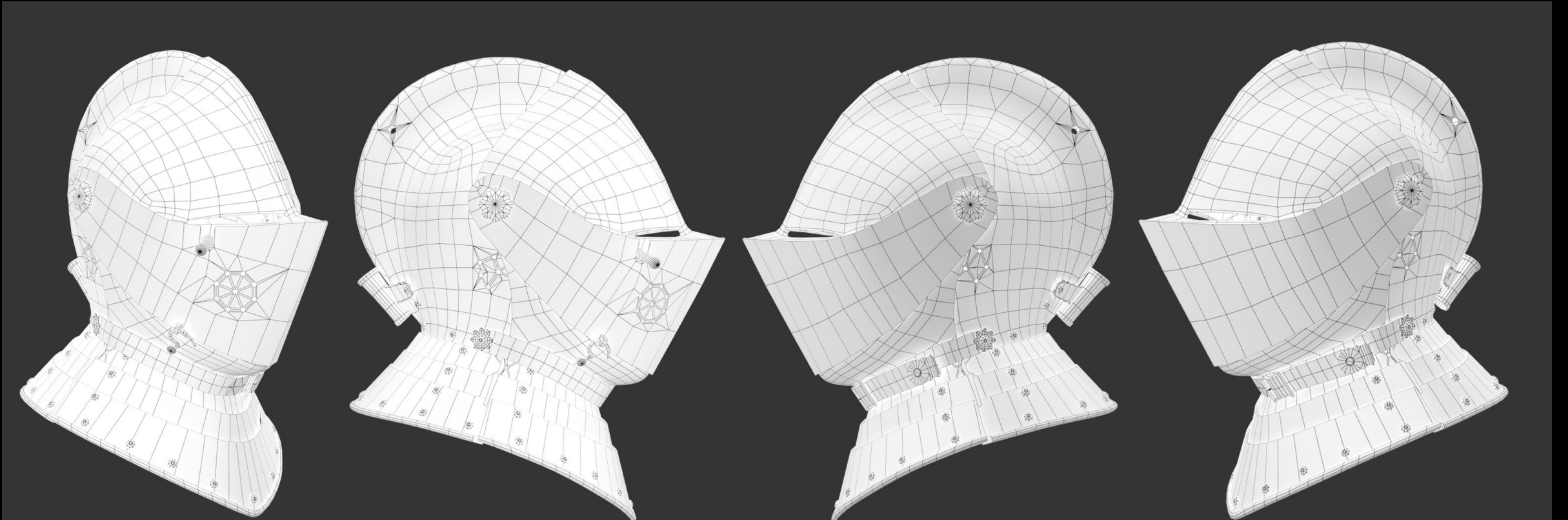


Figure 6.1 Wireframe render of the game ready asset.

The retop was split into 2 models, a cinematic asset with a tri count around 60k and an optimized game ready asset at around 14k tris w/feather cards added.

On the models, I chose to have the holes be actual geometry and not use opacity, this is because for most of the holes, there was interior faces. I also I wanted there to be actual depth for the holes.

Retopology

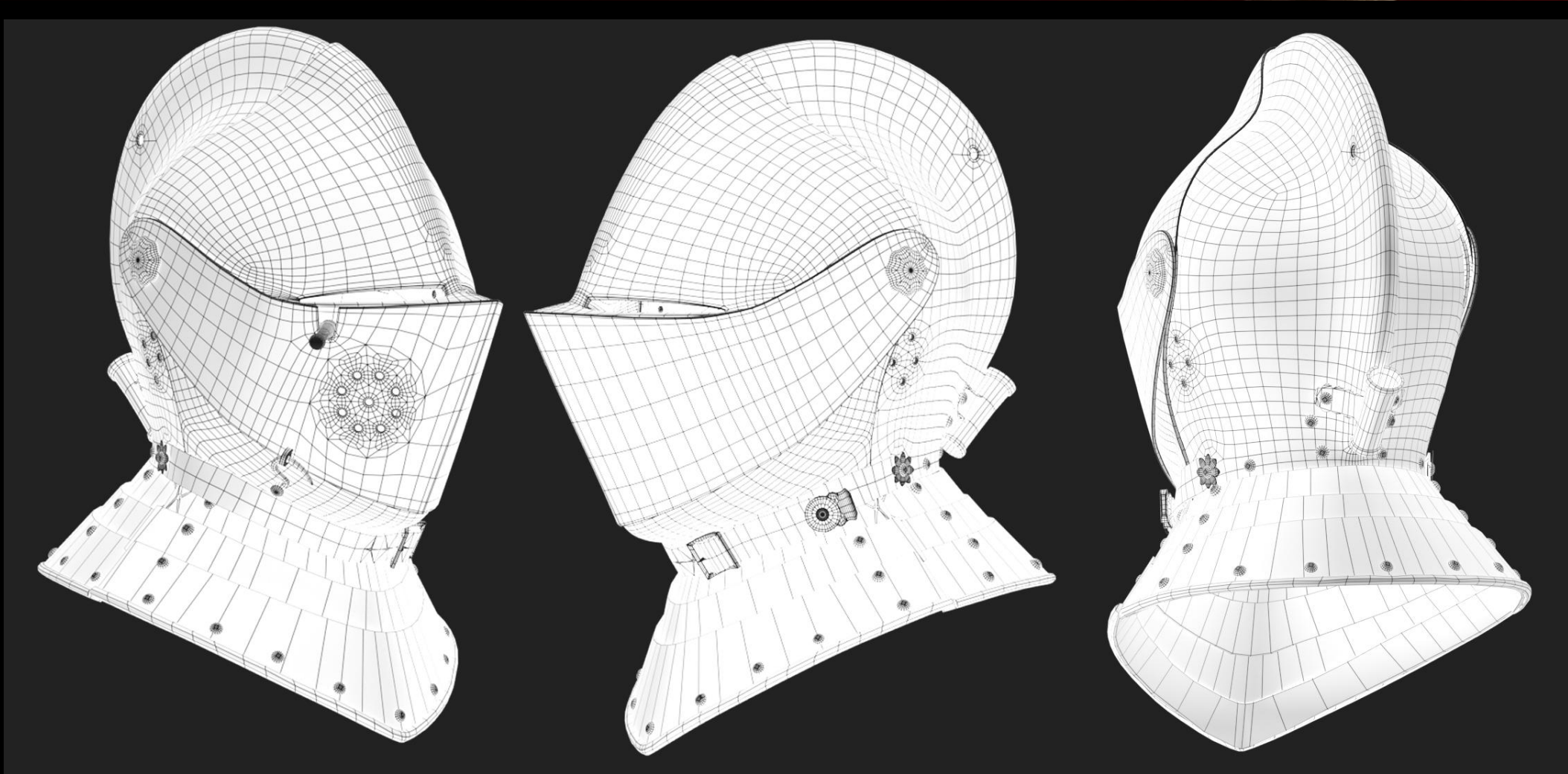
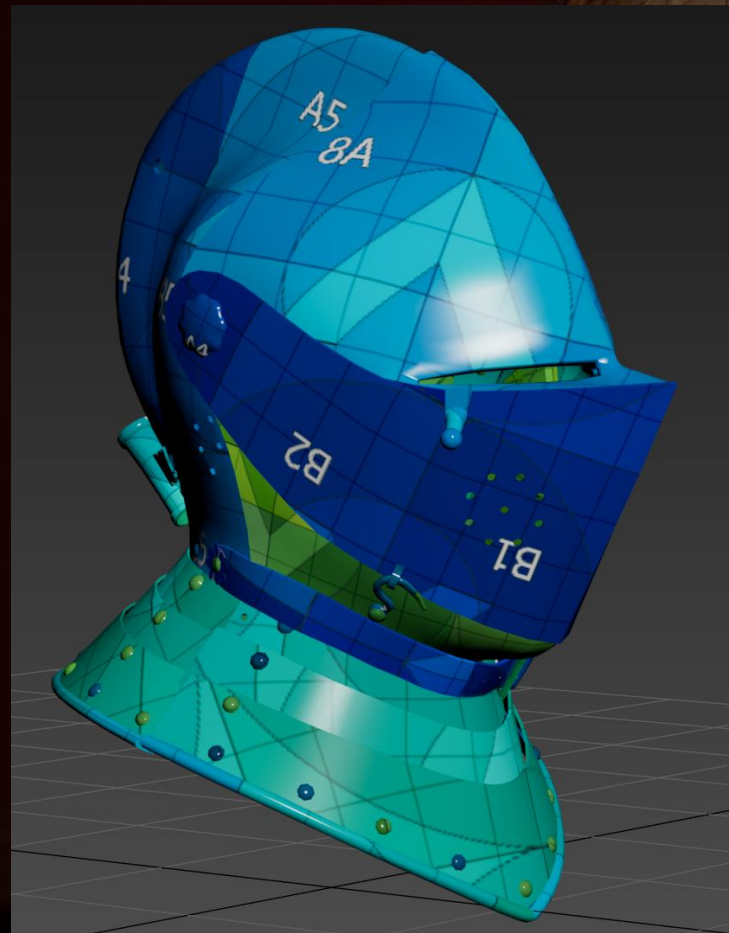


Figure 7.1 Wireframe render of the cinematic asset.

Unwrap



The helmet model is unwrapped onto 1 UV set while the feathers are on a separate UV. I chose to use 1 UV for optimisation reasons, as if this was to be in a game, it is unlikely that more than one would be used.

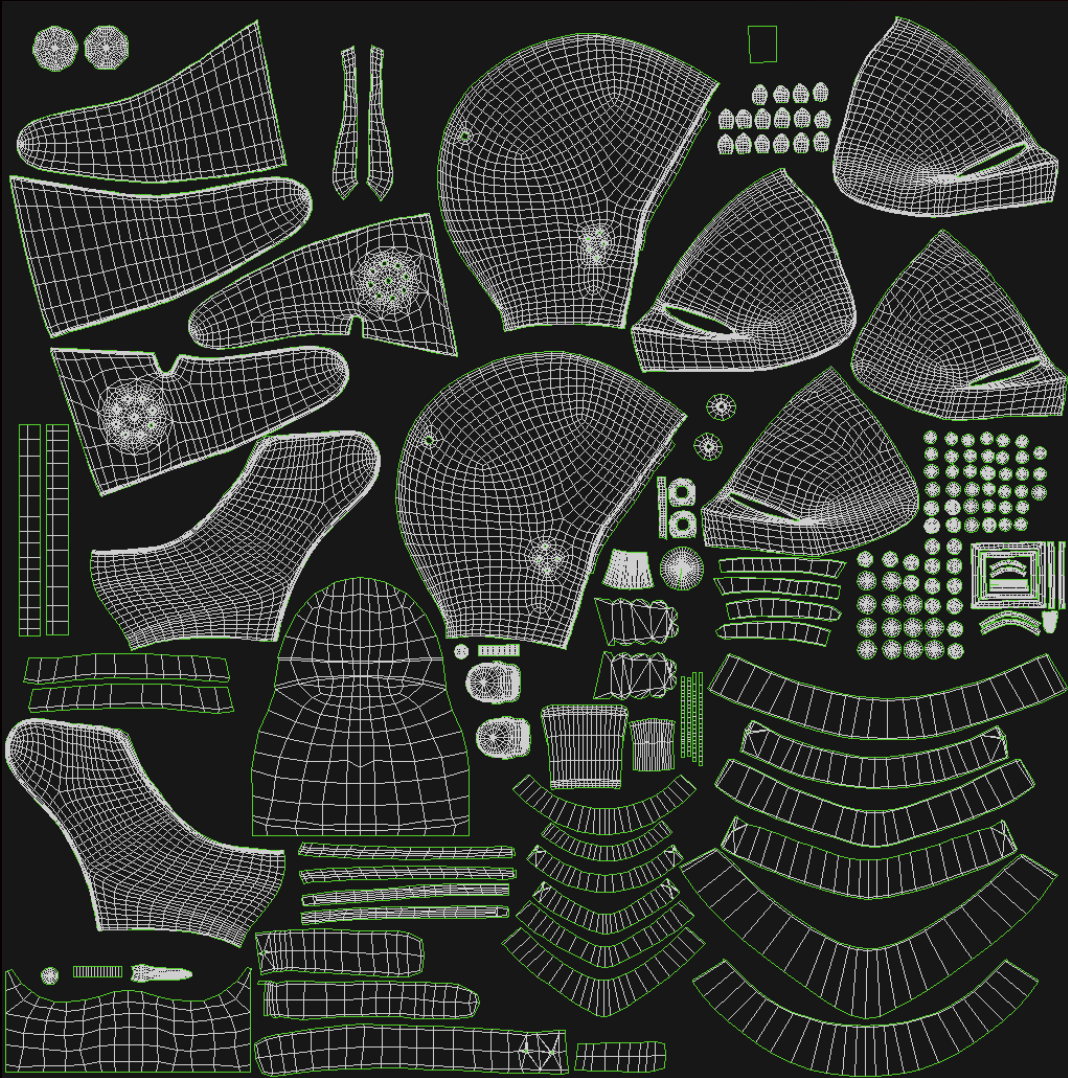


This unwrap is for the optimized version of the model and compared to the cinematic version is more balanced as the intended texture for the model is 2048x2048.

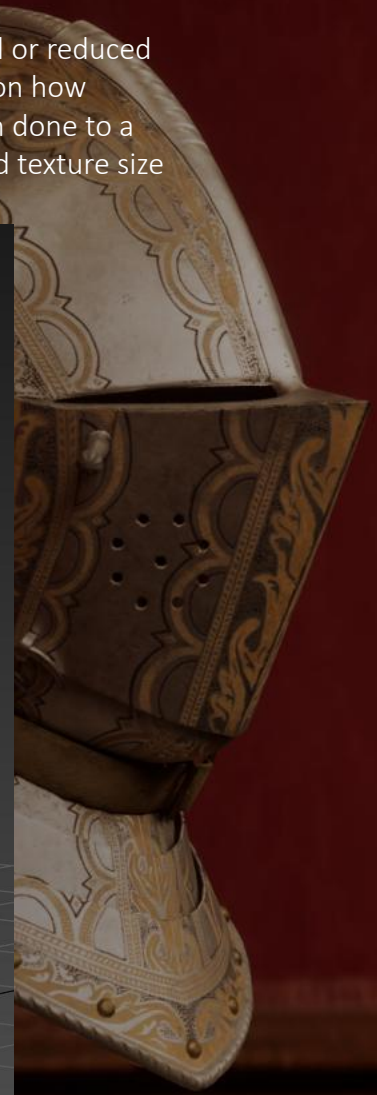
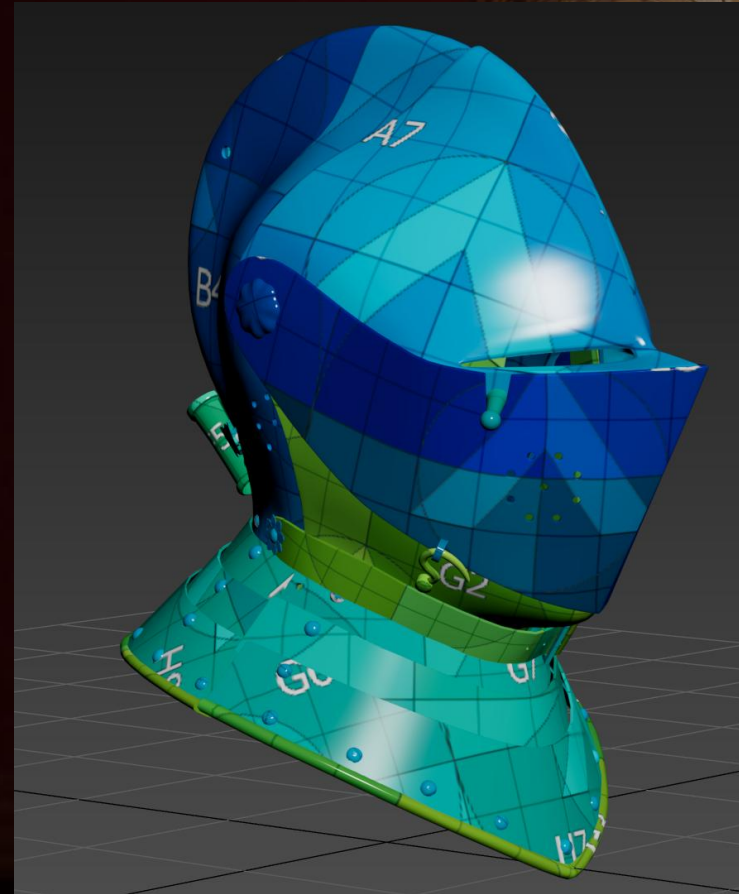
I kept the texel density mostly the same across the model except for larger and smaller areas that would need more detail.

I also deliberately made some islands smaller as they would be less visible and were for less important parts of the model.

Unwrap



Similar to the optimized versions unwrap, I have enlarged or reduced the scale of islands for the cinematic version depending on how detailed those areas are going to be, however it has been done to a more exaggerated degree for this unwrap as the intended texture size is 4096x4096.



Texturing

The textures were initially baked at 8k in substance painter and then downscaled to 4k for the cinematic asset and 2k for the optimized asset.

I chose to bake at such a high resolution as it would create cleaner bakes and would preserve those details when downscaled.

My plan for texturing is to create the textures for the cinematic version of the model and then use Substance Designer's texture transfer baker to transfer the base colour, normal and AO,R,M map to the optimized models unwrap.

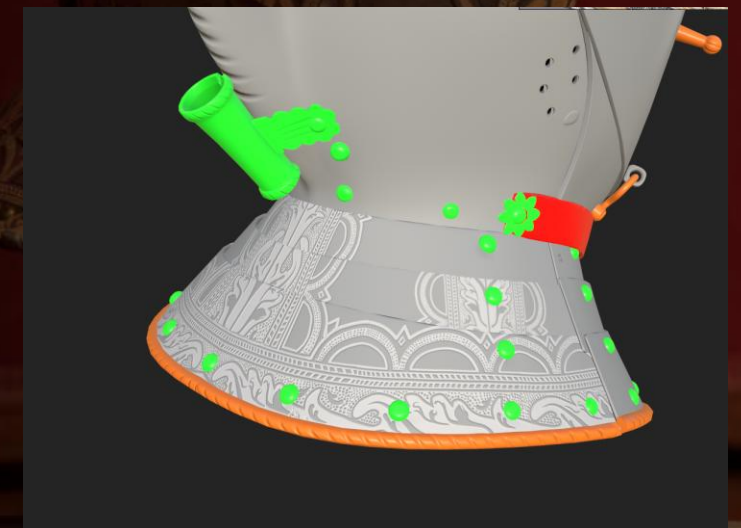
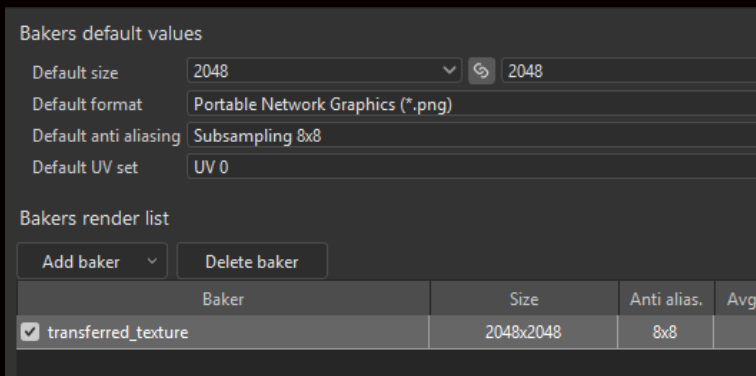
For creating the engravings, I looked at the patterns on the helmet in my references and used Clip Studio Paint to create an alpha like the design on the helmet.



Using the projection tools in Substance Painter, I was able to easily manipulate the alphas into the shapes I needed.

(2024) 3DRedBox's video on armour engravings was extremely useful for this part of the process.

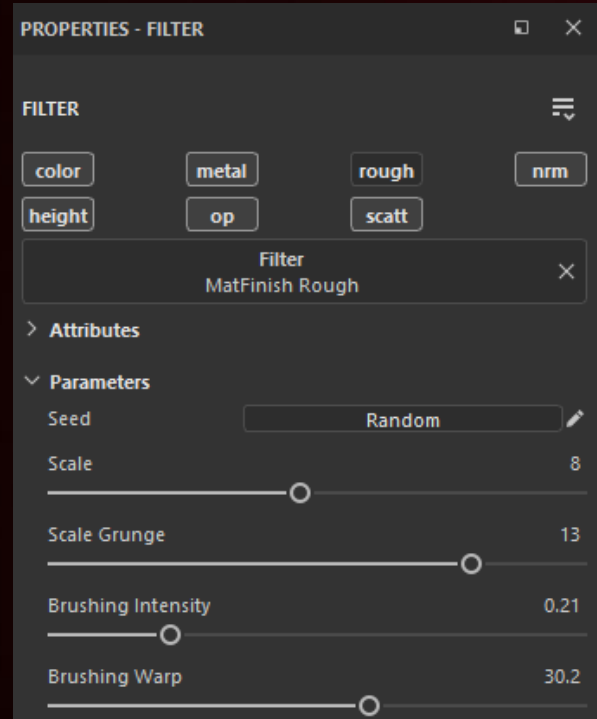
Once I had all of the alphas in place, I exported the masks and combined them so that I could mirror the alphas onto the other half of the model as Substance Painter doesn't have mirror filter that works based off 3D space.



Texturing

Before texturing the metal, I looked at my references to break down the minor details that make up the overall appearance.

When looking into it, you can see that the surface detail is built up through dirt, wear, scratches, damage and the surface texture of the metal.

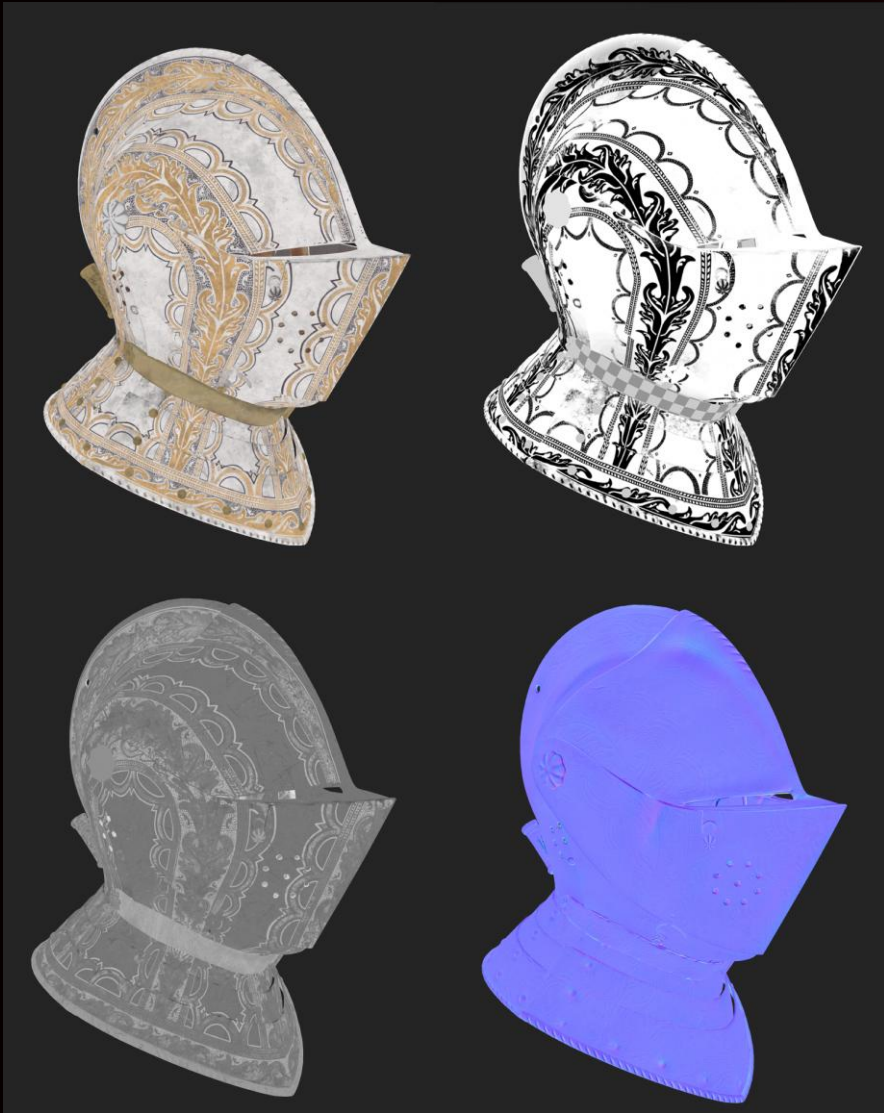


Through some research I did into creating metal textures, I discovered Substance Painters selection of MatFinish filters. These are a filter that will add height, roughness and colour variation to the selected layer and can really help to push the overall quality of the model.

Throughout the texturing process, I checked my textures outside of Substance Painter in UE 5.6, this is because Substance Painter didn't do a good job of properly representing the textures so checking them in engine showed me what needed changing.



Texturing

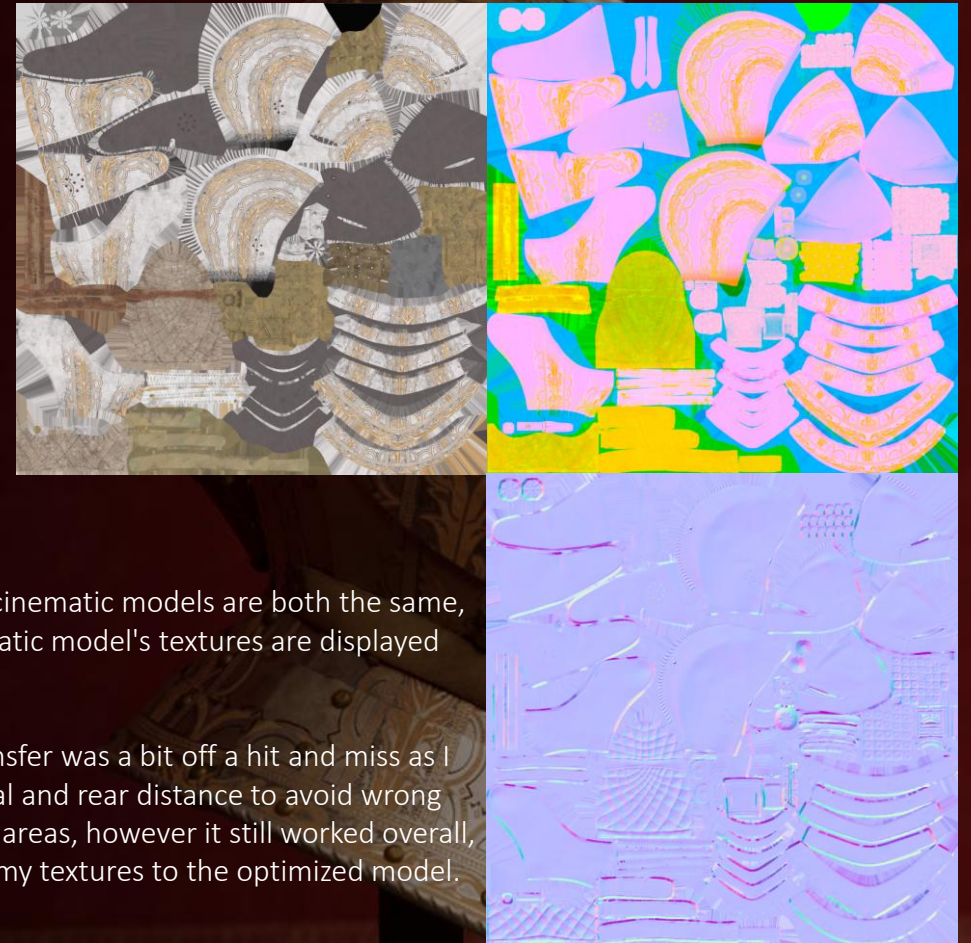


As this model is metallic, there is a bigger emphasis on using roughness as it will show up very easily.

In my previous work, roughness has been one of the areas that is underdeveloped which is something I wanted to improve upon with this work.

As the textures for the optimized and cinematic models are both the same, just laid out differently, only the cinematic model's textures are displayed here.

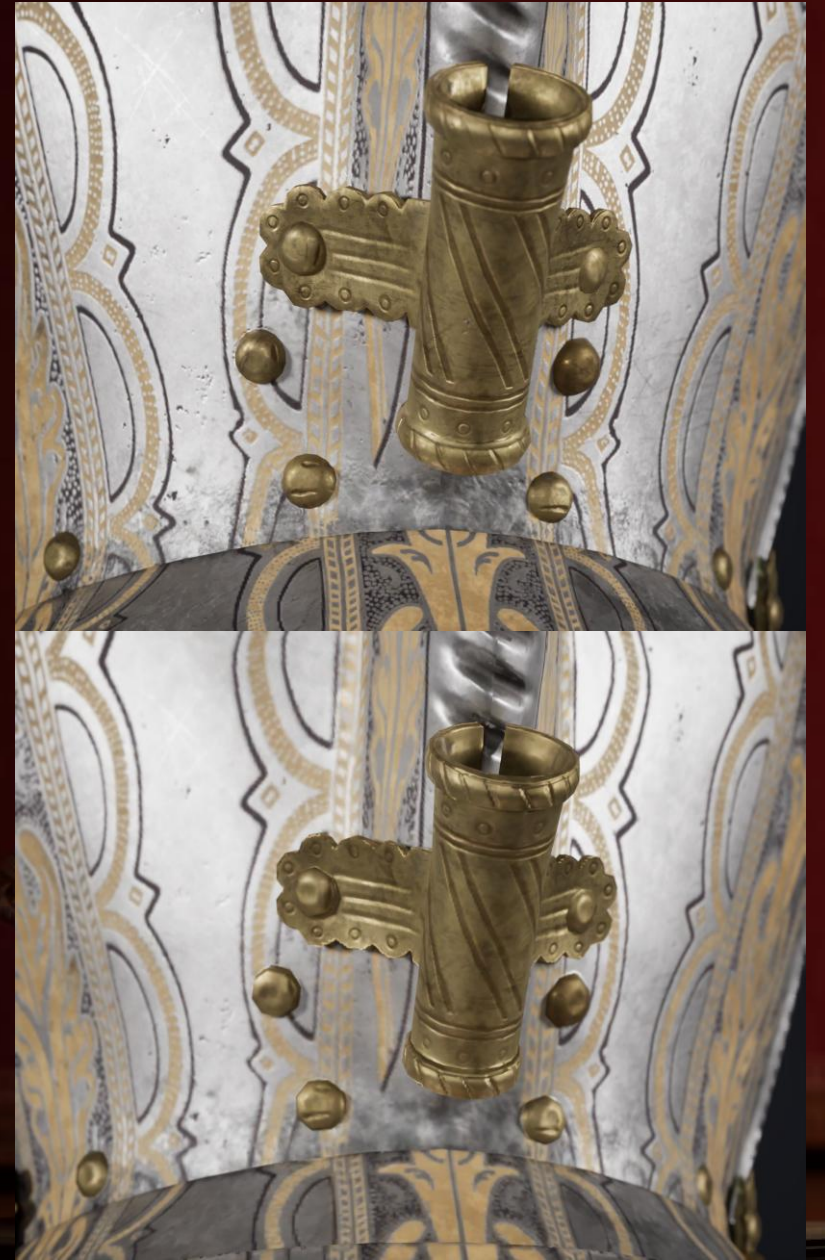
Using Substance Designer's texture transfer was a bit of a hit and miss as I had to play around with the max frontal and rear distance to avoid wrong parts of the texture baking in different areas, however it still worked overall, and I was able to successfully transfer my textures to the optimized model.



Texturing



Visual comparison between the cinematic (top images) and optimised (bottom images).



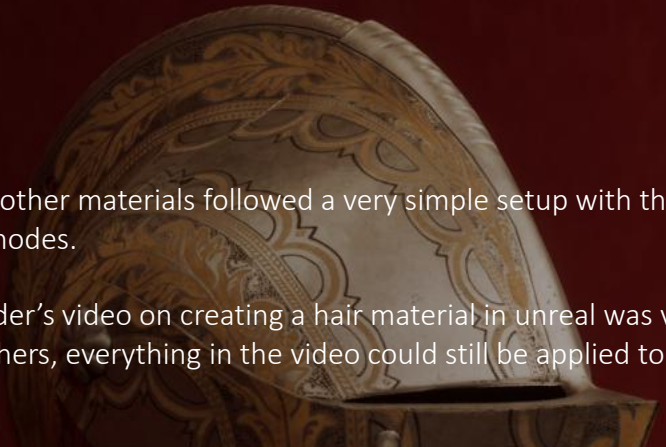
Presentation



For the renders, I had 2 setups, one was using an infinity wall with a standard lighting setup to keep the object lit with several lights to act as backlights for each angle of the renders.

The second setup was done using Quixel mega scan assets off Fab to create a small environment set piece.

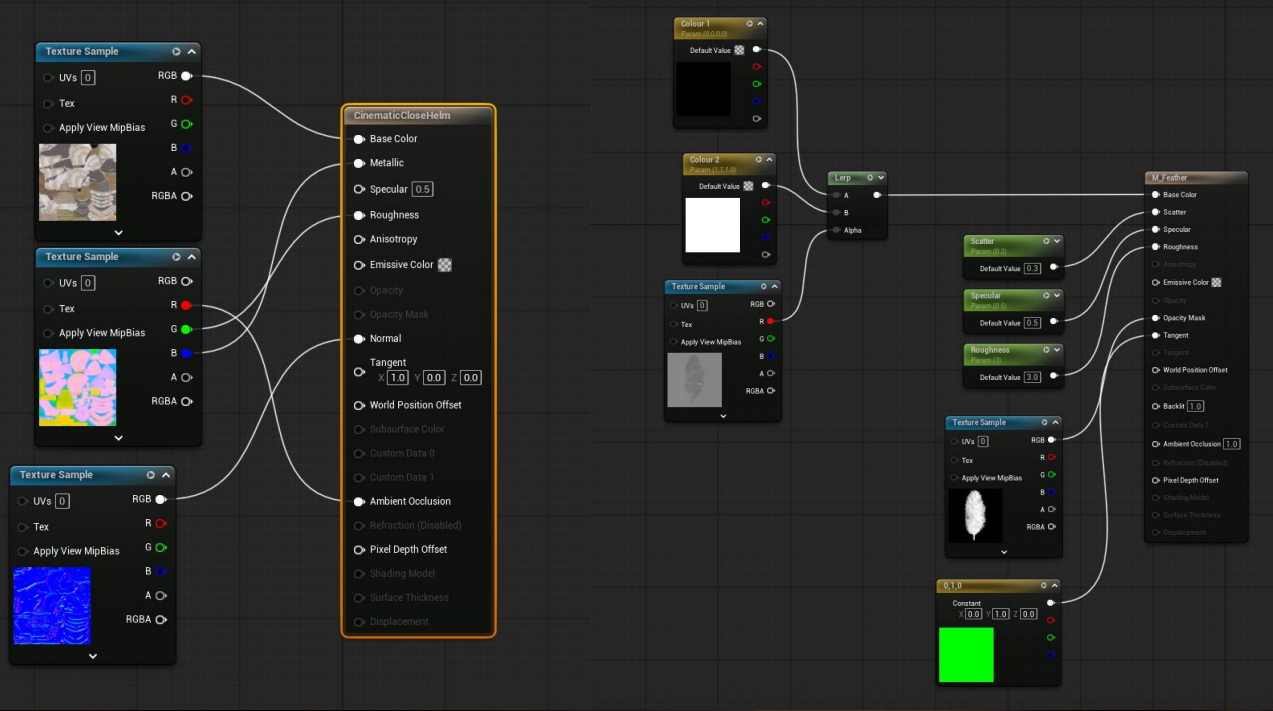
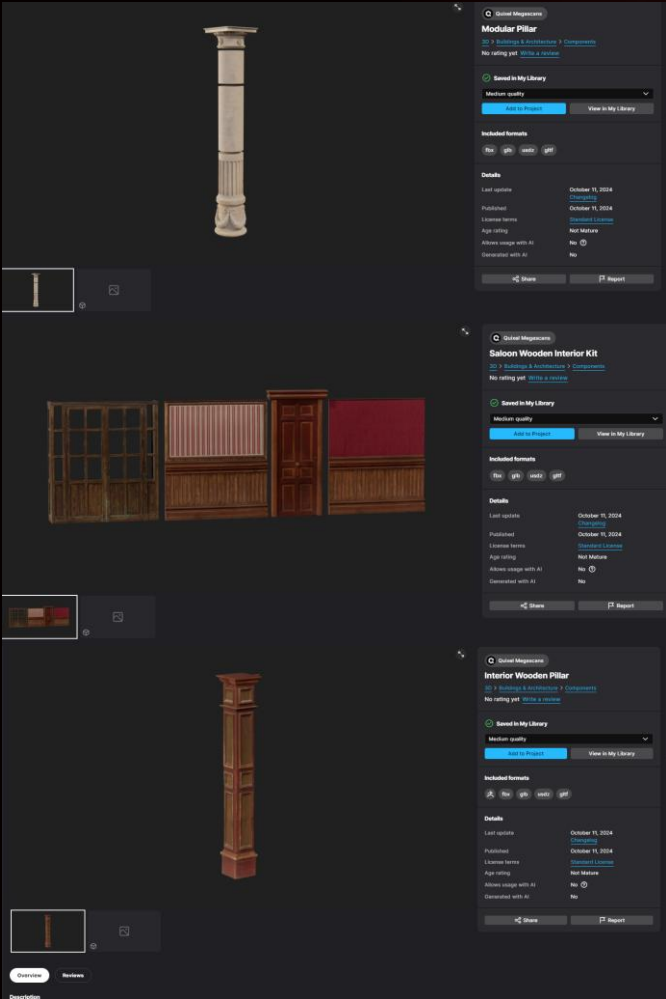
Presentation



Aside from the feather material, the other materials followed a very simple setup with the textures plugged in without any extra nodes.

For the feather material, (2024) Foxcoder's video on creating a hair material in unreal was very useful, as while not directly about feathers, everything in the video could still be applied to making a feather material.

I made use of 2 modular kits for the second render setup, a pillar to act as a pedestal for the helmet to be on, and a small kit to add some walls.



Renders



Optimised Version



Optimised Version



Optimised Version



Cinematic Version



Cinematic Version



Cinematic Version



Cinematic & Optimised Side by Side



Cinematic & Optimised Side by Side



Cinematic Version Beauty Shot



Industry Comparison

For my industry comparison, I will be comparing the optimised version of my helmet to the helmets seen in Mordhau. I have chosen to compare the optimised version instead of the cinematic version as the industry images are also game ready. Compared to the helmets from Mordhau, the modelling for my helmet holds up well, with no noticeable issues. Despite the overall texturing of my helmet working well, there are still improvements to be made, especially when comparing it to the helmets below. The most noticeable detail in the texturing that I have noticed is the hammered metal effect, which is absent from mine, this gives the industry examples a much more believable texture and helps to ground the model as something real, this is something I will be sure to include in my textures going forwards for elements that have been forged, especially for armour. The other elements of the texture hold up well in comparison, with one area, the feathers, needing the most work. This is something that I will have to work on in the future and look for videos/educative information on to improve the quality.



Reflection

The aim of this project was to create a realistic model of our choosing, for my project, I went with making a medieval close helm. I opted to go with a helmet as I wanted to develop my hard surface skills and get some more experience with making things that a character might wear and because I like armour.

This was the first time I've created a purely hard surface asset, however, the videos I found were extremely useful helping me understand the hard surface workflow within Zbrush. For this model, I started the blockout inside Zbrush, I was unsure how challenging starting a hard surface asset in Zbrush might be, but it proved to be quite simple once the process is understood.

To take the model from blockout to clean mesh I extracted individual parts of the mesh and used ZRemesher and ZModeller to clean up the topology. I am still inexperienced with using ZModeller however this project was a big leap in understanding the tools uses. There were some parts of the model that would have been inconvenient to make in Zbrush, so for those elements I used 3ds Max to model them and then reimport them into Zbrush, while I did this for smaller elements, I also used it for making Boolean objects. I avoided adding a lot of tertiary details to the helmet as I intended on using Substance Painter for the repetitive details. In hindsight, however, I could have added some forging artifacts to the armour, adding hammer marks where the metal has been bent and hammered into shape.

When it came to retopology, my time became split between 2 models, this wasn't the initial plan, however I ended up creating a cinematic version (aiming for 50k tris) and an optimised version (aiming for 15k tris), for the cinematic version I ended up going over with the final model around 60k tris, but the optimised model was just below at around 14k tris. If I were to do something similar again, I would spend more time working on the cinematic version as the tri count could be a lot lower, even though optimisation isn't really a concern with cinematic models.

When it came to unwrapping, I attempted to match the UV maps so that they were relatively the same however as the helmets would have different texture sizes, 2k for the optimised helm and 4k for the cinematic. With the 2k unwrap I reduced the size of the UV islands for interior elements of the helmet, this is because I was prioritising islands that would be the focus of attention,

Texturing was a learning experience for me, during the process I learnt about MatFinish in Substance Painter which is a selection of metal finishes you can add to a model to very easily give an indication of the type of metal. I made my own alpha for the engravings and used the surface projection to try and match it to my reference image, this part of the process was extremely slow so if I was to do something similar in the future, I would look for a faster method.

The setup in unreal was incredibly simple and in future is something that I am going to work on improving as I would like to add more in engine customisation to my textures so that I can make little tweaks if necessary.

In conclusion, the main take away from this project is I need to consider what details I am adding in Zbrush or leaving for substance more, such as the hammering effect.

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Close-Helmet for the Field and Tourney - Italian ca. 1560–65; front collar lames, 1544 (no date) *The Metropolitan Museum of Art*. Available at: <https://www.metmuseum.org/art/collection/search/26511> (Accessed: 07 October 2025).



Thank you for reading.

