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Sci-Fi Character Creation with Focus on Multi-Limb Rigging and Visual Effects

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SMU | GUILDHALL
GAME DEVELOPMENT EDUCATION

ART CREATION MASTER'S THESIS POST-MORTEM

SCI-FI CHARACTER CREATION WITH FOCUS ON MULTI-LIMB RIGGING AND VISUAL EFFECTS

HAOXIANG SUN –
ADVISORS – BORIS FISHER, JOOWON MACDOWELL

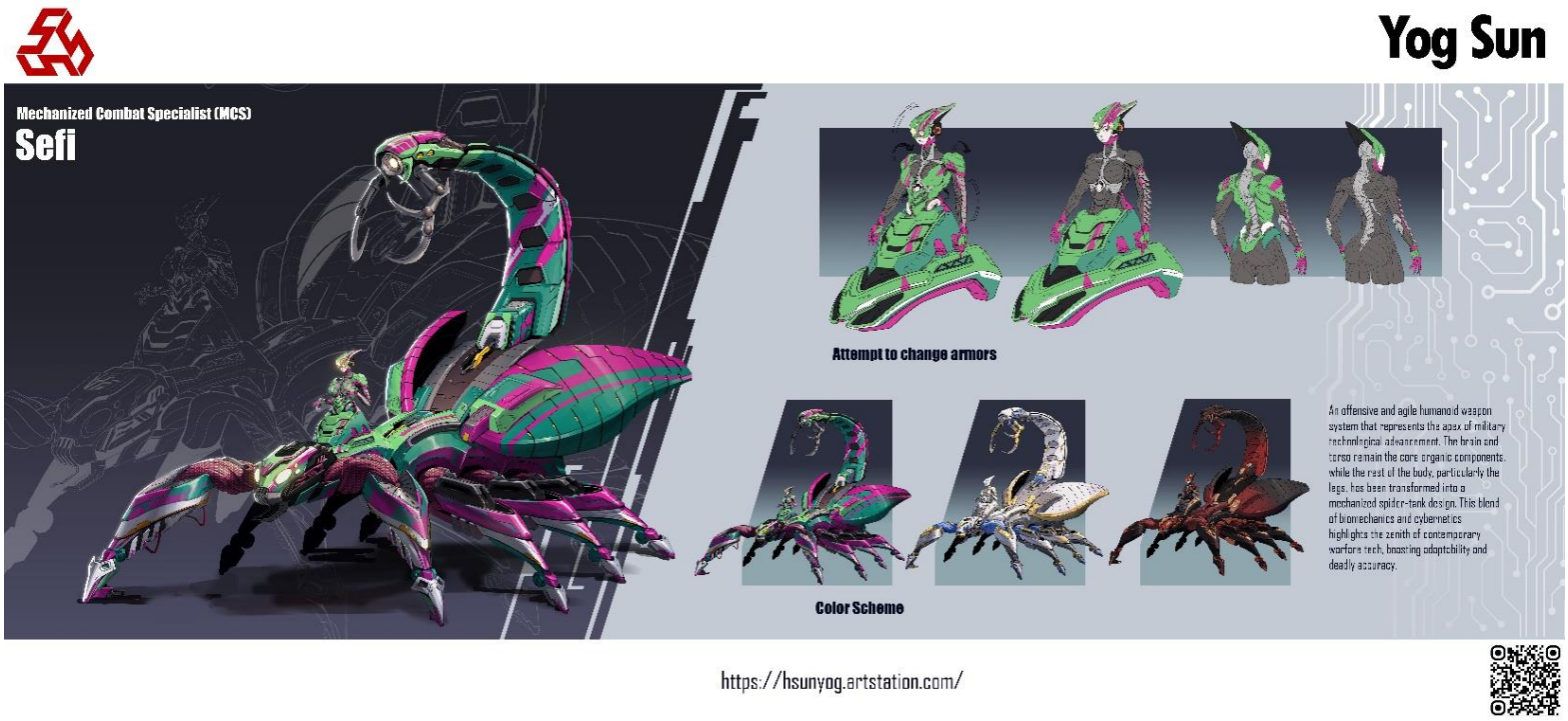

Figure 1 Key Art

ARTIFACT - SYNOPSIS

This artifact is a Sci-Fi Character Creation that was created in Unreal Engine 5 with an emphasis on multi-limb rigging and visual effects. The idea generation phase of the thesis project focused on the rigging of a sophisticated character model and the production of special effects for this character. The character's artwork is stylized and made of clean materials.

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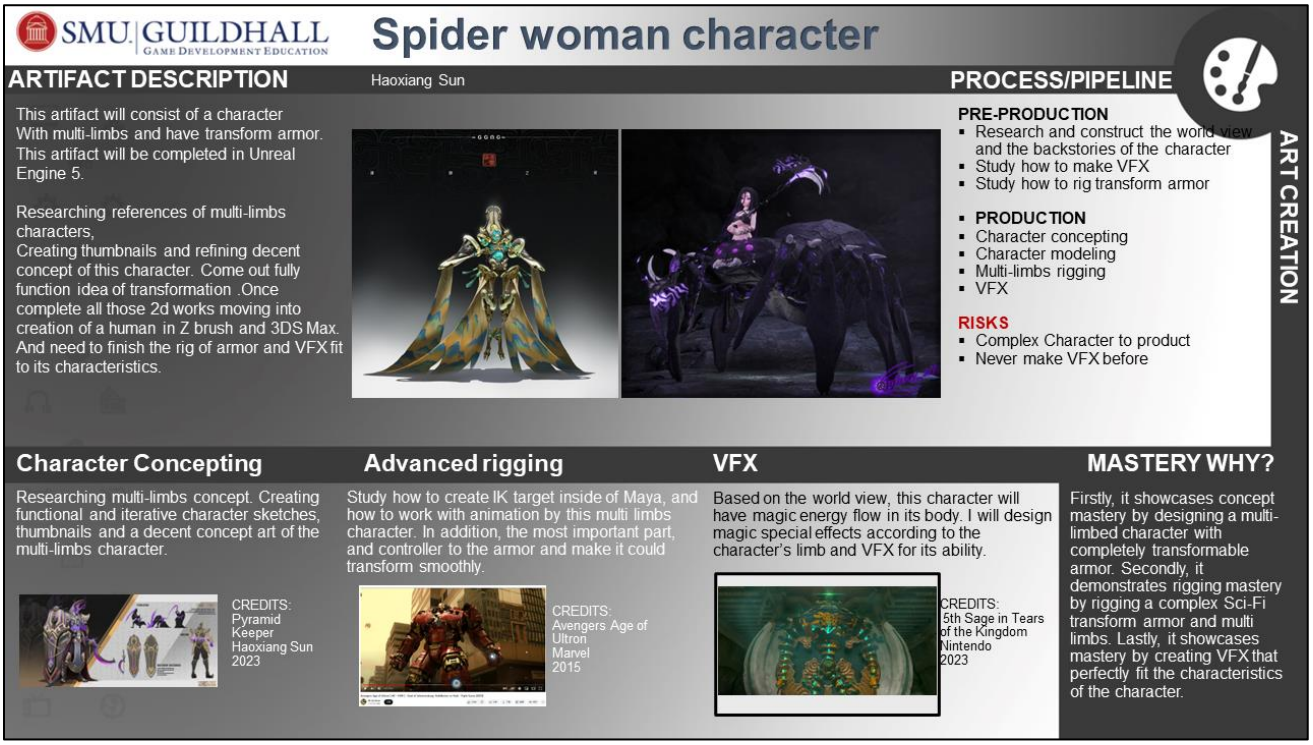
PRE-PRODUCTION



MASTERY PILLAR 1

DESCRIPTION

Before diving into the exploration of character appearances, it is crucial to establish a clear vision of the creative endeavor. Even within the realm of arthropod, each possesses slightly distinct anatomies.

However, concept art serves as the initial blueprint preceding any actual creation. Therefore, it is essential to resolve it promptly in order to commence the process of 3D asset development.

What is more, having a solid understanding of human structure is also important so that the artist could have a better combination of human and animal.

To accomplish this, it is prudent to investigate the methodologies and techniques employed by professionals in the field. Simultaneously, one should strive to define the concept of concept art itself, unraveling its intricacies and gaining a comprehensive understanding.

Additionally, undertaking research on arthropod anatomy and selecting a suitable model becomes necessary. Furthermore, exploring supplementary elements that enhance personal creativity and aesthetics becomes a vital aspect of the artistic process. Moreover, referencing existing morphing armor techniques will shed light on the mechanics involved, aiding in a better comprehension of the subject matter.

RESEARCH

Method 1: Character concept work pipeline

1. Magdalena Radziej (MJ Rad):

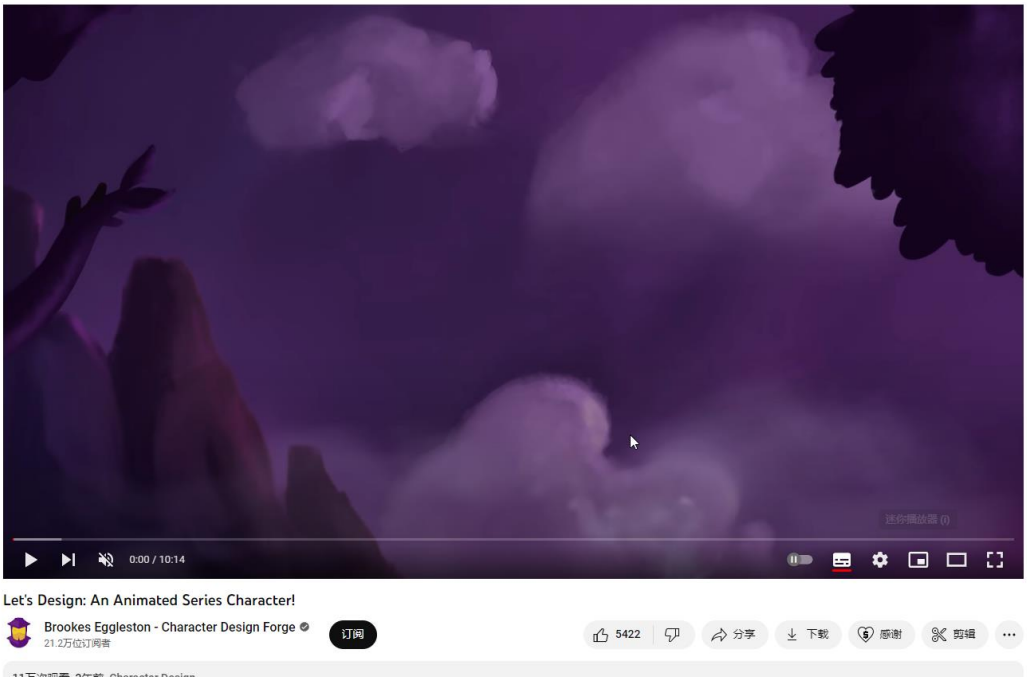


Figure 2 - Let's Design: An Animated Series Character!

https://www.youtube.com/watch?v=MQ-4EuLe4nc

- YouTube Channel: https://www.youtube.com/channel/UCJklo0Zl5tLV9kkk_Jd81EA

- Magdalena Radziej is a character concept artist known for her work on video games such as "The Witcher 3: Wild Hunt" and "Cyberpunk 2077." She often shares her character concept creation process on her YouTube channel.

Figure 3 - Let's Design: An Animated Series Character!

https://www.youtube.com/watch?v=MQ-4EuLe4nc

Character Creation Process:

- Magdalena begins by gathering references and researching the character's backstory, personality, and the game's setting.

- She starts with rough sketches to explore various ideas, poses, and silhouettes for the character.

- Once she has chosen a direction, she refines the sketch by adding more details, refining the anatomy, and experimenting with different design elements.

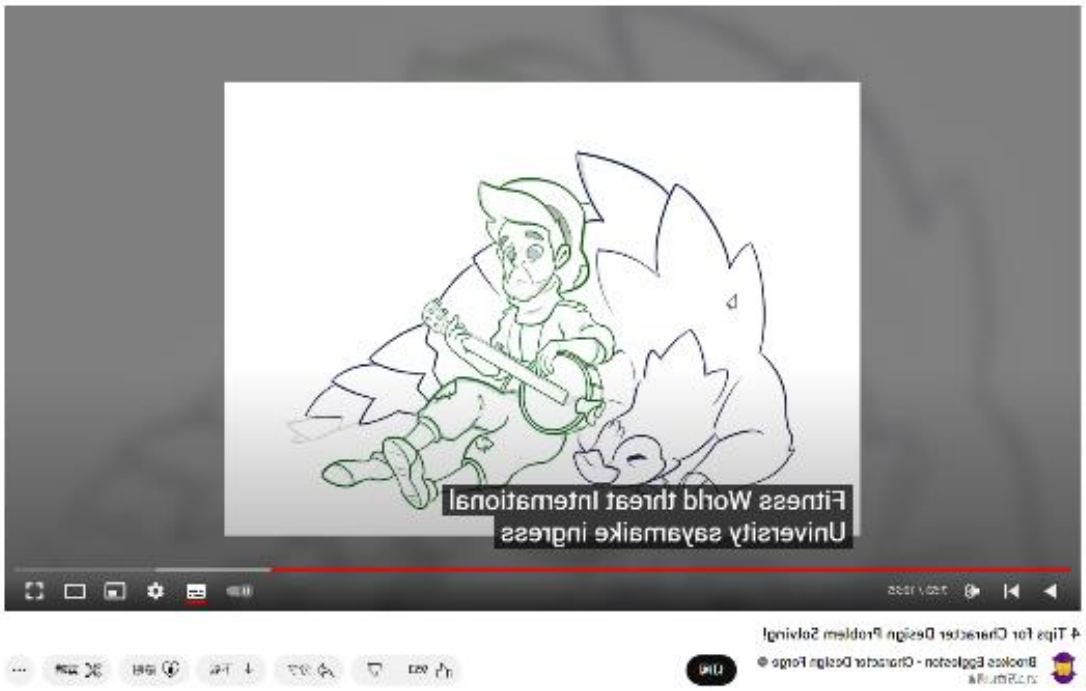


Figure 4- 4 Tips for Character Design Problem Solving!

https://www.youtube.com/watch?v=UQQFot2EYAc

- She then proceeds to add colors, shading, and textures to bring the character to life.

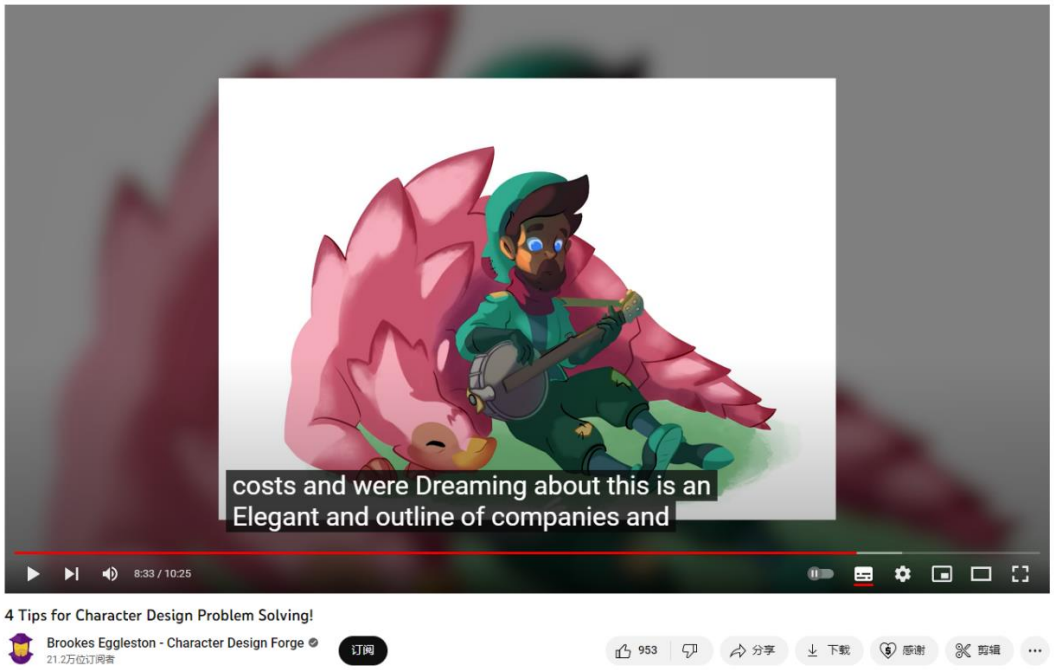


Figure 5 - 4 Tips for Character Design Problem Solving!

https://www.youtube.com/watch?v=UQQFot2EYAc

- Magdalena often creates multiple iterations of the character concept to explore different options and get feedback from her teammates.

Communication and Feedback:

- Magdalena collaborates with her teammates through various communication channels such as email, instant messaging, and project management tools.

- She shares her work-in-progress character concepts with the team and receives feedback and suggestions for improvement.

- Feedback sessions can involve discussions, annotations on the concept artwork, or even virtual meetings.

- Magdalena iterates on the concept based on the feedback received, adjusting, and refining the design until it aligns with the team's vision.

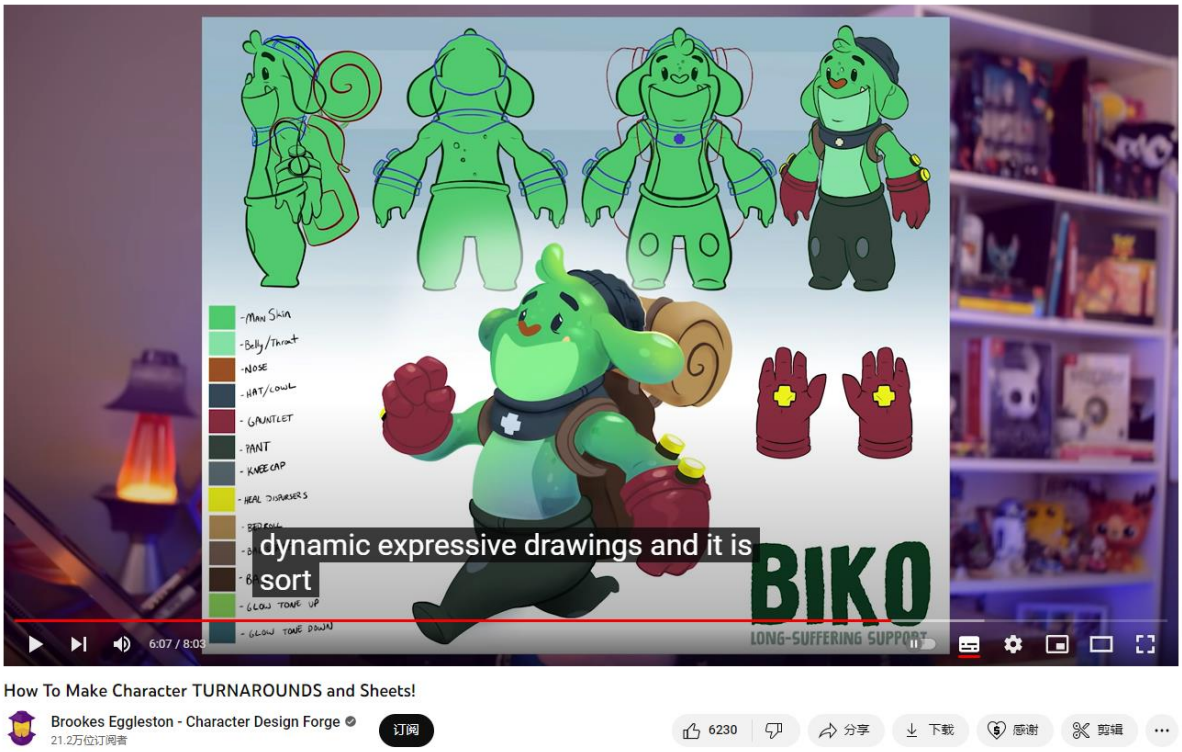


Figure 6 - How To Make Character TURNAROUNDS and Sheets!

https://www.youtube.com/watch?v=chTb_ic-oVI

Character Concept Sheet:

- After finalizing the character concept, Magdalena creates a character concept sheet that provides a comprehensive view of the character.

- The character concept sheet includes various views of the character, close-up details of important features, color palette, and any additional information necessary for the 2D character artist or 3D modeler to create the final character assets.

2. Krenz Cushart:

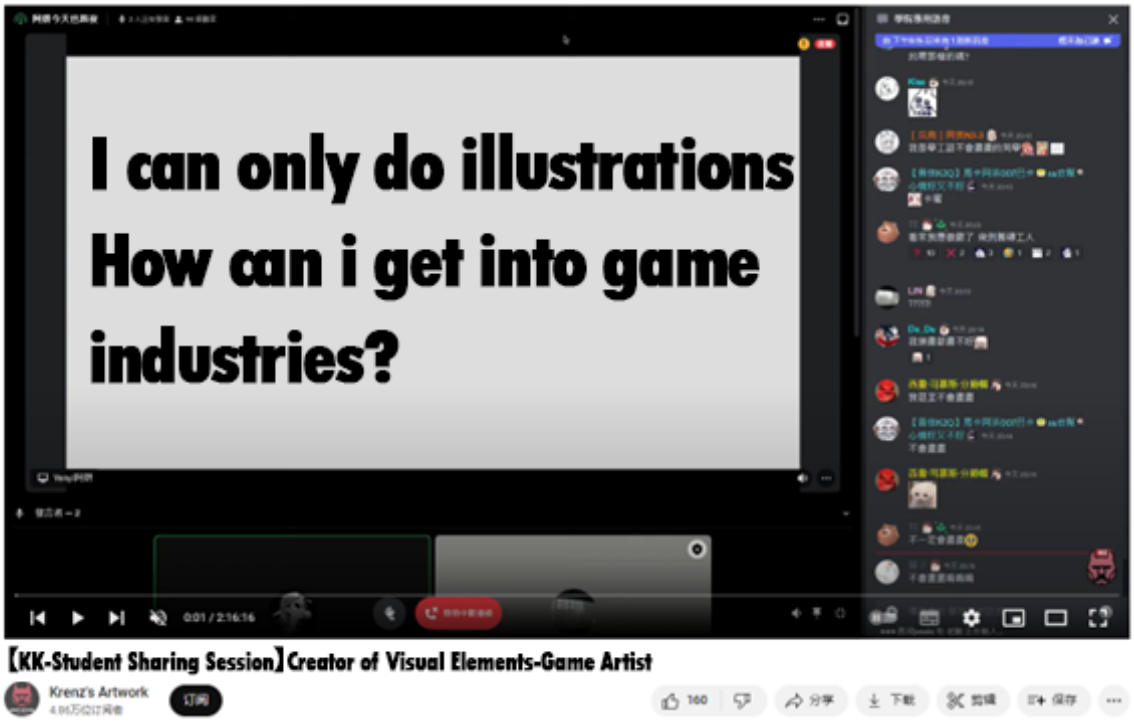


Figure 7 - 【KK-Student Sharing Session】Creator of Visual Elements-Game Artist

https://www.youtube.com/watch?v=raQtmKuybkc&list=PL-PDfVb-BNllRcA8-okUh_yvFXzjTDY-4

- YouTube Channel: https://www.youtube.com/@krenzsartwork5373

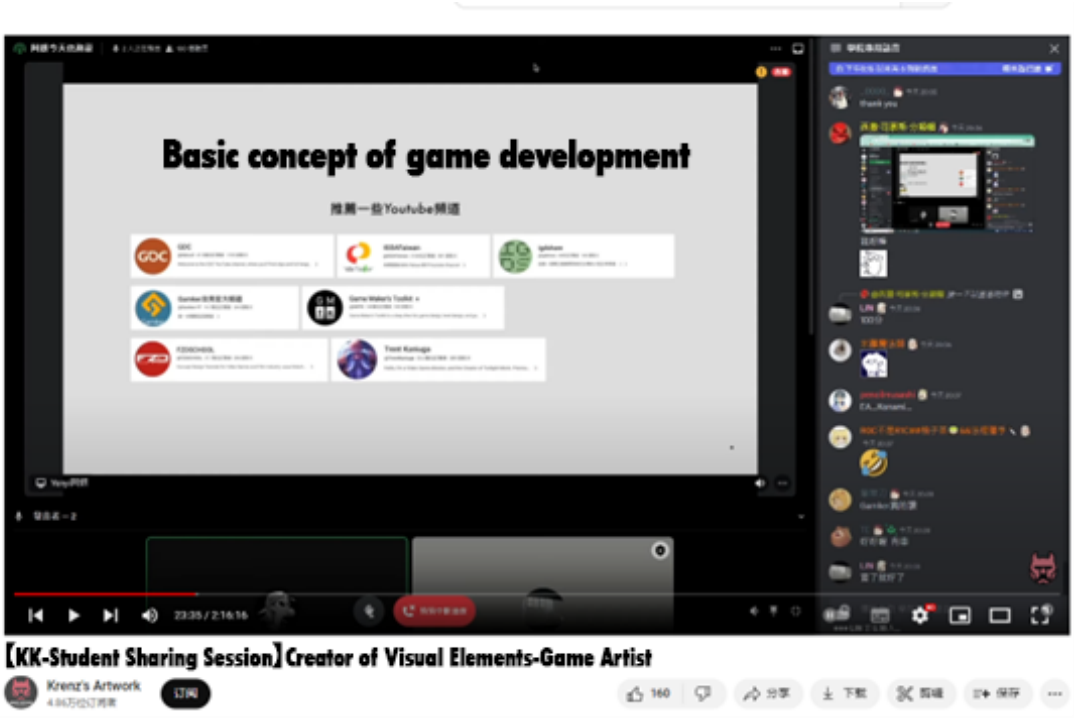


Figure 8 - 【KK-Student Sharing Session】Creator of Visual Elements-Game Artist

https://www.youtube.com/watch?v=raQtmKuybkc&list=PL-PDfVb-BNllRcA8-okUh_yvFXzjTDY-4

Character Creation Process:

- Krenz starts by understanding the character's role, personality, and the game's art style.

Figure 9 - Grab type treatment room under EP3

https://www.youtube.com/watch?v=2qbT6fvniz4

- He begins with rough thumbnail sketches to explore different ideas and compositions.

- Once a thumbnail is selected, Krenz creates a more refined line drawing, adding details, proportions, and refining the design.

- He then proceeds to block in colors, focusing on establishing the character's silhouette and lighting.

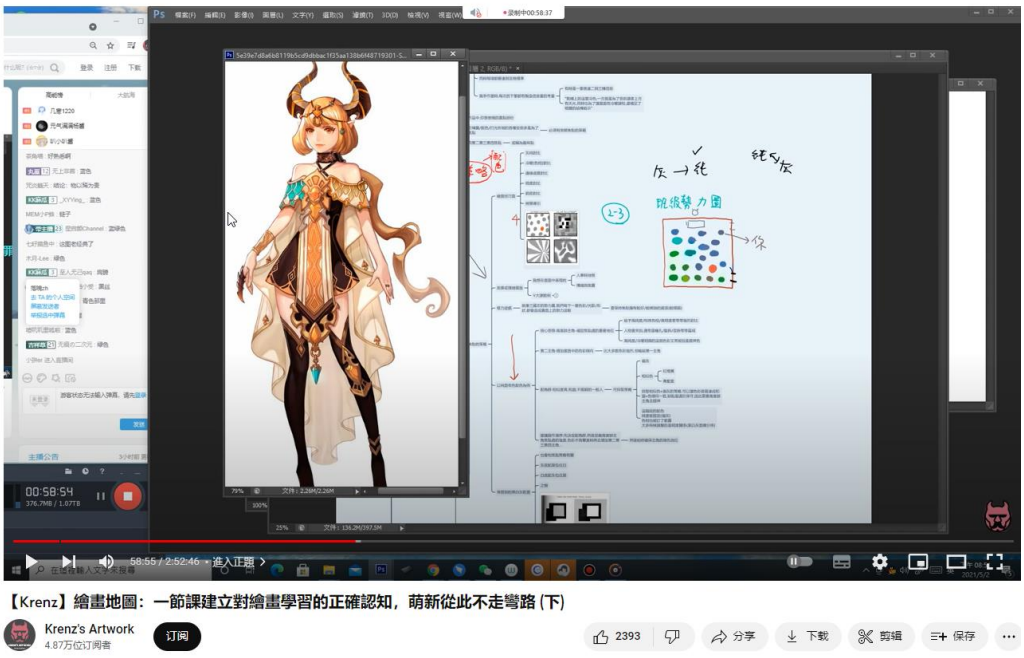


Figure 10 - 【Krenz】Drawing Maps: A lesson to establish a correct understanding of drawing learning, newcomers will never take a detour

https://www.youtube.com/watch?v=XfHLXSaYL0I&t=1420s

- Krenz adds more details, textures, and shading to bring the character concept to a polished state.

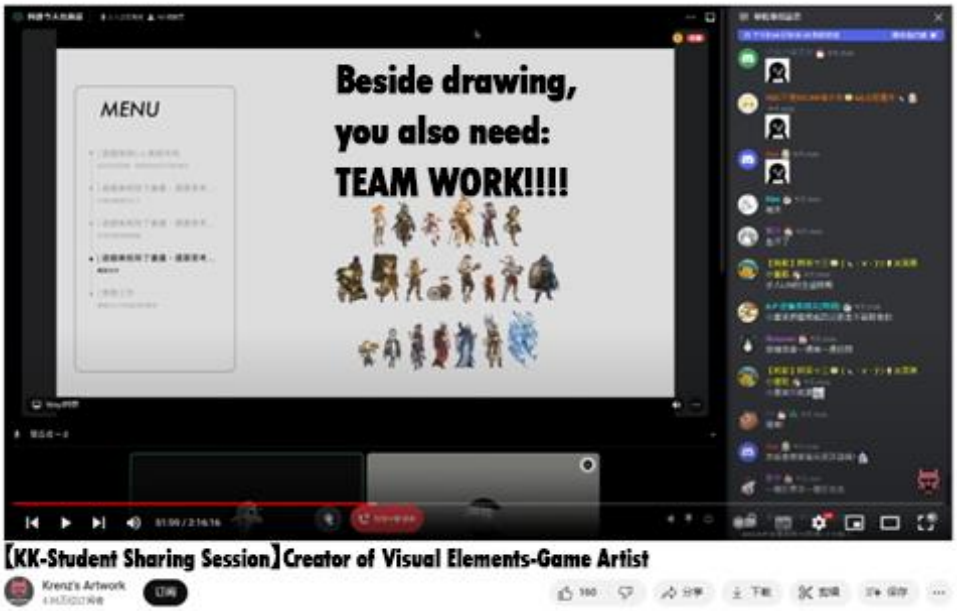


Figure 11 - 【KK-Student Sharing Session Creator of Visual Elements-Game Artist

https://www.youtube.com/watch?v=raQtmKuybkc&list=PL-PDfVb-BNllRcA8-okUh_yvFXzjTDY-4

Communication and Feedback:

- Krenz communicates with his teammates through platforms like email, messaging apps, or project management tools.

- He shares his work-in-progress character concepts, either as sketches or more developed illustrations, to gather feedback from the team.

- Feedback can be provided through comments, annotations on the artwork, or in meetings with the team.

- Krenz takes the feedback into consideration, making revisions and adjustments to the concept as needed.

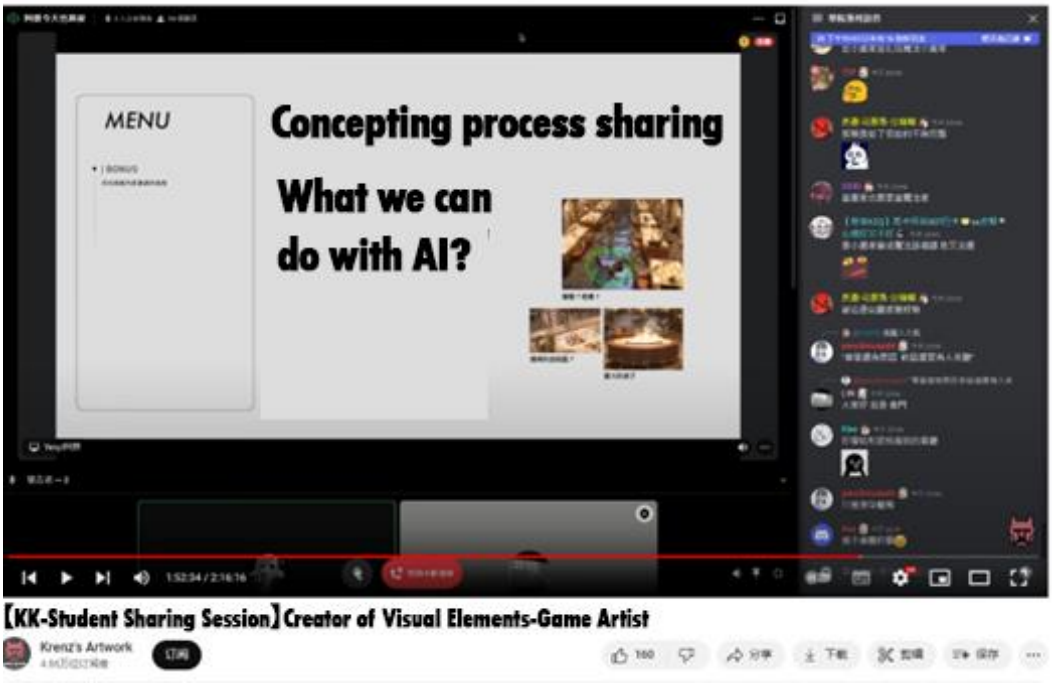


Figure 12 - 【KK-Student Sharing Session Creator of Visual Elements-Game Artist

https://www.youtube.com/watch?v=raQtmKuybkc&list=PL-PDfVb-BNllRcA8-okUh_yvFXzjTDY-4

Character Concept Sheet:

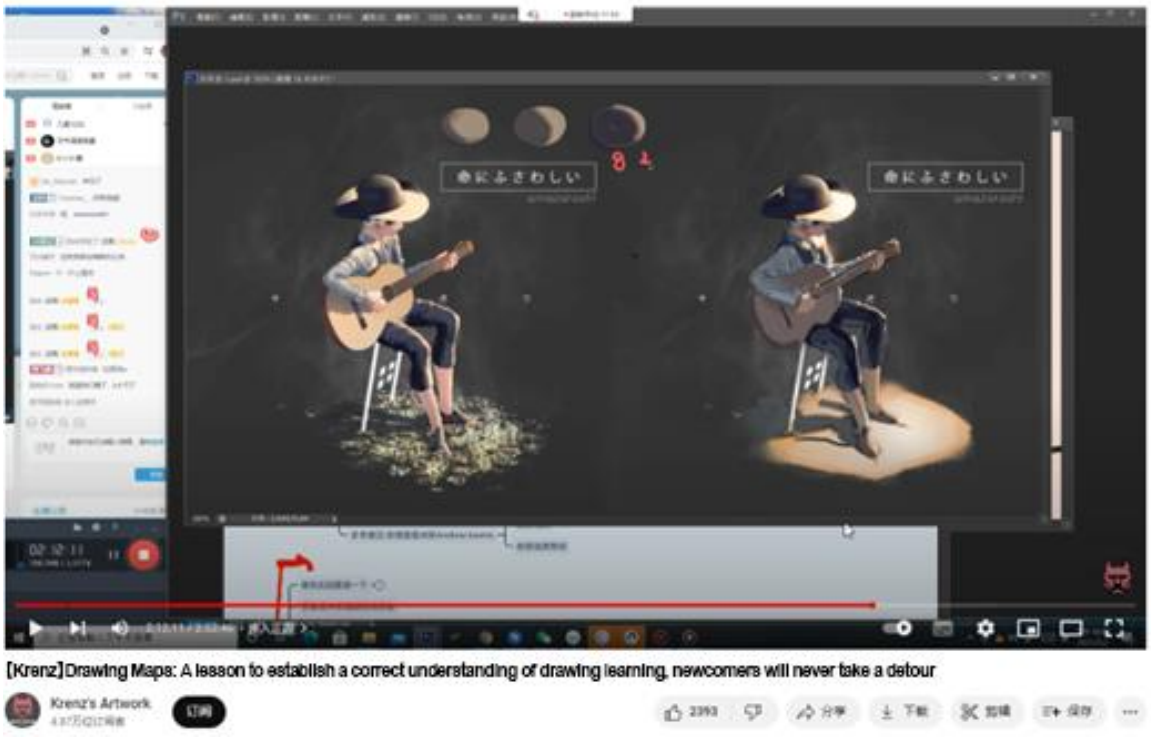


Figure 13 - 【Krenz】Drawing Maps: A lesson to establish a correct understanding of drawing learning, newcomers will never take a detour.

https://www.youtube.com/watch?v=XfHLXSaYL0I&t=1420s

- After finalizing the character concept, Krenz creates a character concept sheet that serves as a reference for the production team.

- The concept sheet typically includes different views of the character , expressions, poses, and important details like clothing, weapons, or accessories.

- It may also include color swatches, material references, and additional information that helps the 2D and 3D artists understand the character's design.

3. Qiaoshan:

Figure 14 - Qiaoshan Bio Character Design Basic Course Episode 1: Copywriting + Image Materials

https://www.youtube.com/watch?v=8ebg3VojUJ8

Character Creation Process:

- Understanding: Qiaoshan begins by gaining a clear understanding of the character's role, personality, and the art style of the game they are working on.

Figure 15 - Qiaoshan Bio Character Design Basics Course Episode 2: Individual Sketch Schemes

https://www.youtube.com/watch?v=4Z97vMG9LkA

- Thumbnail Sketches: Qiaoshan explores various ideas and compositions through rough thumbnail sketches. This allows them to quickly iterate and experiment with different concepts.

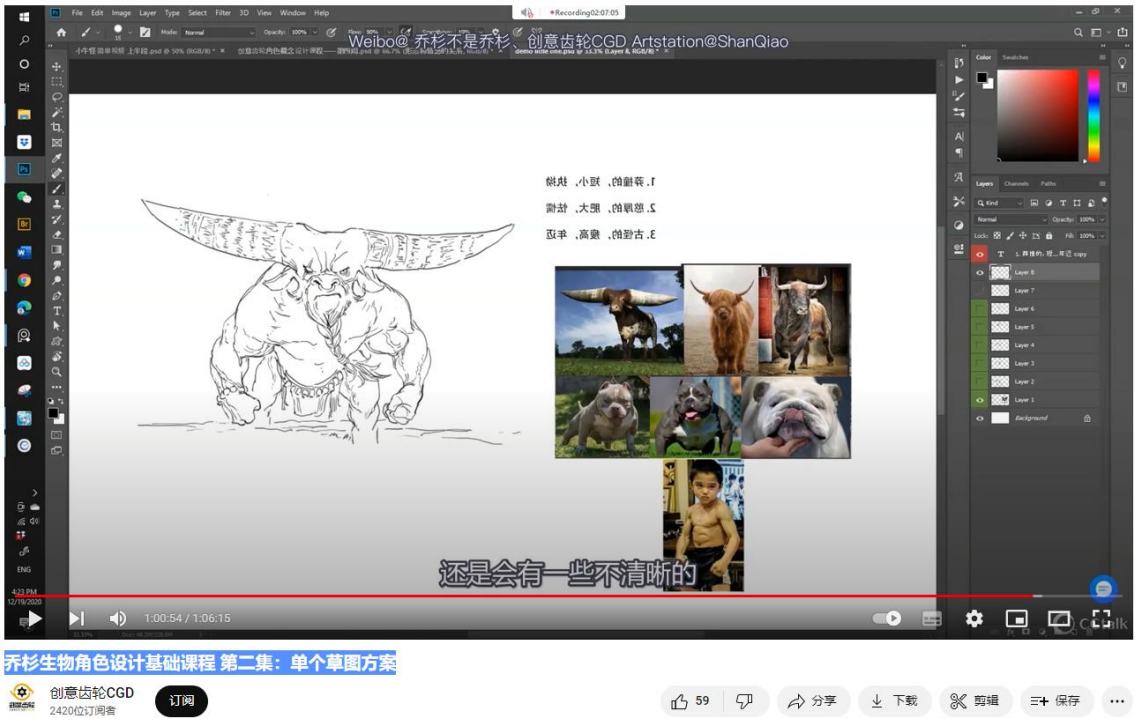


Figure 16 - Qiaoshan Bio Character Design Basics Course Episode 2: Individual Sketch Schemes

https://www.youtube.com/watch?v=4Z97vMG9LkA

- Refining the Design: Once a promising thumbnail is selected, Qiaoshan refines the design by creating a more detailed line drawing. They focus on adding proportion, details, and refining the overall composition.

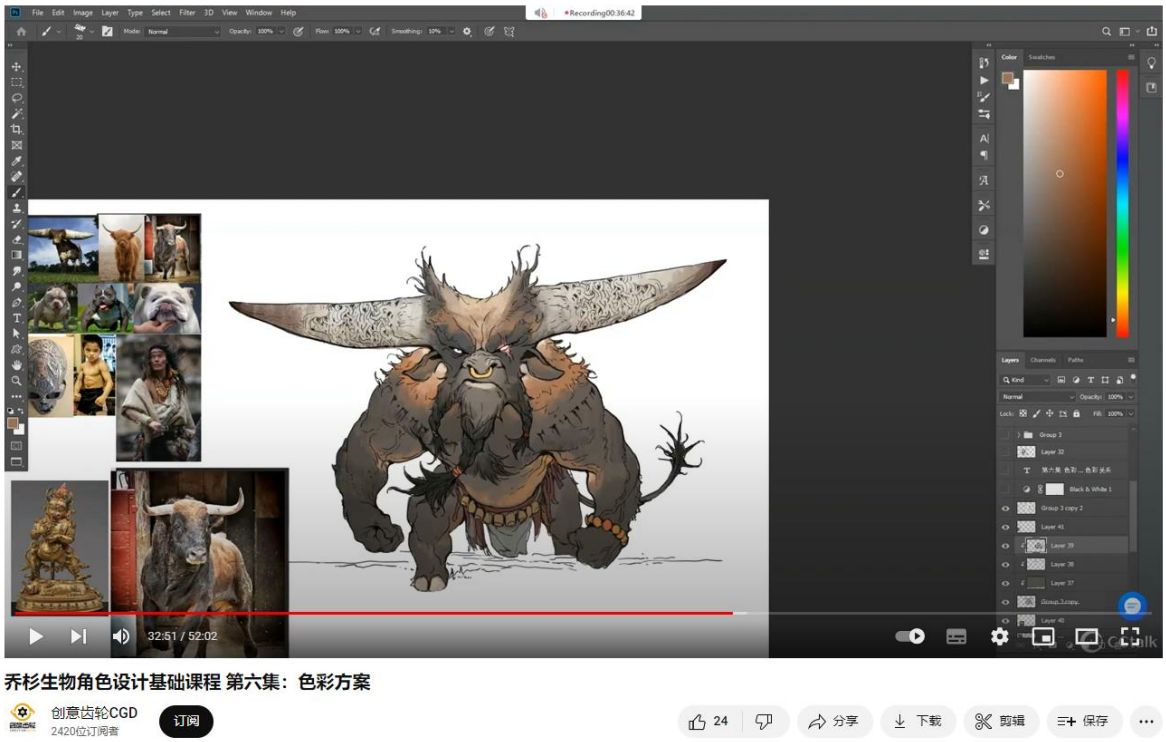


Figure 17 - Qiaoshan Bio Character Design Basic Course Episode 6: Color Schemes

https://www.youtube.com/watch?v=sI1c7eROofU

- Blocking in Colors: Qiaoshan proceeds to block in colors, concentrating on establishing the character's silhouette and lighting. This stage helps to set the mood and overall visual impact of the concept.

Figure 18 - Qiaoshan Bio Character Design Basic Course Episode 7: Light and Shadow Programs

https://www.youtube.com/watch?v=5Q4nRJZgzXo

- Adding Details and Textures: Qiaoshan adds more intricate details, textures, and shading to enhance the character's appearance and bring them closer to a polished state.

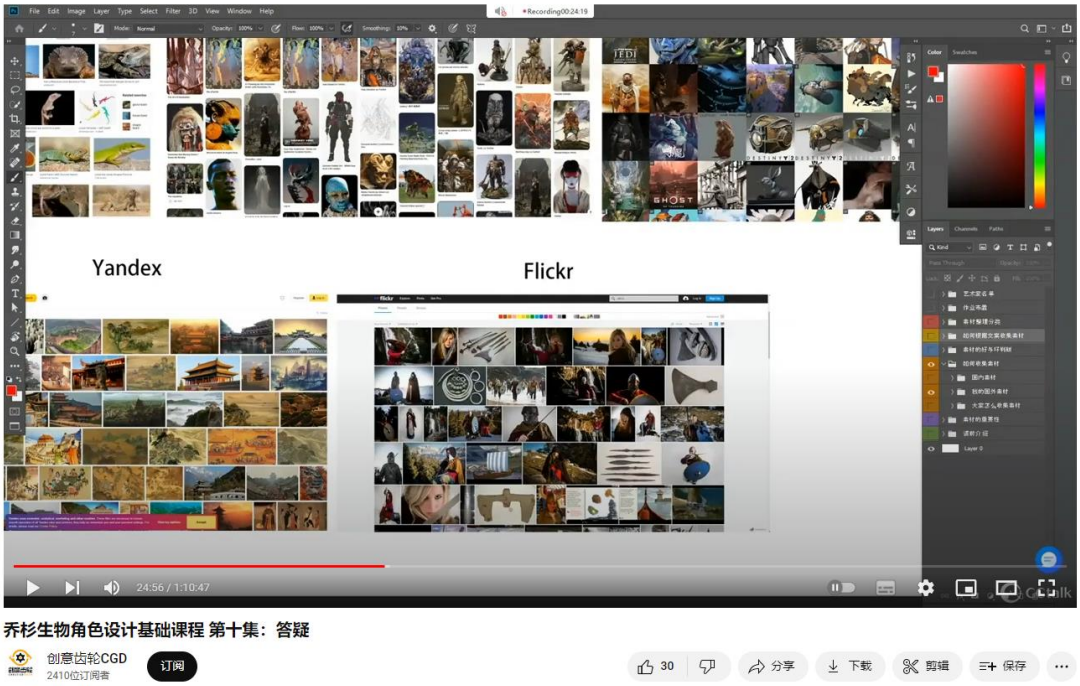


Figure 19 - Qiaoshan Bio Character Design Fundamentals Course Episode 10: Q&A

https://www.youtube.com/watch?v=Dlr5bXh5p98

Communication and Feedback:

- Team Collaboration: Qiaoshan communicates with their teammates using various platforms such as email, messaging apps, or project management tools to exchange ideas and progress updates.

- Sharing Work-in-Progress: Qiaoshan shares their work-in-progress character concepts with the team, presenting sketches or more developed illustrations. This allows them to gather feedback and suggestions from their colleagues.

- Feedback Channels: Feedback can be provided through comments, annotations on the artwork, or during team meetings. Qiaoshan considers the feedback received and incorporates it into their work, making revisions and adjustments as necessary.

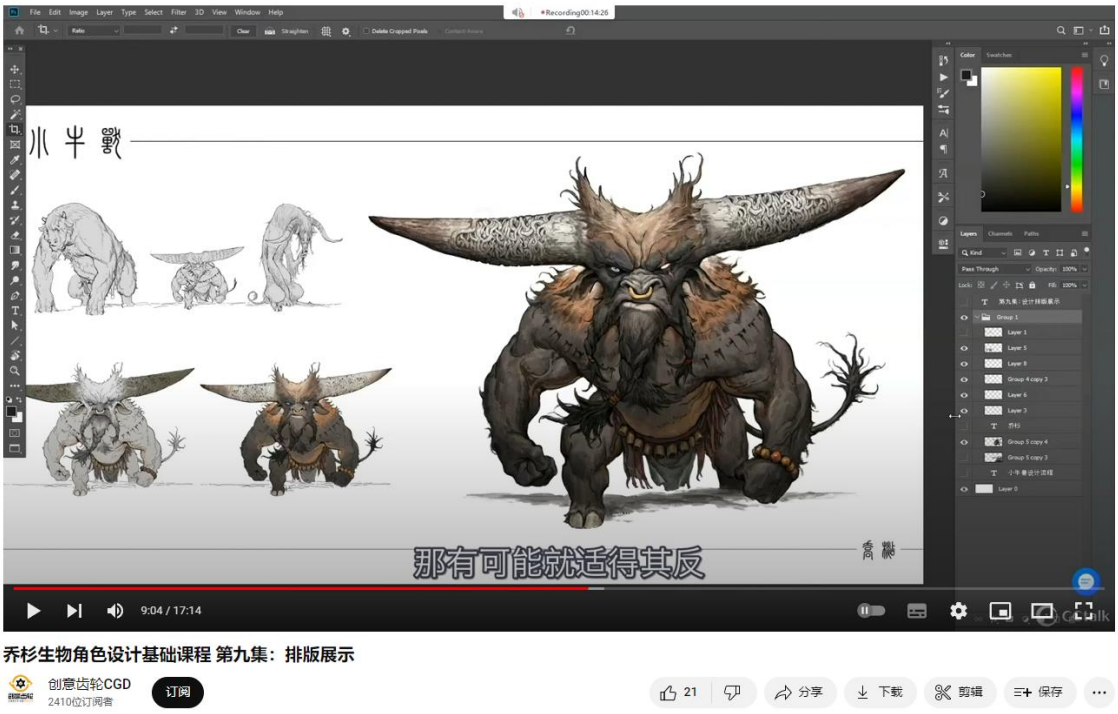


Figure 20 - Qiaoshan Bio Character Design Basic Course Episode 9: Typography Showcase

https://www.youtube.com/watch?v=foYdEYFH1UA

Character Concept Sheet:

- Finalizing the Concept: After refining the character concept, Qiaoshan prepares a final version that meets the project's requirements and vision.

- Character Concept Sheet: Qiaoshan creates a character concept sheet that serves as a reference for the production team. This sheet typically includes different views of the character (front, back, side), expressions, poses, and important details like clothing, weapons, or accessories.

- Additional Information: The concept sheet may also feature color swatches, material references, and any additional information that helps the 2D and 3D artists understand and accurately translate the character's design into the game.

I decide to use the way of Krenz Cushart for following reasons:

1. Krenz Cushart is a famous and successful game artist in Taiwan, his workflow is affirmed by industry insiders.
2. I've taken his class before and I'm familiar with his method.
3. A lot of his students have already become famous concept artists in Taiwan.

Method 2: Design language theory

I studied the language theory of character design to have a deeper understanding of the methodology. This article is very detailed and in-depth, providing knowledge and theories that need to be considered and applied in character design.

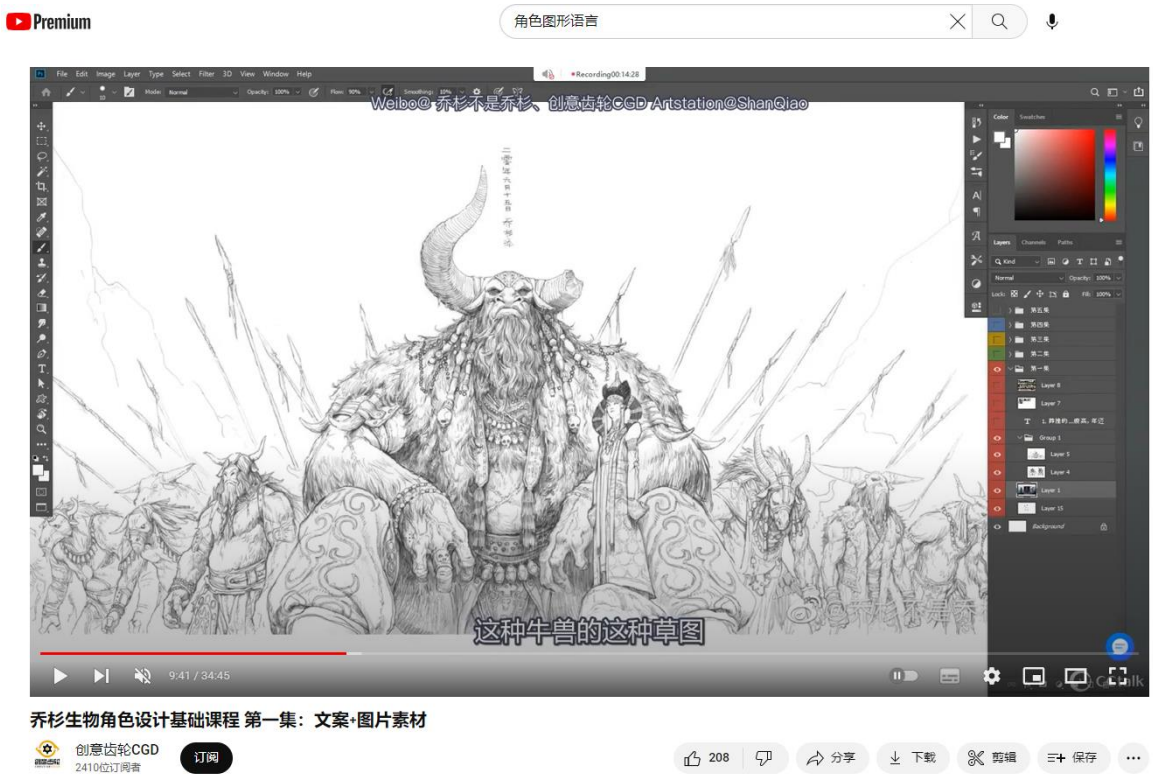
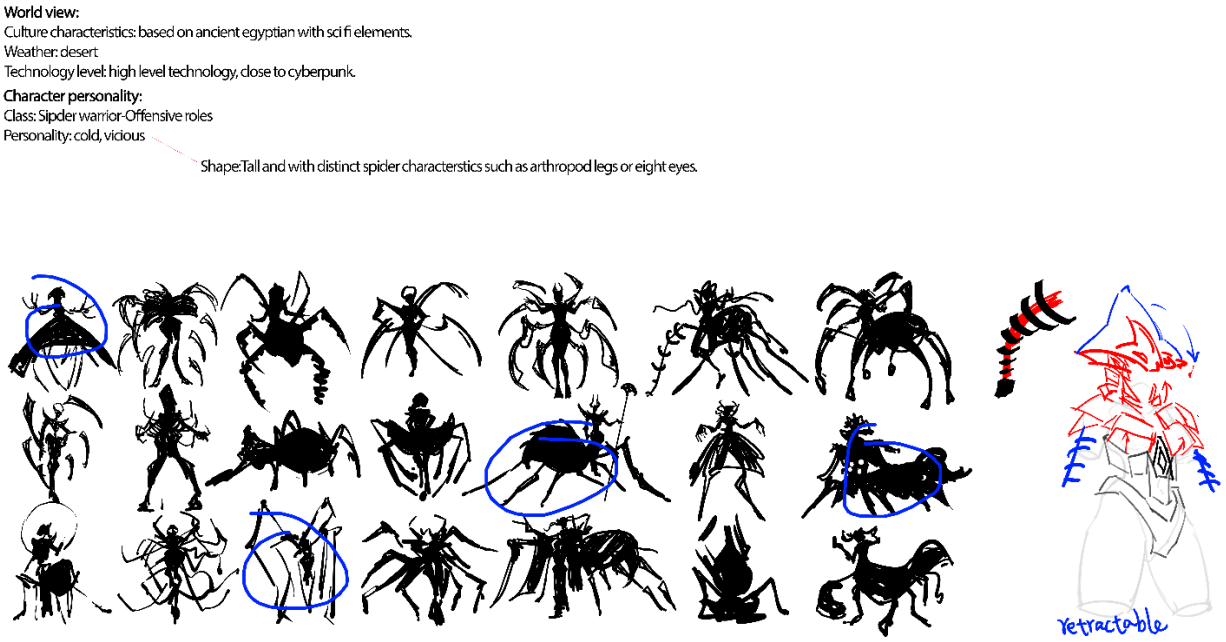


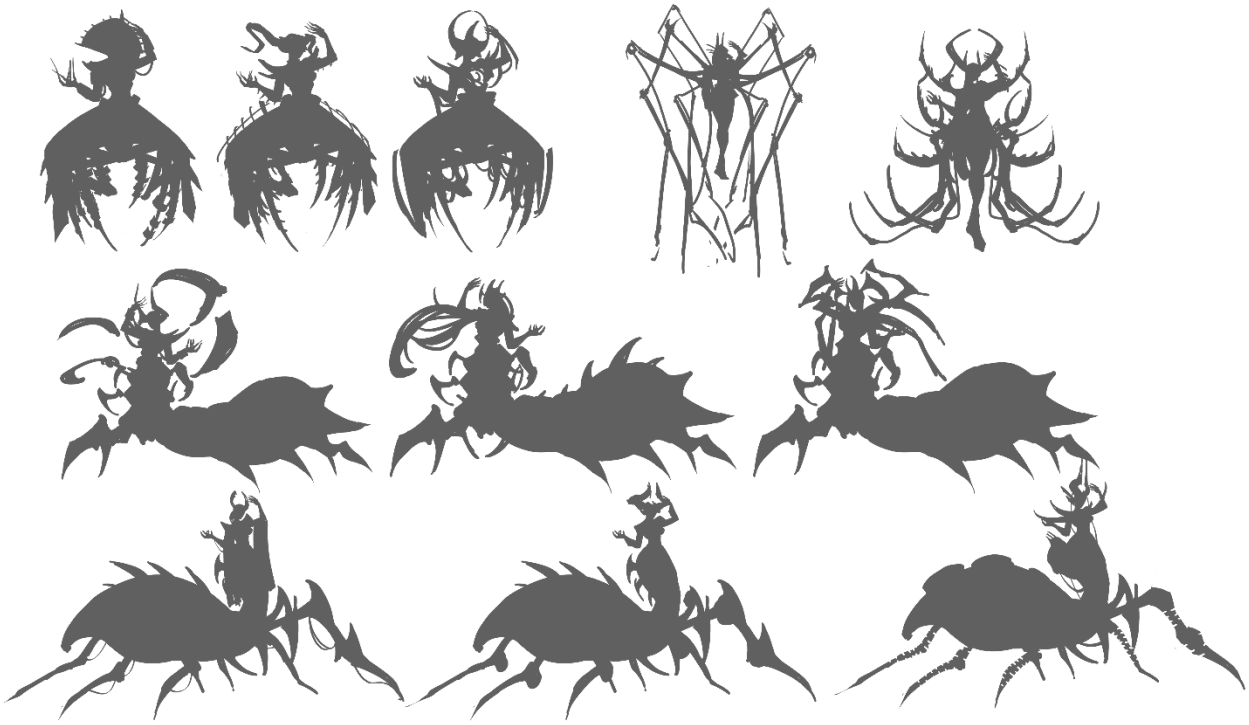
Figure 21 - Qiaoshan Bio Character Design Basic Course Episode 1: Copywriting + Image Materials

https://www.youtube.com/watch?v=8ebg3VojUJ8

PROOF OF CONCEPT

Based on the knowledge I absorbed from those tutorials, I created thumbnails as followed:





MASTERY PILLAR 2

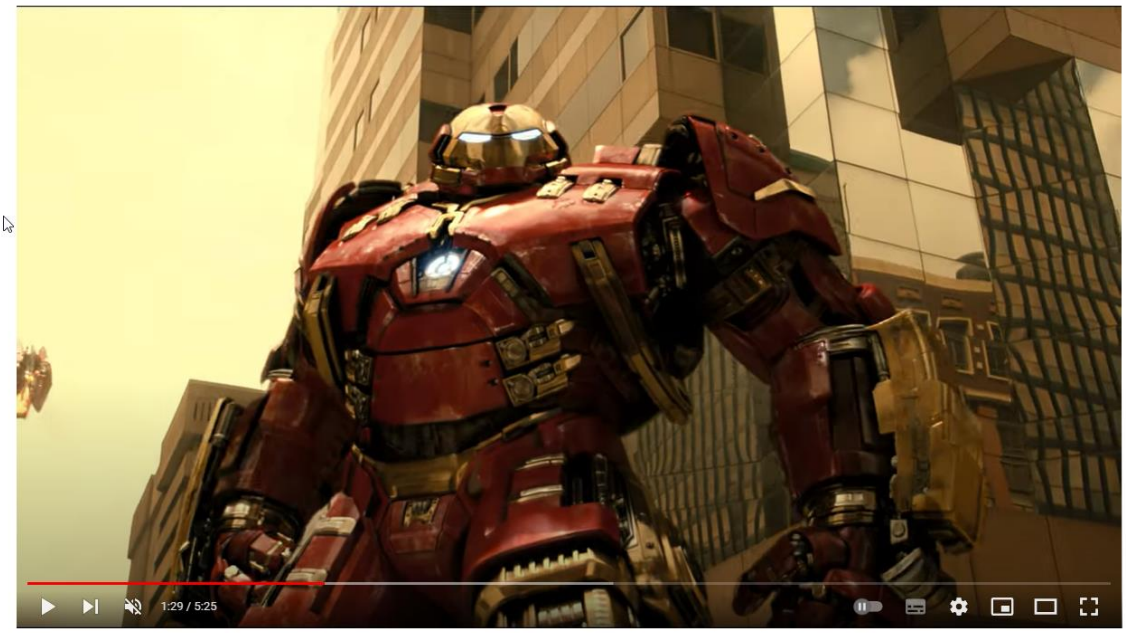
DESCRIPTION

This pillar is about creating multi-limb rigging and an armor with transform function. Though the order of how you go about this process can be preferential, I decided to explore the existing instance like ironman and transformers. The challenge with multi-limb character and transform armor lies in the method how to transform, therefore in the concept stage I need to get a clear idea of it, then apply the idea to the product.

RESEARCH

Method 1: Transform Armor

For this part, I need to gather references of transformation and come out a concept for transform armor for my character.



Avengers Age of Ultron [4K - HDR] - Duel of Johannesburg. HulkBuster vs Hulk - Fight Scene (2015)

Figure 22 - Avengers Age of Ultron [4K - HDR] - Duel of Johannesburg. HulkBuster vs Hulk - Fight Scene (2015)

https://www.youtube.com/watch?v=YMMFYE6SpE8

I need to investigate how transformation in the modeling field works. I found this tutorial of transformer helped me with how to rig armor and create controllers.

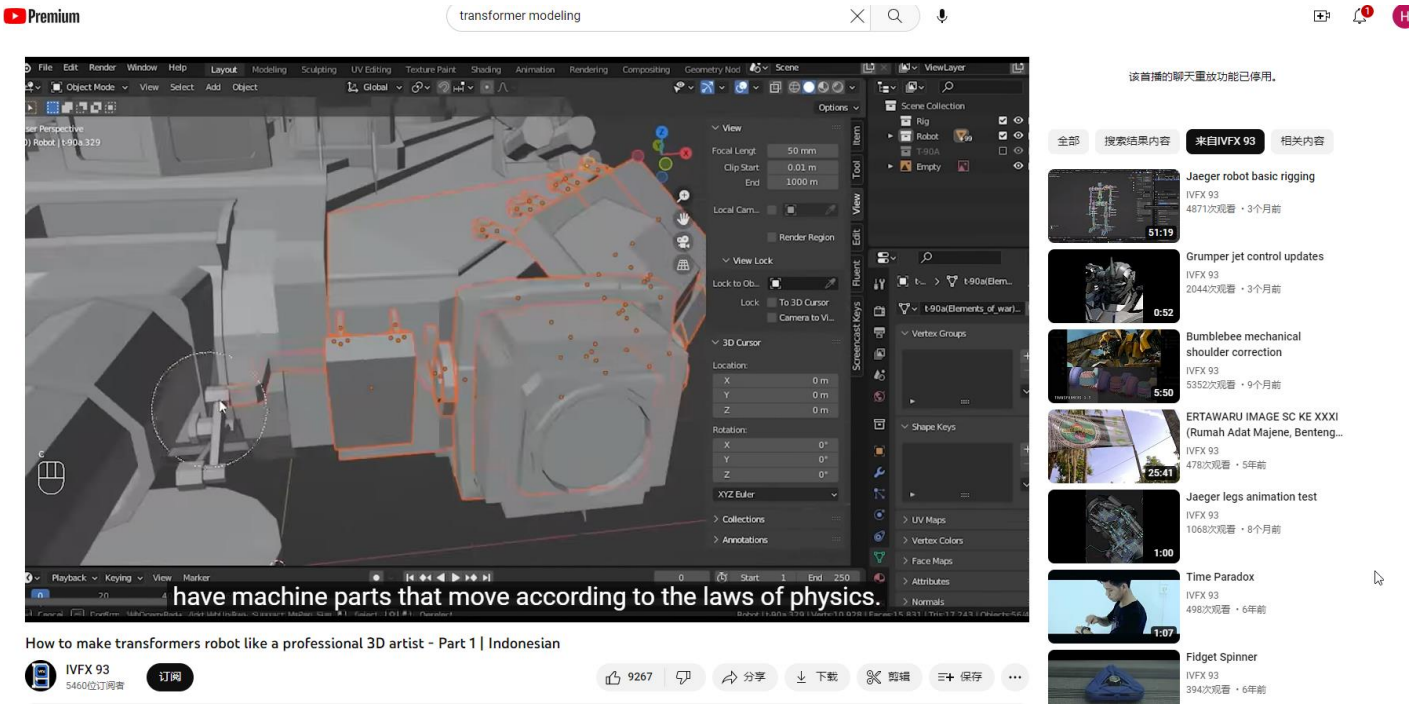


Figure 23 - How to make transformers robot like a professional 3D artist - Part 1 | Indonesian.

https://www.youtube.com/watch?v=D7vT1hrbCG4

Method 2: Multi-limbs rigging.

I researched how a YouTube artist rigged a spider. This tutorial did exactly the same thing that I want to do in the artifact. Started rigging the spider legs by adding bones and nodes in 3D software, creating controllers to those bones and then skin the bones.

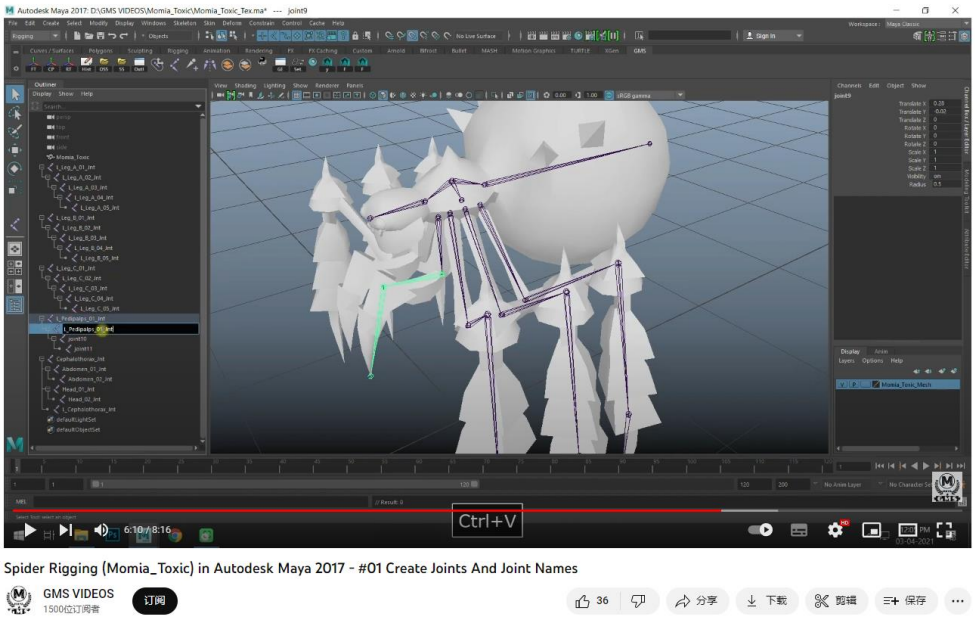


Figure 24: Spider Rigging (Momia_Toxic) in Autodesk 3D software 2017 - #01 Create Joints And Joint Names

https://www.youtube.com/watch?v=wQUdsfoJW4Y

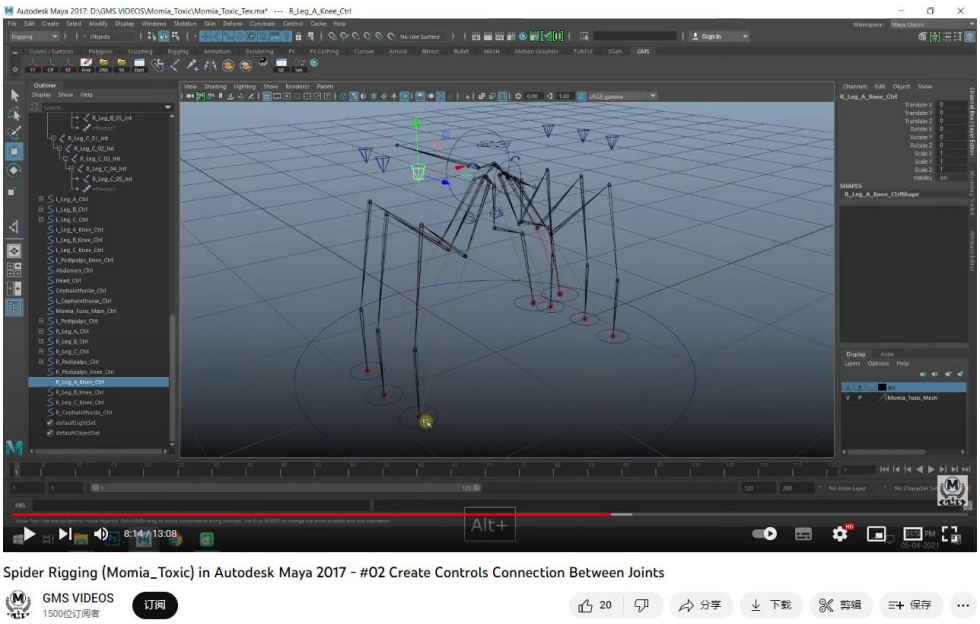


Figure 25: Spider Rigging (Momia_Toxic) in Autodesk 3D software 2017 - #02 Create Controls Connection Between Joints

https://www.youtube.com/watch?v=bgTGG138uW8&t=7s

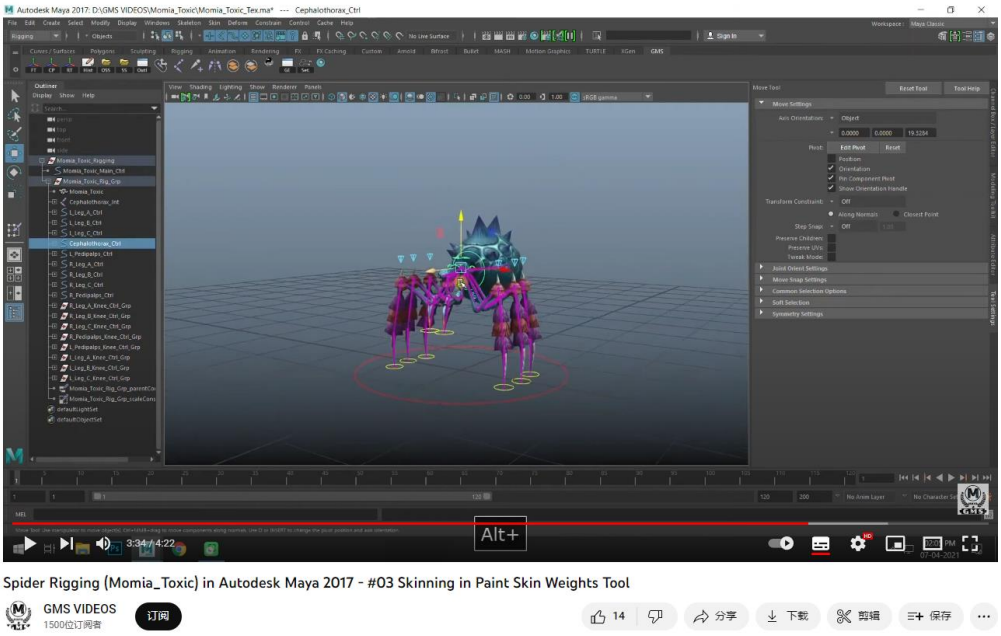
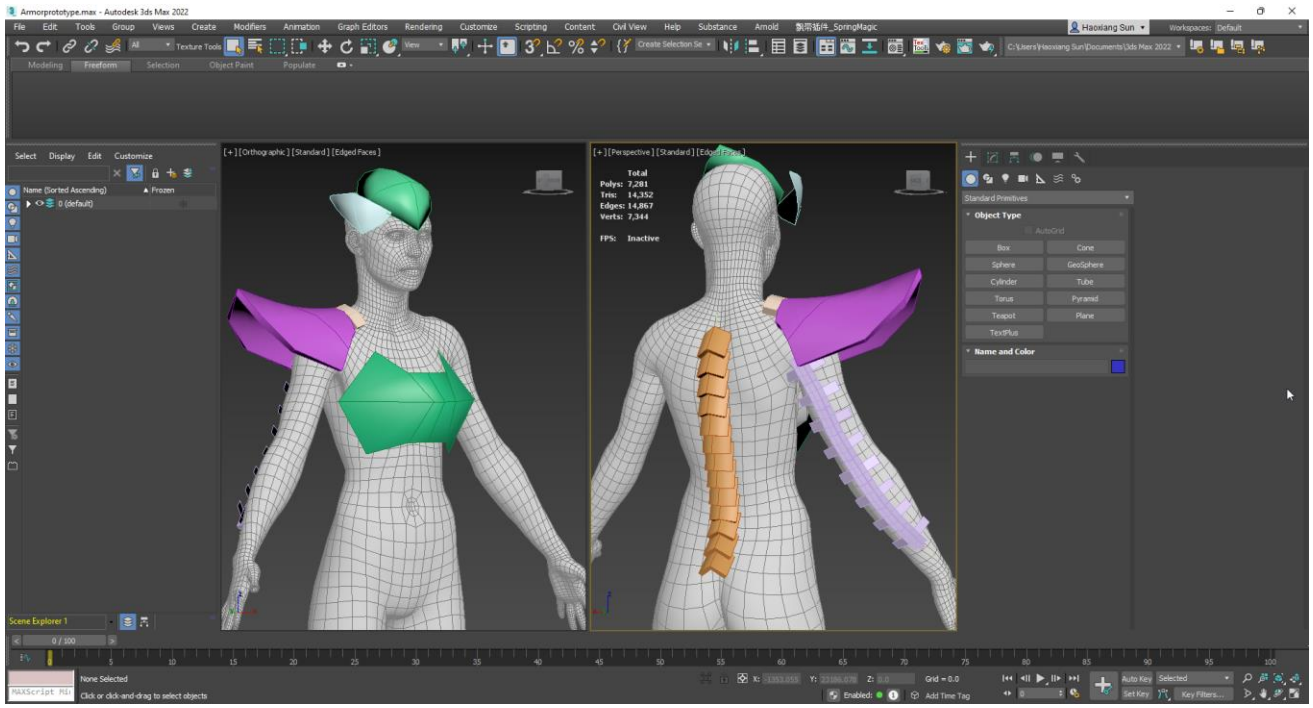


Figure 26: Spider Rigging (Momia_Toxic) in Autodesk 3D software 2017 - #03 Skinning in Paint Skin Weights Tool

https://www.youtube.com/watch?v=godw5YK0_ZM

PROOF OF CONCEPT

Therefore, I created armor simple proxy to demonstrate my concept of armor:



MASTERY PILLAR 3

DESCRIPTION

Visual effects that match the character`s theme and basic animation. Thus, the visual effects need to be matched with the model to emphasize the characteristics of the creatures and enhance the beauty from aesthetical angle.

RESEARCH

Method 1: VFX

First of all, I need to get familiar with how VFX works. So, I found this tutorial for beginners. This tutorial taught me what is Niagara system, how it works and the different function of different nodes.

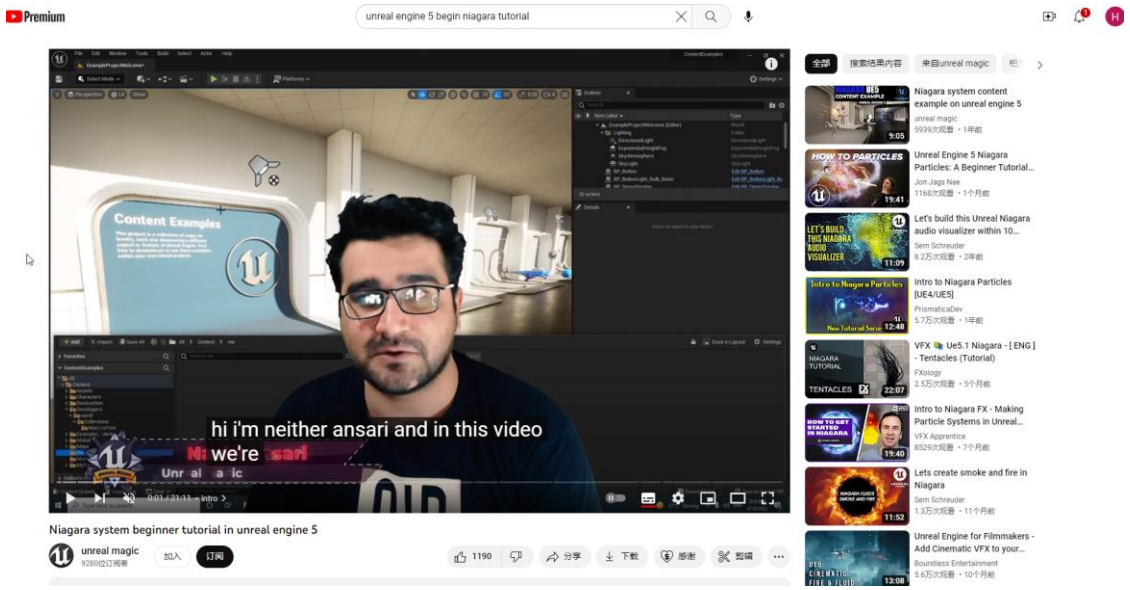
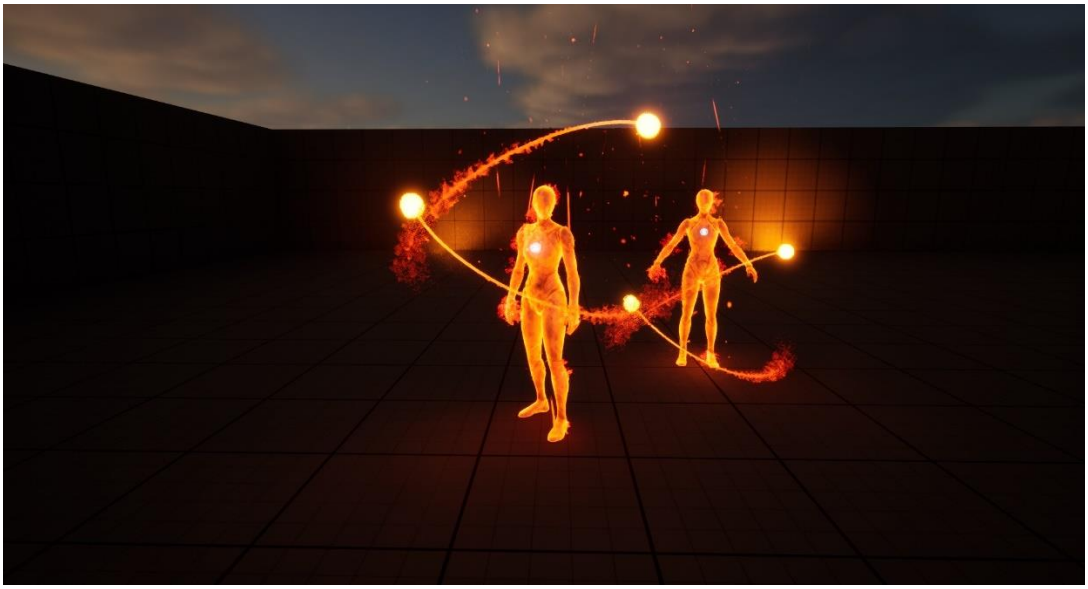


Figure 27: Niagara system beginner tutorial in unreal engine 5

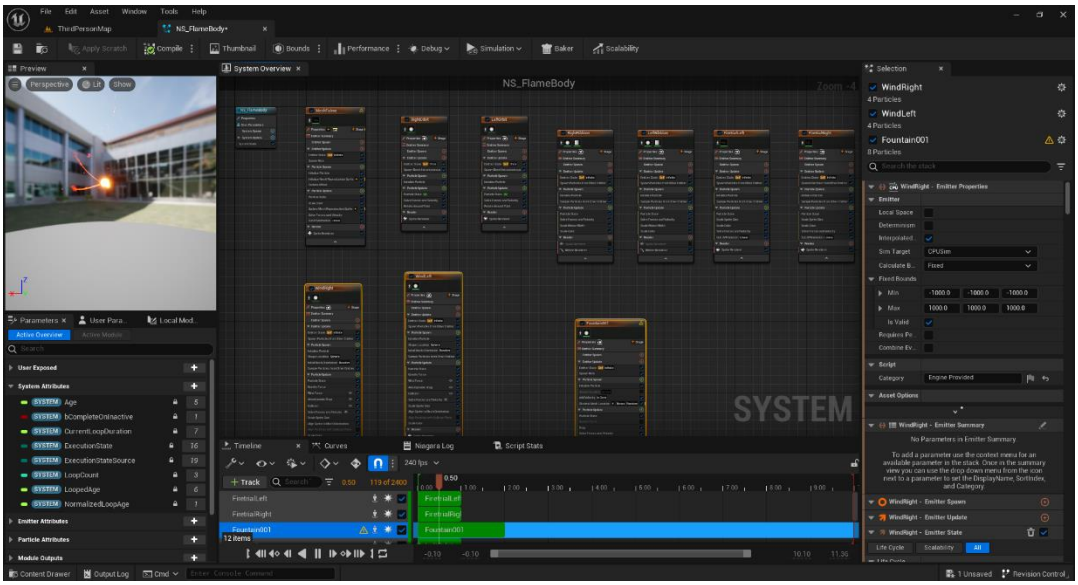
https://www.youtube.com/watch?v=_6YbcMhfHWg&t=1s

PROOF OF CONCEPT

Based on the knowledge I absorbed from those tutorials, I created VFX prototype as followed:



In my artifact, VFX will include 3 sections that more than shining body and flying sphere which showed in my VFX prototype: energy flow in character's body, VFX of attacking ability and VFX that will affect the floor. But I need to explore more in the concepting phase and deciding what they will really looks like.



THE ARTIFACT

DESCRIPTION

This artifact is a Sci-Fi Character Creation that will create in Unreal Engine 5 with an emphasis on multi-limb rigging and visual effects. The idea generation phase of the thesis project focused on the rigging of a sophisticated character model and the production of special effects for this character. The character's artwork is stylized and made of clean materials.

RESEARCH

1.The character's aesthetic is described as stylized with clean materials, which suggests a need for a specific artistic direction. Researching existing Sci-Fi characters and current trends in Sci-Fi media can help in forming a unique character design. Additionally, studying various concept arts can provide insights into merging artistic vision with technical feasibility in Unreal Engine.

2.Character rigging is a crucial process in character animation, involving the creation of a skeleton structure (bones and joints) and defining how the mesh of the character moves with these bones. In Unreal Engine 5, this process can be enhanced with advanced tools like Control Rig, which allows for procedural animation and easier rig adjustments. Research will focus on:

Rigging fundamentals in Unreal Engine 5.
Advanced techniques for multi-limb configurations to handle characters with multiple arms, legs, or tentacles.
Comparison of traditional rigging methods and the Control Rig features available in Unreal Engine 5.

3. Special effects (VFX) play a significant role in character design, especially in Sci-Fi settings, to accentuate the otherworldly or futuristic aspect of characters. This includes materials and shaders that interact dynamically with the environment and lighting. Key research areas include:

Material creation in Unreal Engine 5, emphasizing clean, stylized textures.
Use of particle systems and Niagara VFX system for creating dynamic effects like glowing lines, energy fields, or peculiar atmospheres around the character.

PROOF OF CONCEPT

Step 1: Preparing Your Project

Setting Up Unreal Engine 5: Download and install Unreal Engine 5. Create a new project suitable for character animation.

Concept Art Integration: Import your character's concept art into Unreal for reference.

Step 2: Modeling and Rigging

Character Modeling: Using a 3D modeling tool (e.g., Blender), create your character, paying special attention to the unique features that fit a Sci-Fi theme. Since the character is described as having multiple limbs, ensure each limb is properly proportioned and integrated into the main body.

Importing Model to Unreal Engine: Export your model in a format supported by Unreal Engine (e.g., FBX) and import it into your project.

Rigging the Model: Use Unreal Engine's Rigging tools to create a skeleton for your character. Focus on the multi-limb structure, ensuring each limb has its own set of bones for proper animation control.

Applying Control Rig: Set up a Control Rig for advanced procedural animations and easier manipulations. This will be crucial for animating multiple limbs effectively.

Step 3: Texturing and Materials

Creating Stylized Textures: Design textures that reflect the clean, stylized look of the character. This might include smooth surfaces with metallic or futuristic finishes.

Applying Materials in Unreal Engine: Utilize Unreal's powerful material editor to create and apply materials that enhance the character's look with Sci-Fi elements, such as emissive textures for glowing parts.

Step 4: Visual Effects

Using Niagara: Implement the Niagara system to create visual effects around the character. This can include effects like energy pulses from the limbs or ambient glows that emphasize the character's Sci-Fi nature.

Particle Systems: Design particle systems for dynamic environmental interactions, like sparks when a limb touches the ground or energy discharges during movements.

Step 5: Animation

Basic Animation Setup: Animate basic movements using the Unreal Engine animation toolkit. Start with simple motions to ensure all limbs move correctly.

Advanced Animation Techniques: Implement more complex animations that take advantage of the multi-limb structure, such as coordinated limb movements or unique combat maneuvers.

Step 6: Testing and Refinement

In-Engine Testing: Regularly test the character in various scenarios within Unreal Engine to check for any rigging or animation issues.

Refinement: Adjust rigging, textures, and animations based on testing results to ensure the character behaves as intended in different environments.

Step 7: Final Touches and Presentation

Polishing: Make final adjustments to textures, animations, and effects.

Rendering a Scene: Set up a scene in Unreal Engine to showcase your character, including appropriate lighting and background to enhance the Sci-Fi theme.

Documentation and Sharing: Document the creation process and share your project if it's part of a larger portfolio or thesis.

PRODUCTION

PROTOTYPE

DESCRIPTION

In this milestone, I will continue to polish my character silhouette till I got a will done grayscale character front art, and I draw front and back view line drafts of mannequin part of this character. For the 3D aspect, I will make proxy model of the character and figuring out how to rig the transform armor pieces. For the VFX, I planning to explore how overlay material work with Niagara VFX.

SCHEDULING / PLANNING

THESIS I PRE-PRODUCTION – SCHEDULE

WEEK	TASKS / HOURS / JOURNAL
1	This is where your detailed entries and images go. Remember to credit the images and references in line. Mock proposal, collecting references. -2 hours

	Summary My own ability of mastery. – 12 hours Re –enter here per chosen mastery. Character concept. Hard surface modeling. Character modeling Character animation
2	Re –enter here per chosen mastery. Character concept Hard surface modeling Advanced rigging Character animation Environment concept Hyper modularity Creature rigging/animation. Realism character Create slides of art crafts. -12 hours
3	Re –enter here per chosen mastery. Character concept Advanced rigging Transformation Environment concept Hyper modularity VFX Static materials Static atmosphere Write journals. 12hour
4	MIDTERM PRESENTATION Re –enter here per chosen mastery. Character concept Transformation VFX Create final decided slide and summarizing mastery topics. - 12 hours

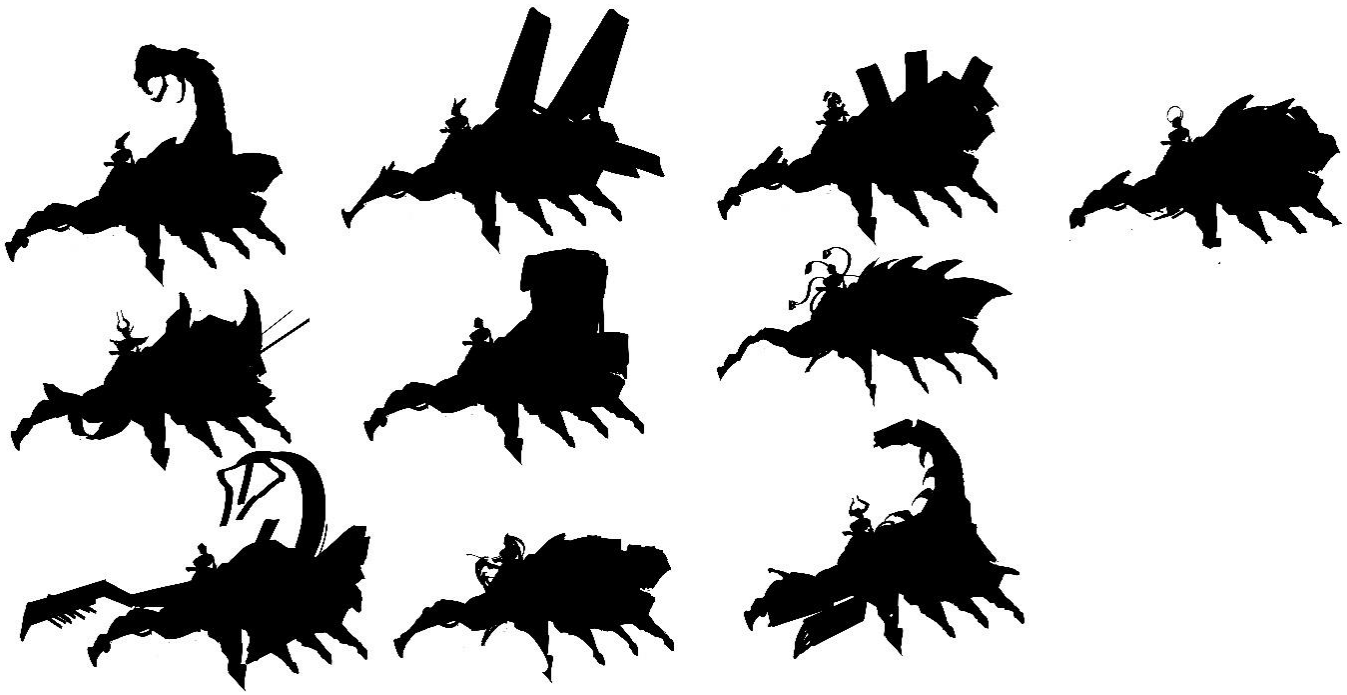
5	All new continuing research and development from here forward. Summarize methods I am going to use in the artifact. – 12 hours
6	Collect tutorial videos for transformation and VFX. Summarize concept workflows of different artists. – 6 hours Summarize methods I am going to use in the artifact. – 2 hours
7	Constructing world view and colleting references, making concept prototype. - 8 hours Watch tutorials of VFX and start to make proxy VFX- 6 hours Writing journals. – 3 hours Creating armor proxy models. – 2 hours
8	Keep making proxy of thumbnails and VFX. 10 hours Fix issues of journal. – 4 hours Writing ADL. – 2 hours
9	FINAL THESIS I MASTERY ARTIFACT PLAN AND SCHEDULE PRESENTATION

METHODOLOGIES

MASTERY TOPIC 1: CHARACTER CONCEPT

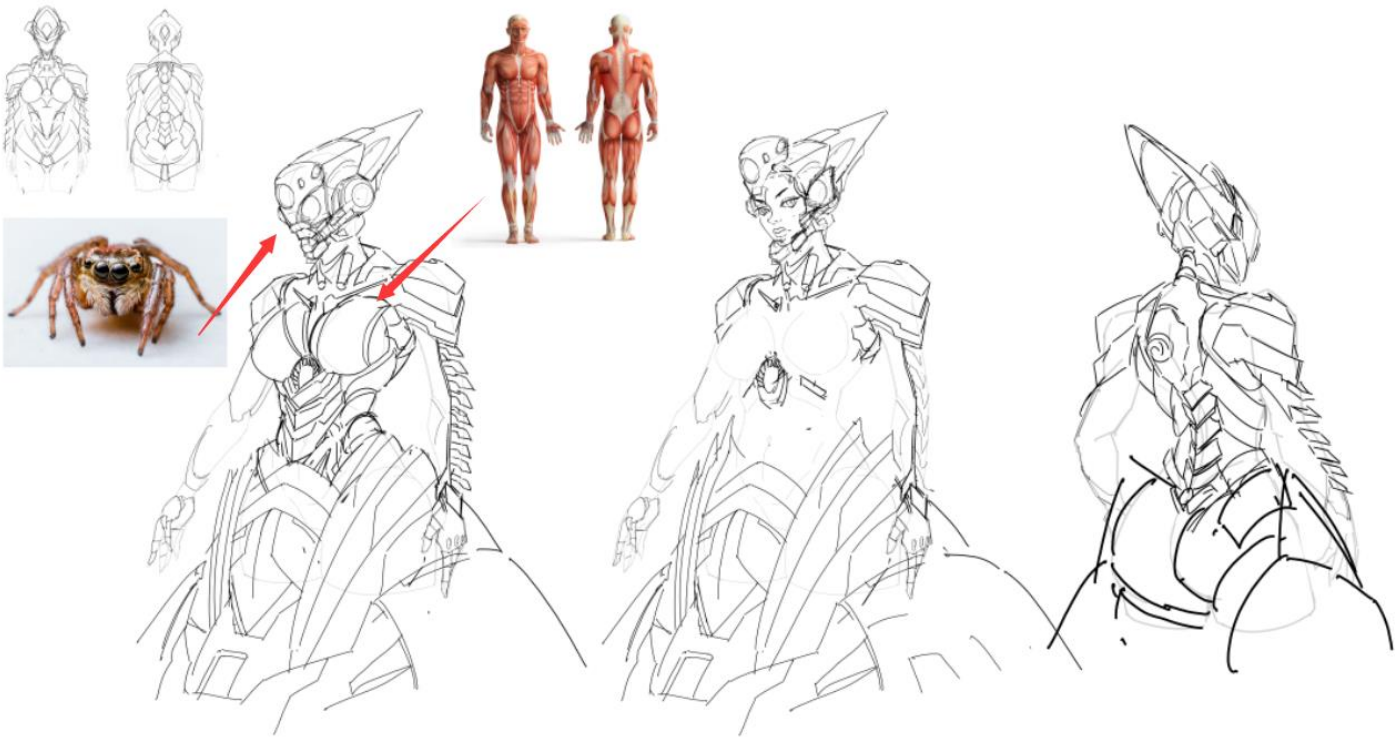
I looked at the silhouettes I created last semester, then I realized I need to make this character more aggressive, and the human part is too big that can't tell she is MCS. Then I went through those iterations. At the end, I got the result I like.

But that is not enough, I Also created silhouettes below to explore the possibility of the silhouettes. In the end, I chose the first one. BUT I also came up with some great ideas from other silhouettes, which can be very good for later development.

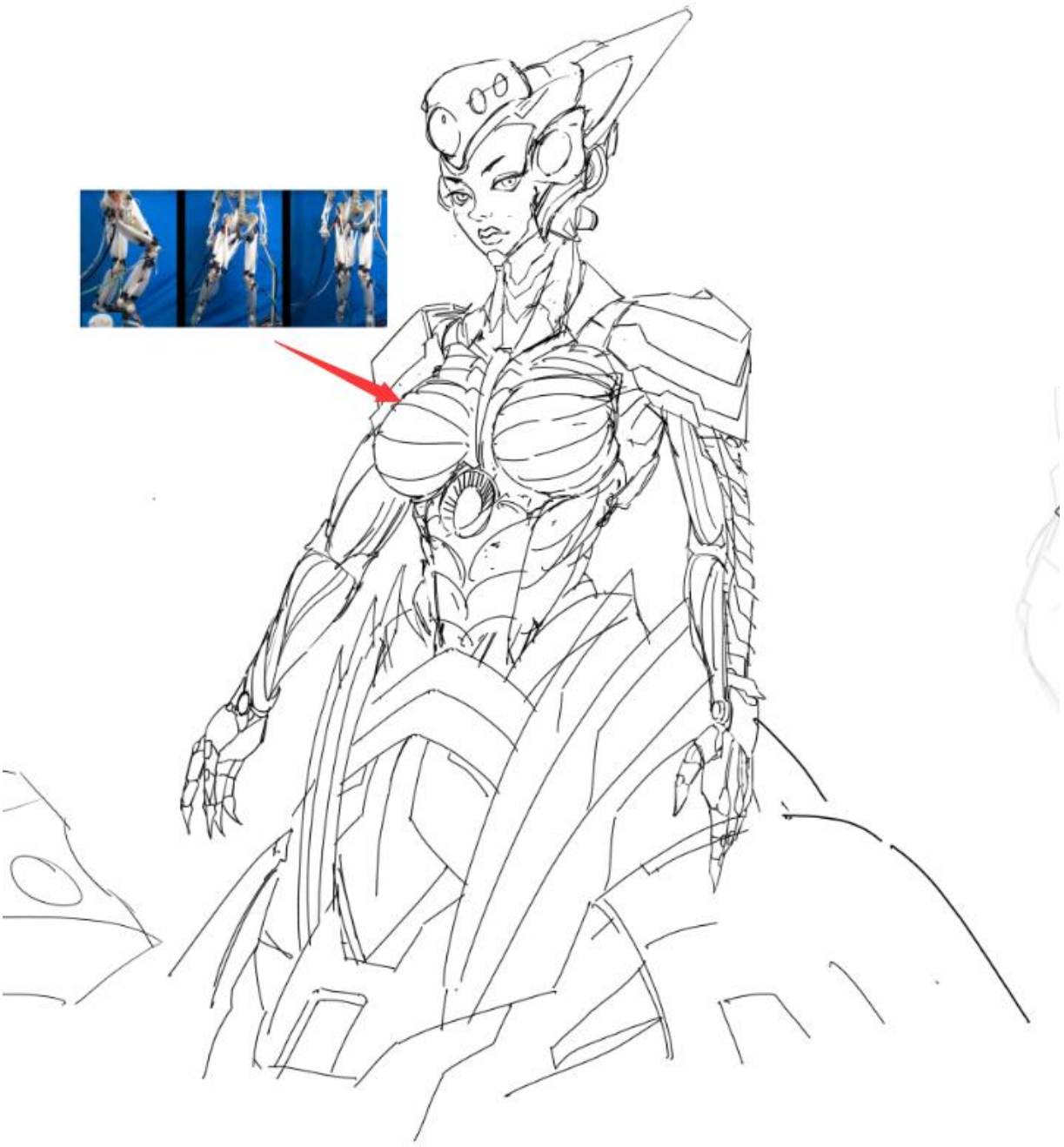


When I was developing the origin art, I started with the whole shape of the character. What I want to show is the triangle shape which could make the character most aggressive. Therefore, I added a tail, not only it could support to from a triangle, but also regarding the tail as cannon could fit to its characteristic of tank.

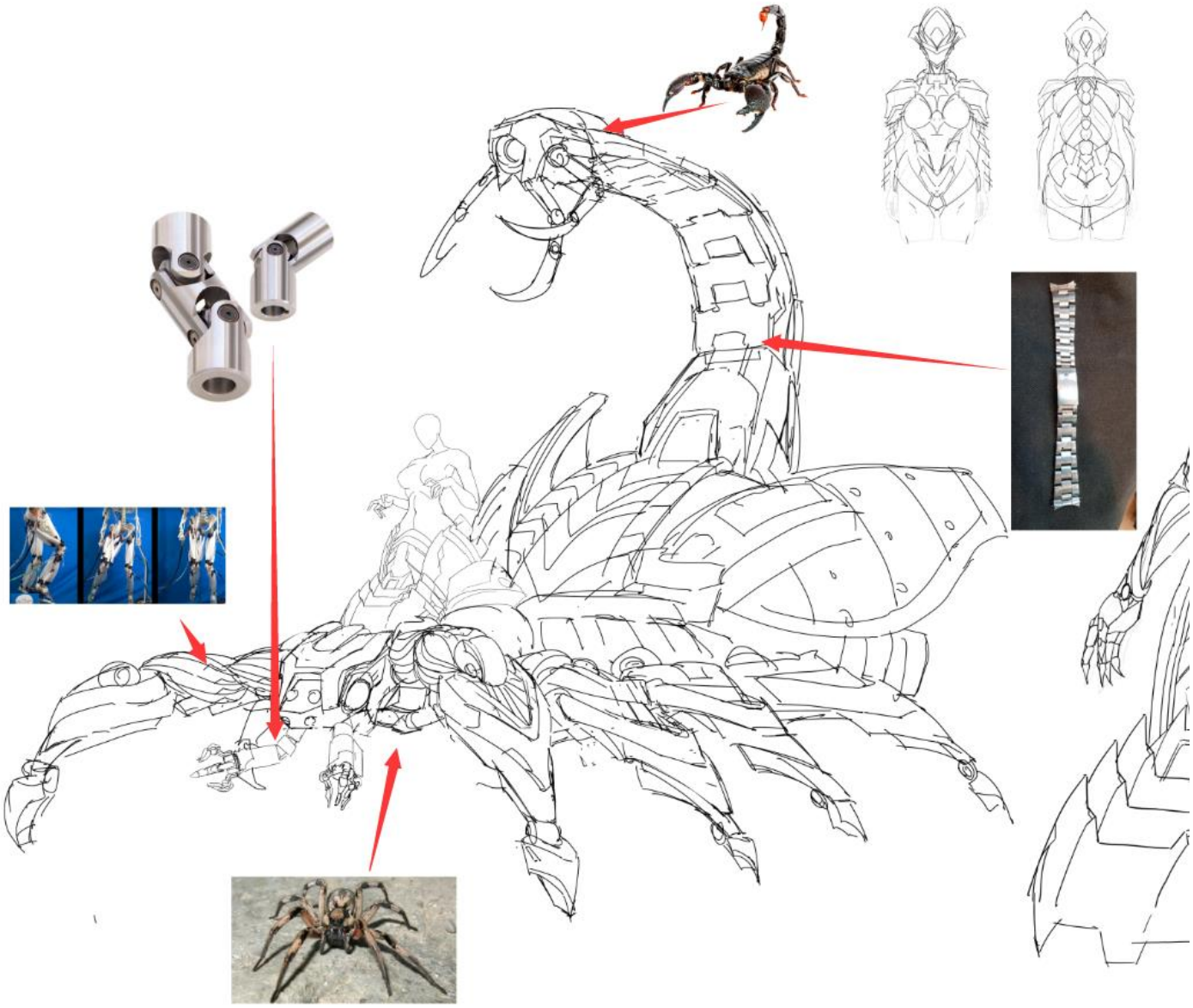
For the shape of armor, I referred to humanoid muscle. Following the muscle trends and blending those lines with triangle shape. The helmet referred to spider's head; I added multiple eyes to mimic spider's compound eyes.



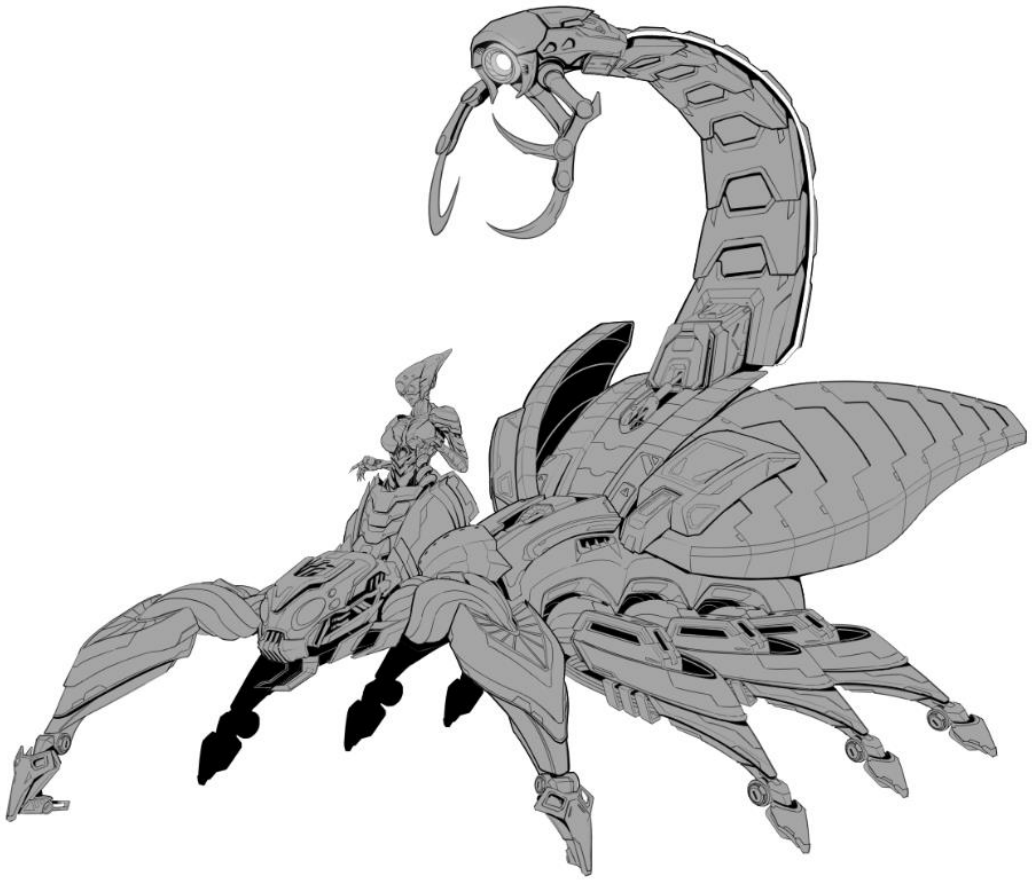
For the interior part of humanoid body, I referred fibrous muscles in bionics. In this part I will apply lighting VFX to the fibrous muscles. The reason I chose bionics characteristics to humanoid part not only is it fit to the characteristics of humanoid weapon, but also it could show the beauty of human mannequin.



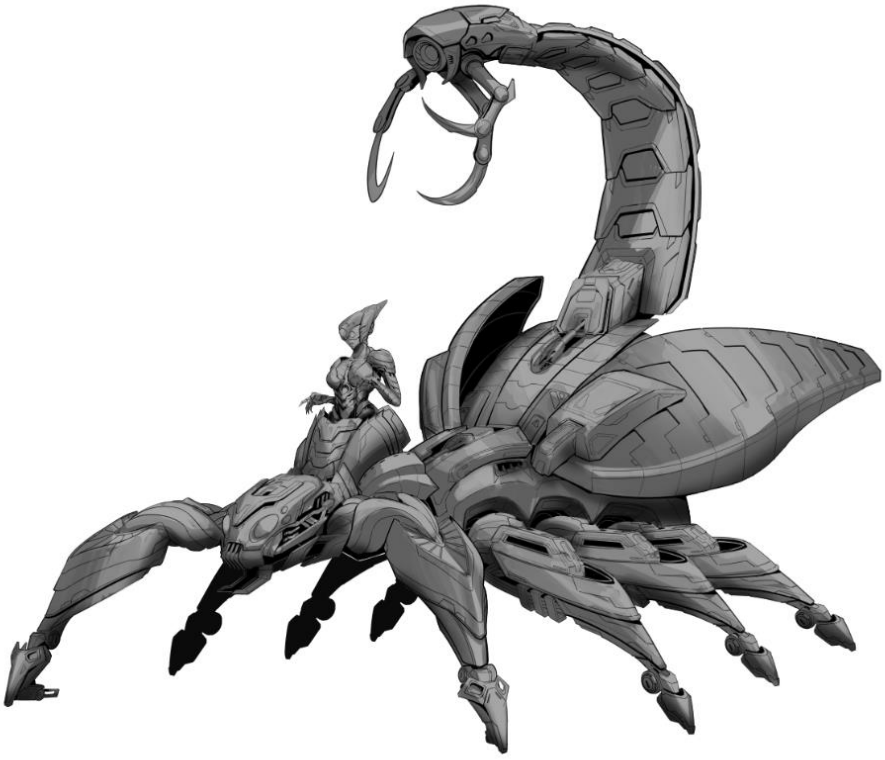
During the refinement phase of the spider tank's design, I utilized the spider as a reference for the primary component, the scorpion for its tail, fibrous muscle for the leg connections, and mechanical joints and watch chain bands for the tail's main structure.



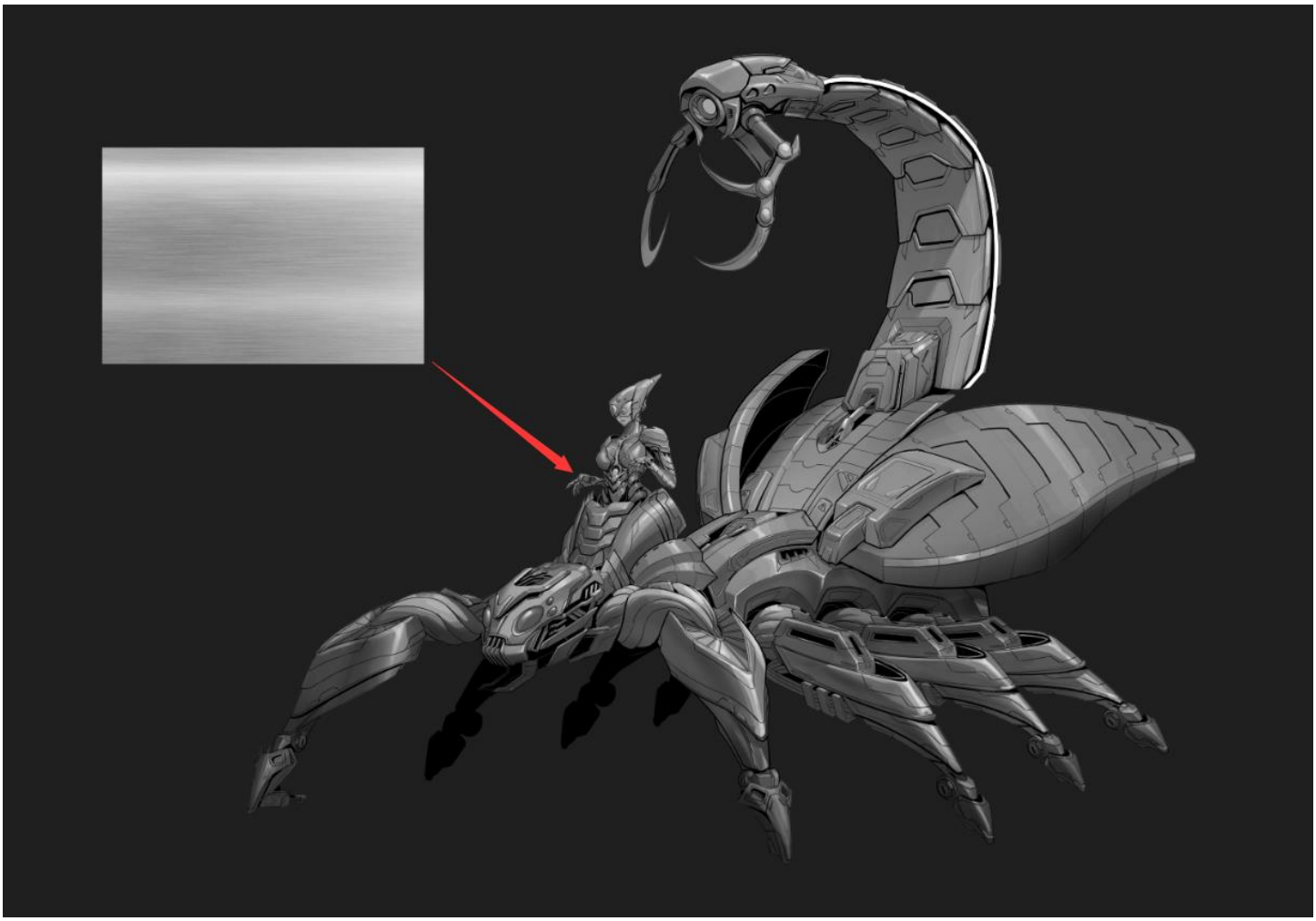
After I finished the line draft of the original art, I used magic wand to select the block. Then I gave the gray block rough shadow area. Then, keeping refine it, giving it AO, reflect lights and high lights. And the last back



light.

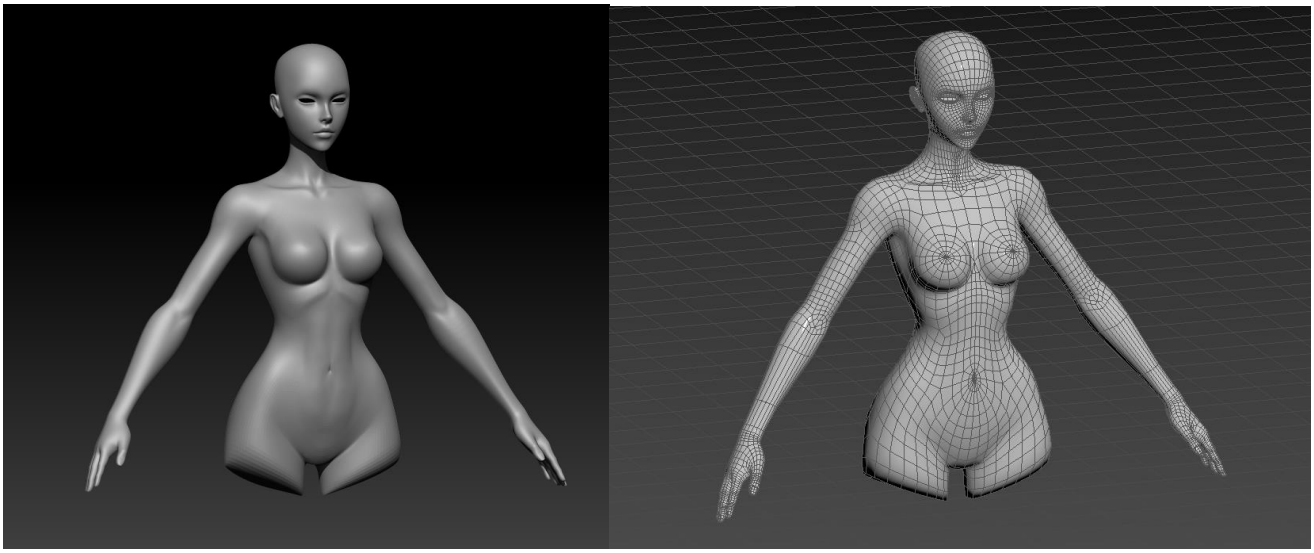


In rendering phase, I referred titanium alloy material which not only does it fit the character's high-tech physical characteristics, but also it can increases the perception of the image to the readers.

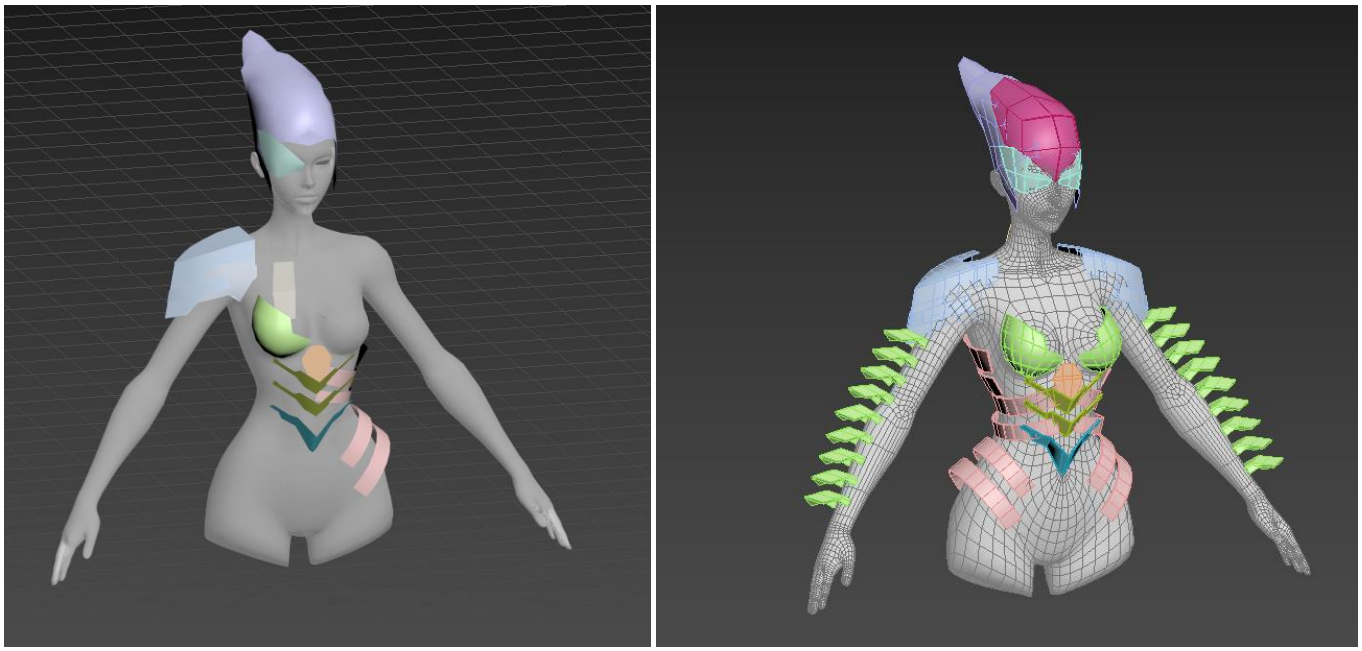


MASTERY TOPIC 2: ADVANCED RIGGING

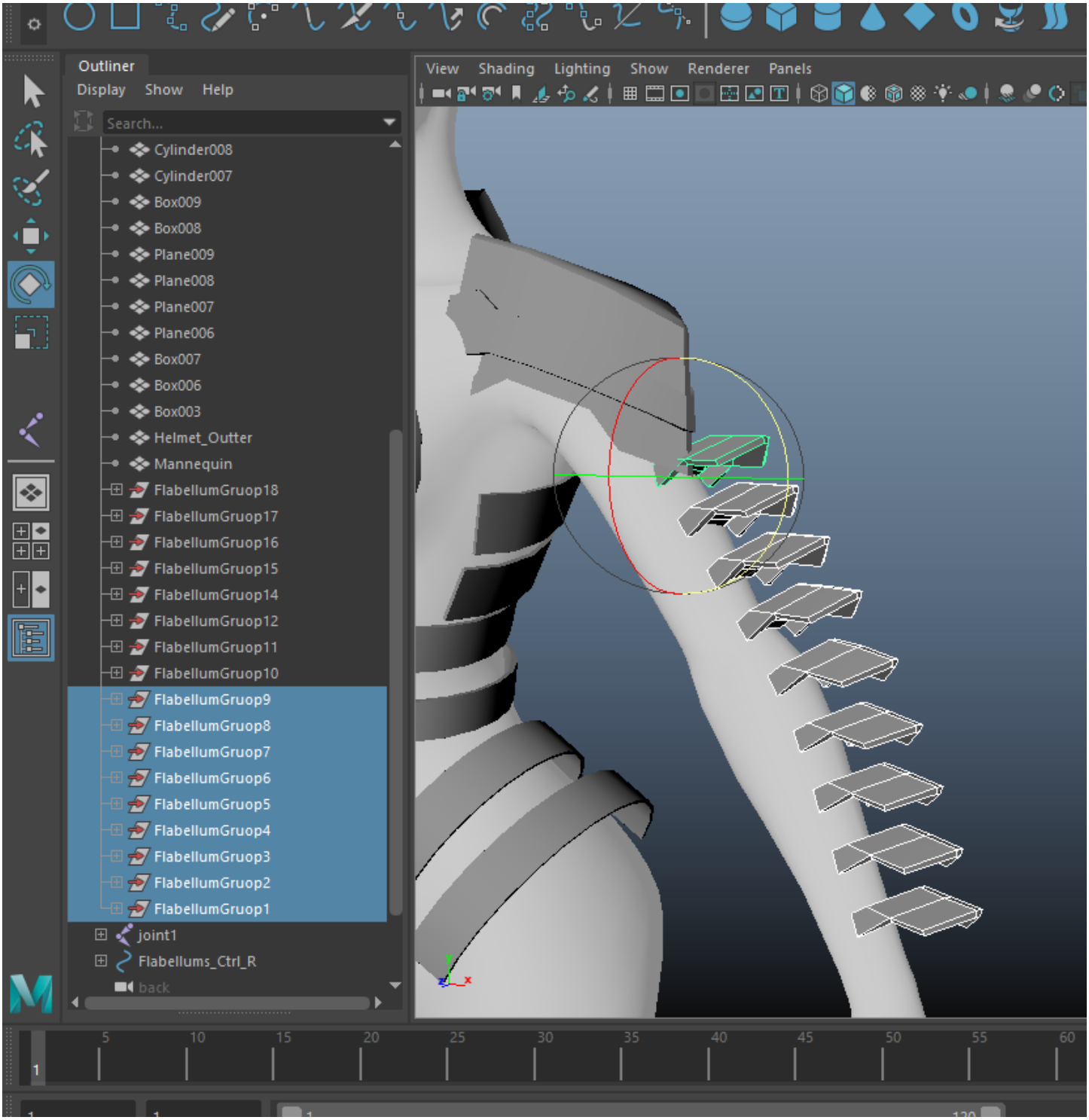
First, I need to build base humanoid mesh. I sculpted this mannequin in ZBrush, and then used retopology function in 3DS MAX



After the mannequin is ready, I built prototype models of armor pieces for rigging.



I want to explore how to process complex rigging in MAYA, so I exported meshes to MAYA. First, rigging the fan blade on the character's arm. Separate fan blade to individua meshes and give each mesh an individual group.


Outliner
Display Show Help
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Mannequin
FlabellumGruop18
FlabellumGruop17
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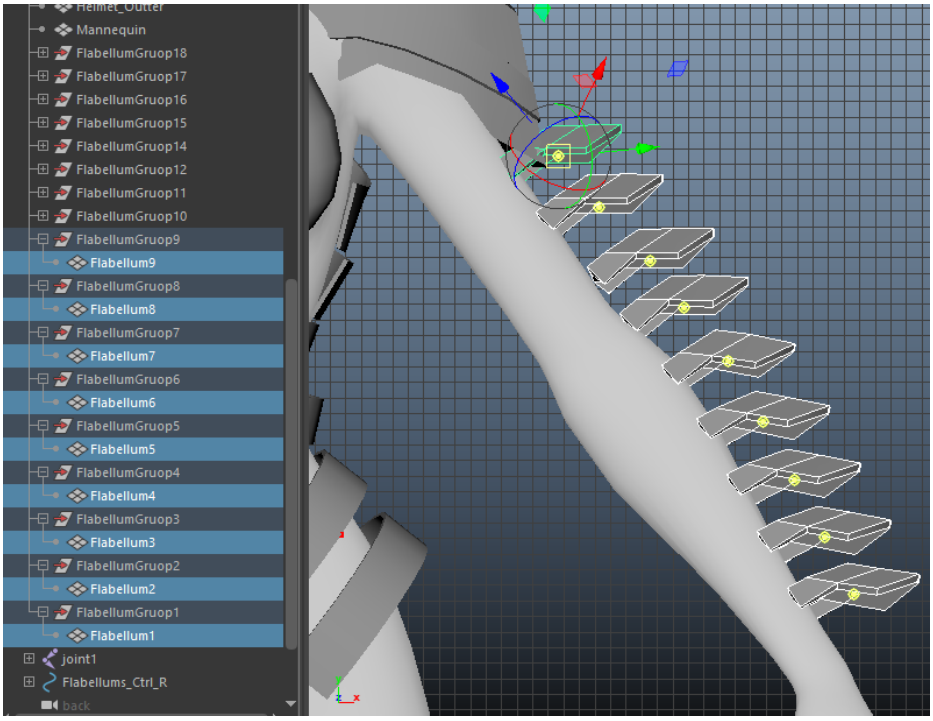
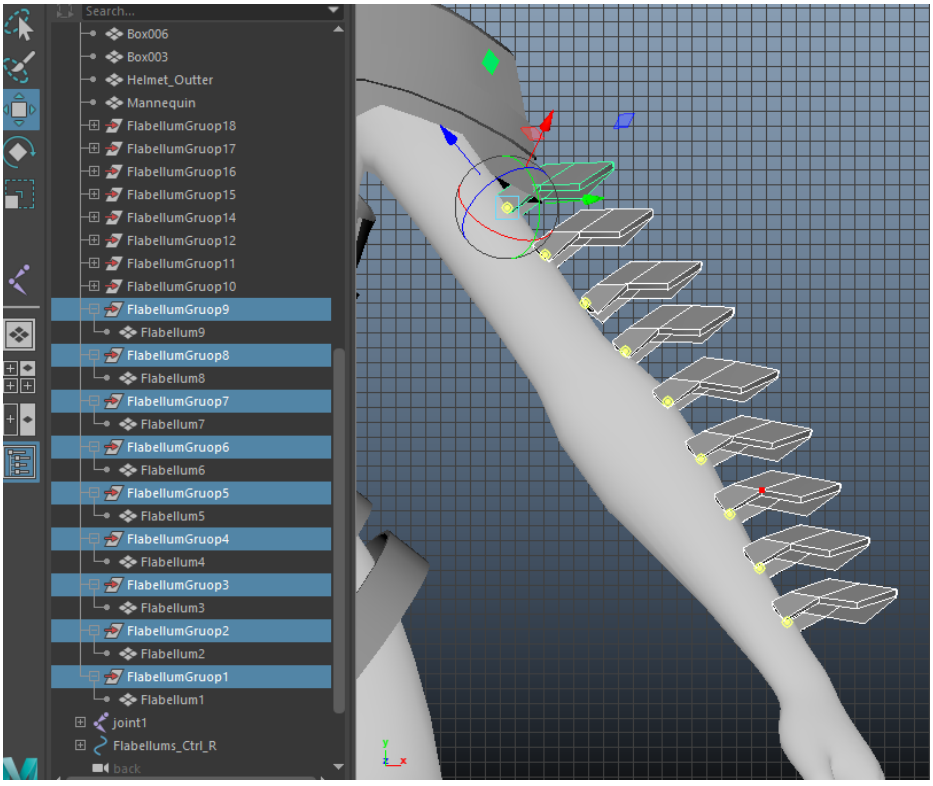
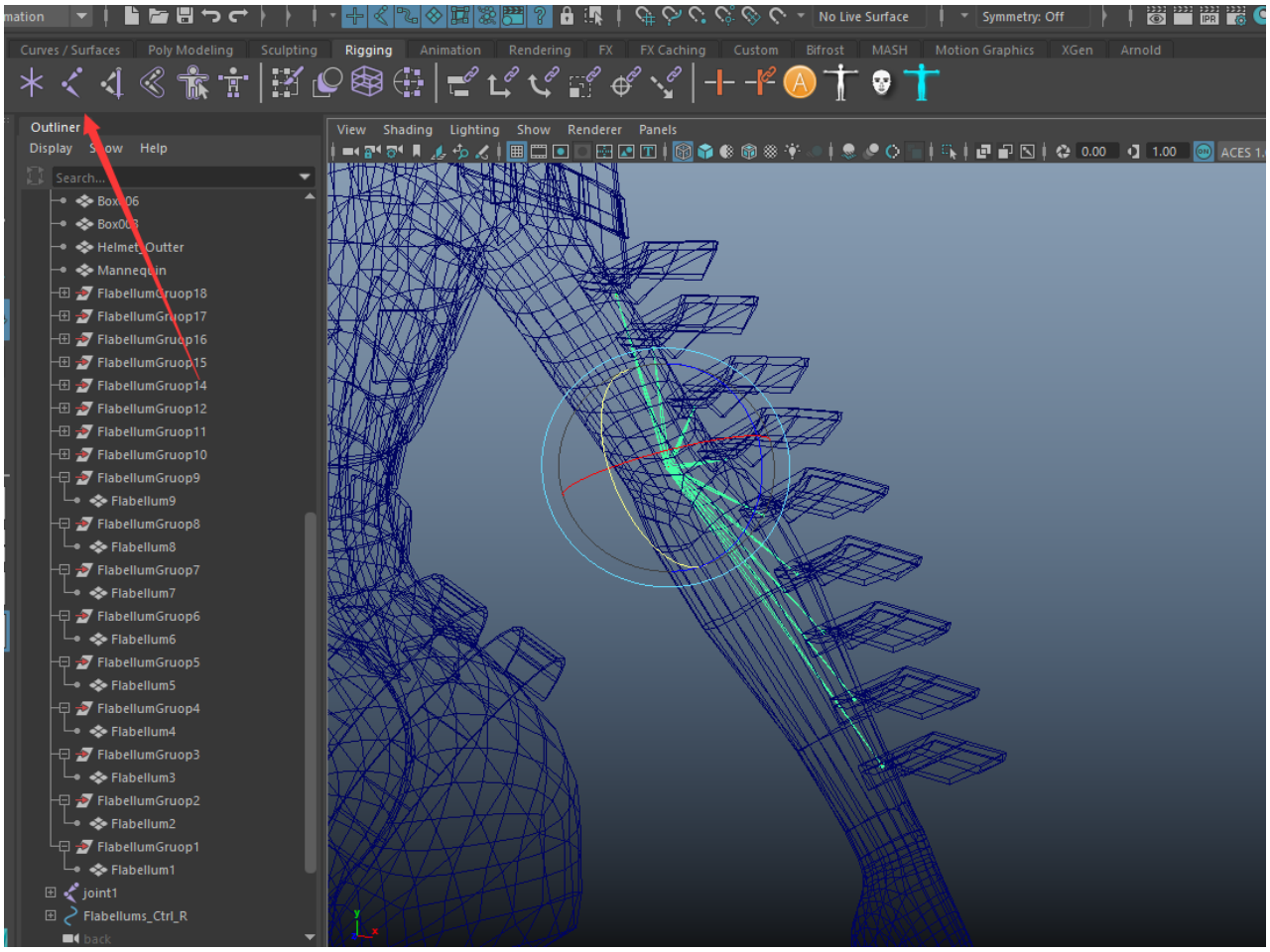
1

Reason of doing this operation is prepare for rigging, basiclly I will rig groups instate of meshes in case meshes will offset for no reason. Giving groups can make groups and meshes have different piviots.

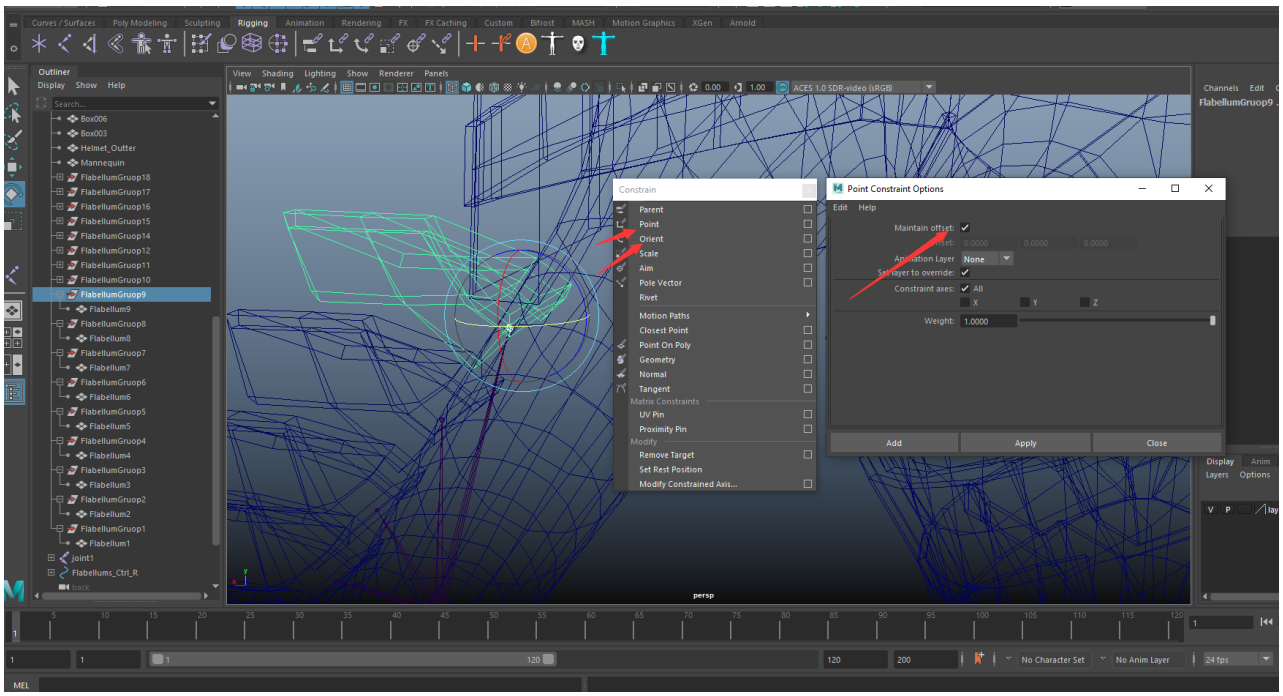




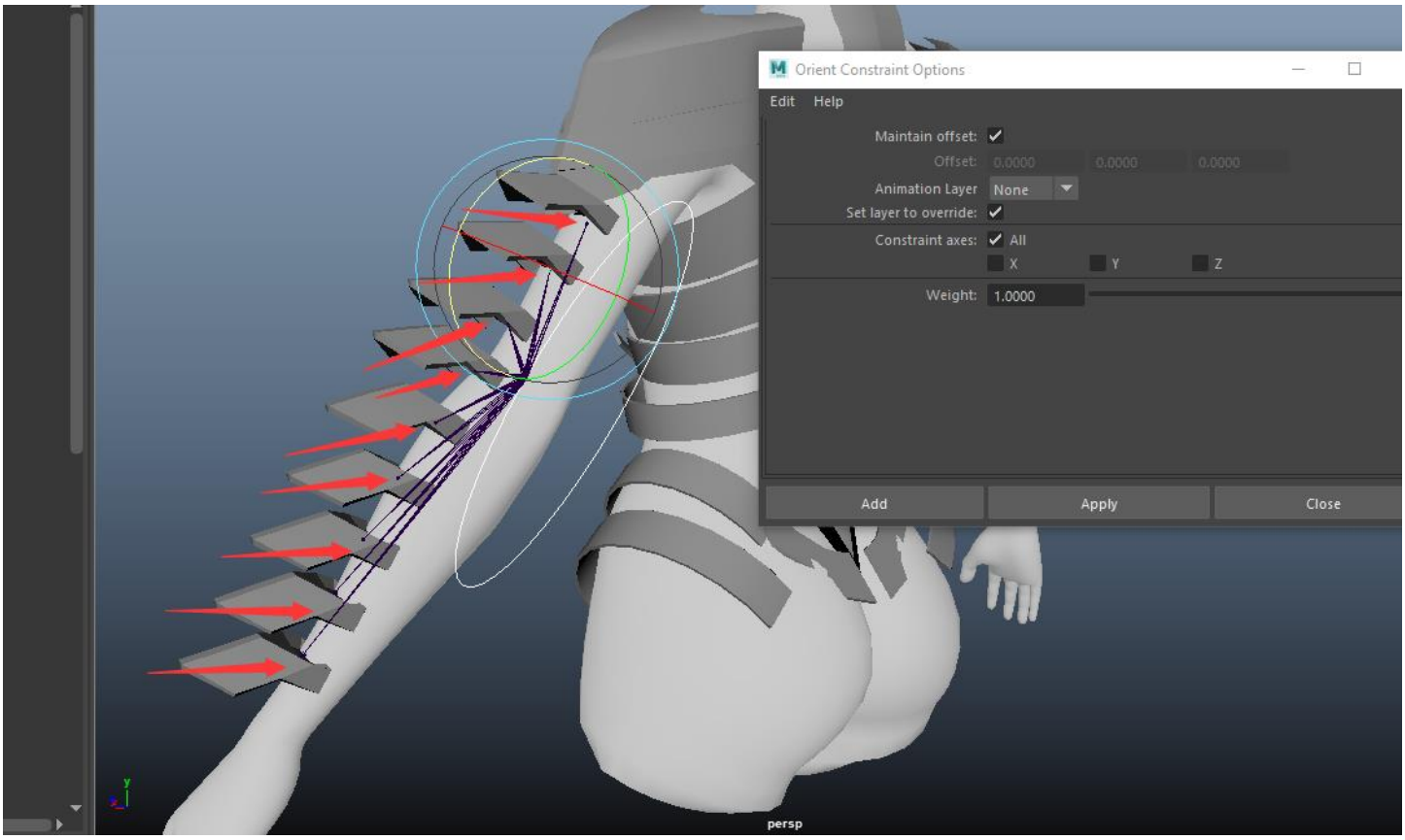
Then, using the bone tool on the panel, creating bone nodes that fit to each pieces of fan blade.



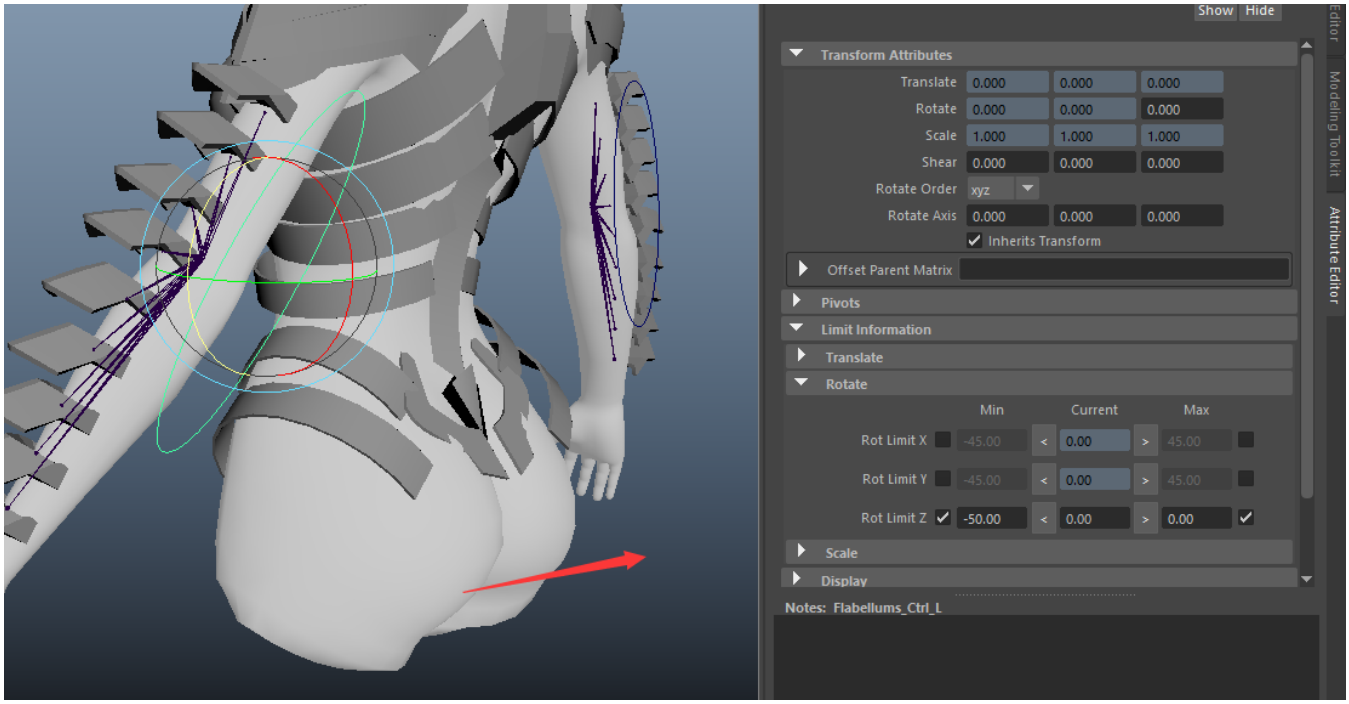
And now I could constrain each node to each pieces of fan blade. Using point and orient constrain separately, and keep maintain offset checked.

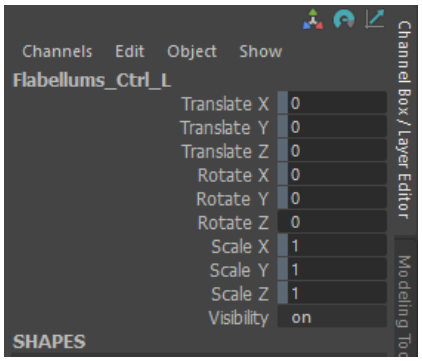


Now, bones are ready to go. I created a curve and placed it near bone nodes. Giving each node orient constrain to the curve and turing the curve to a controller.

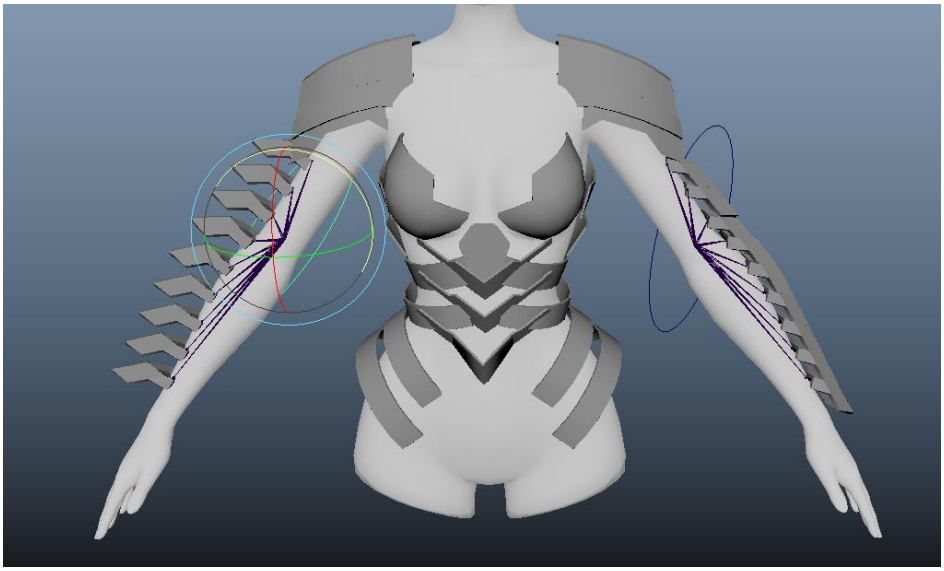


I wish fan blade could only rotate in the z-axis direction in a limited way, so I need give the controller rotate limit in Attribute Editor, and lock all other movement in Channel Box/ Layer Editor.

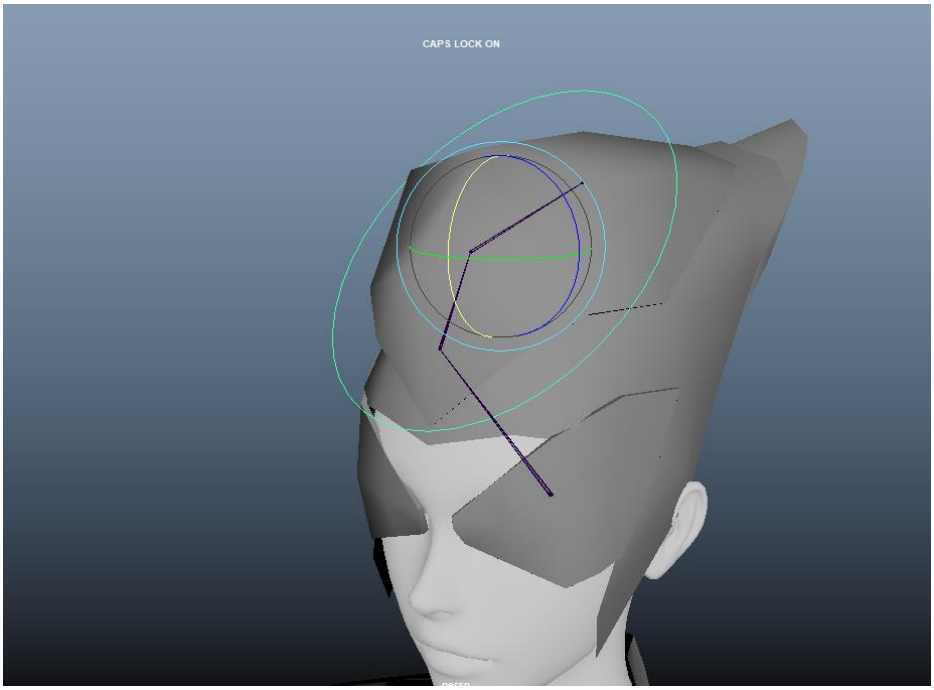




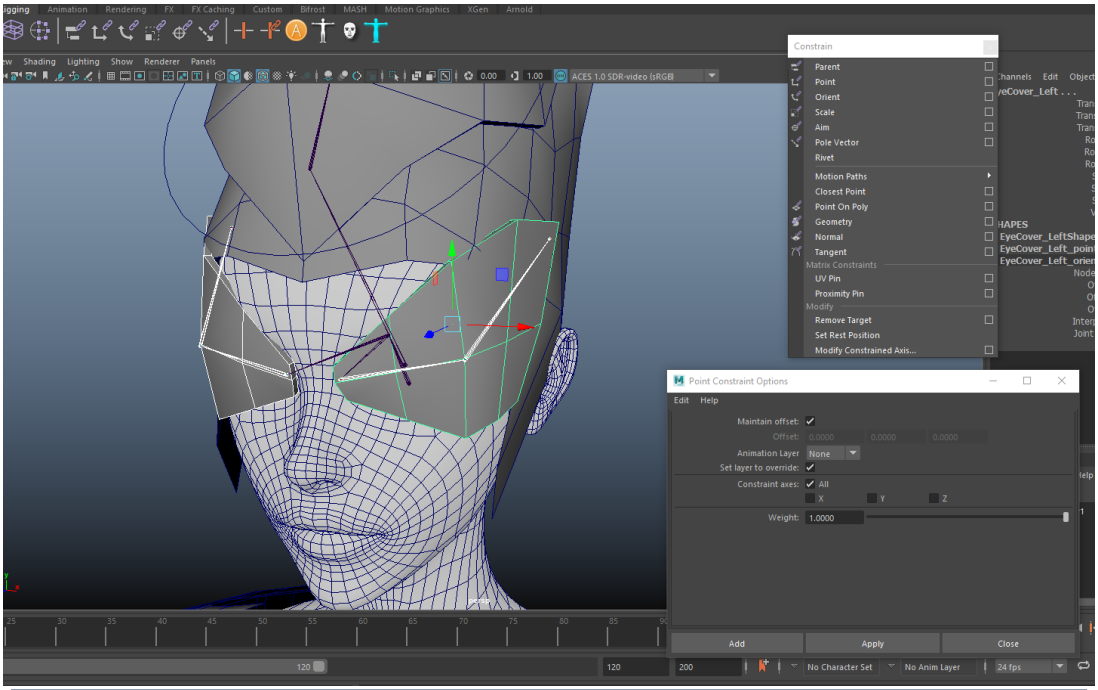
And now we got rigged fan blades which can close/open by rotating controllers.

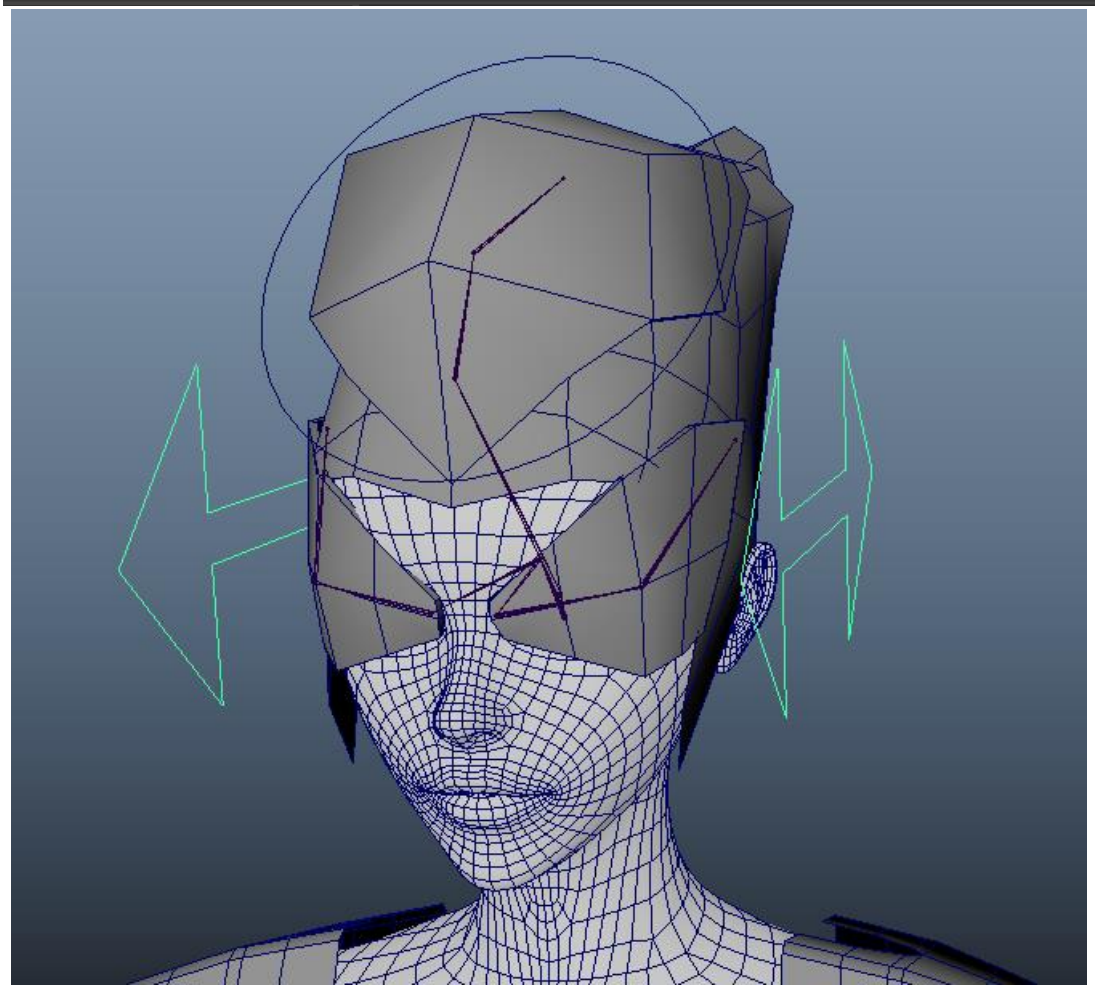


For her head set, the topper part was utilized exactly same finesse as fan blades.

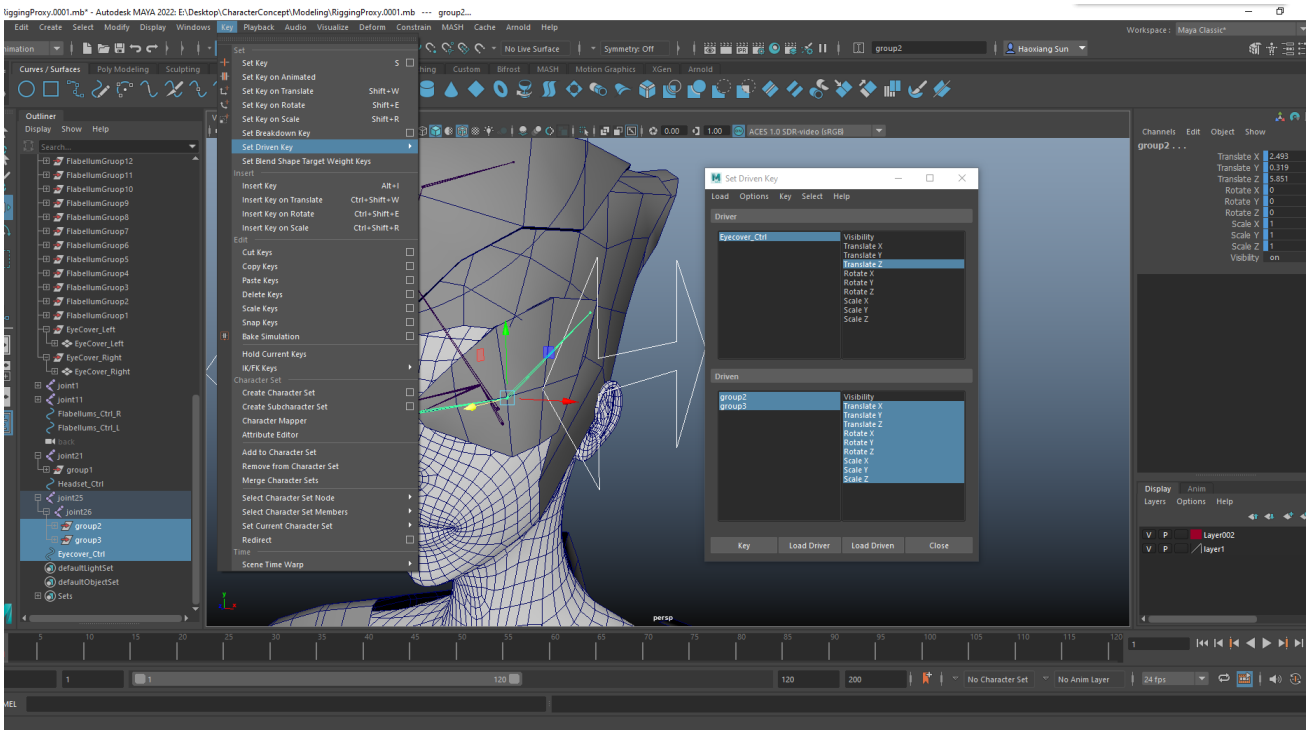


But for eye covers on left and right sides, I used some other skills. First of all, I need to build up bone nodes and place them in correct position. And constrain bones and eye covers with point and orient. Also, we need a controller for it.

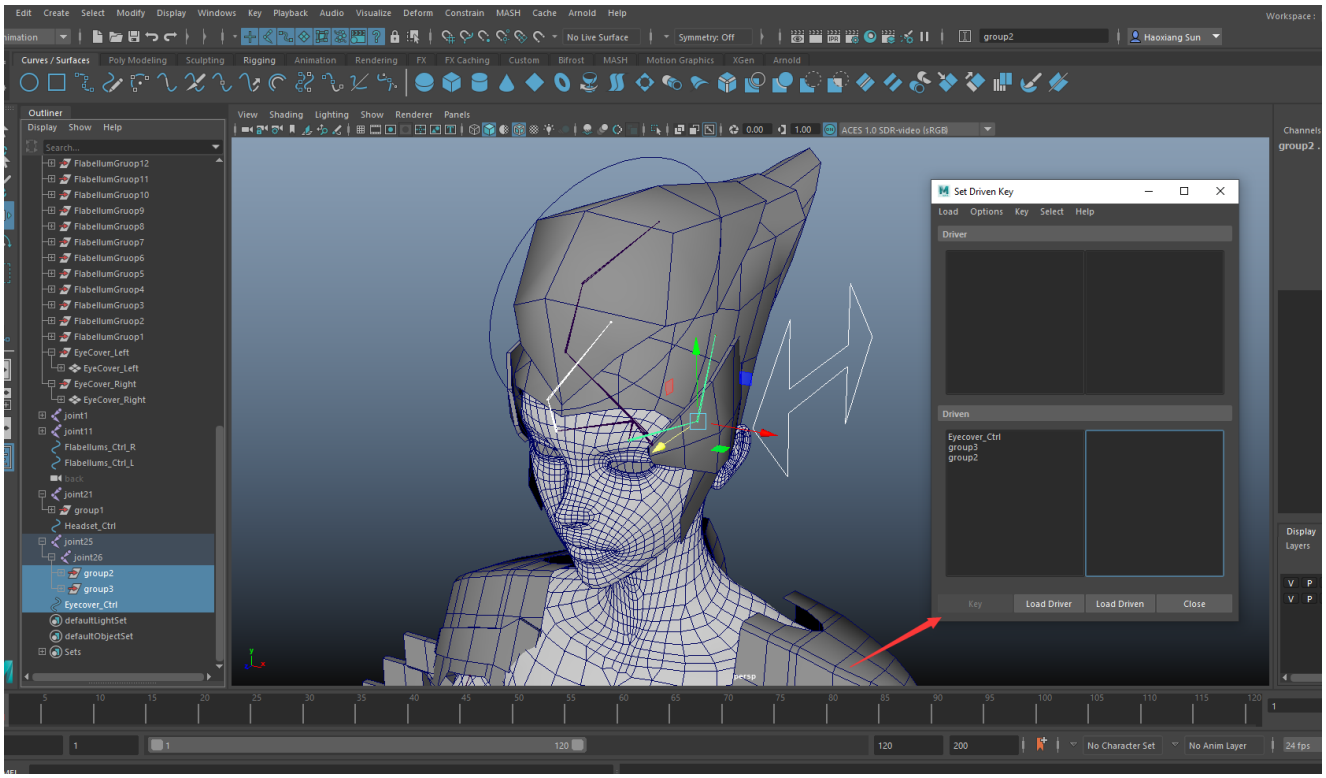




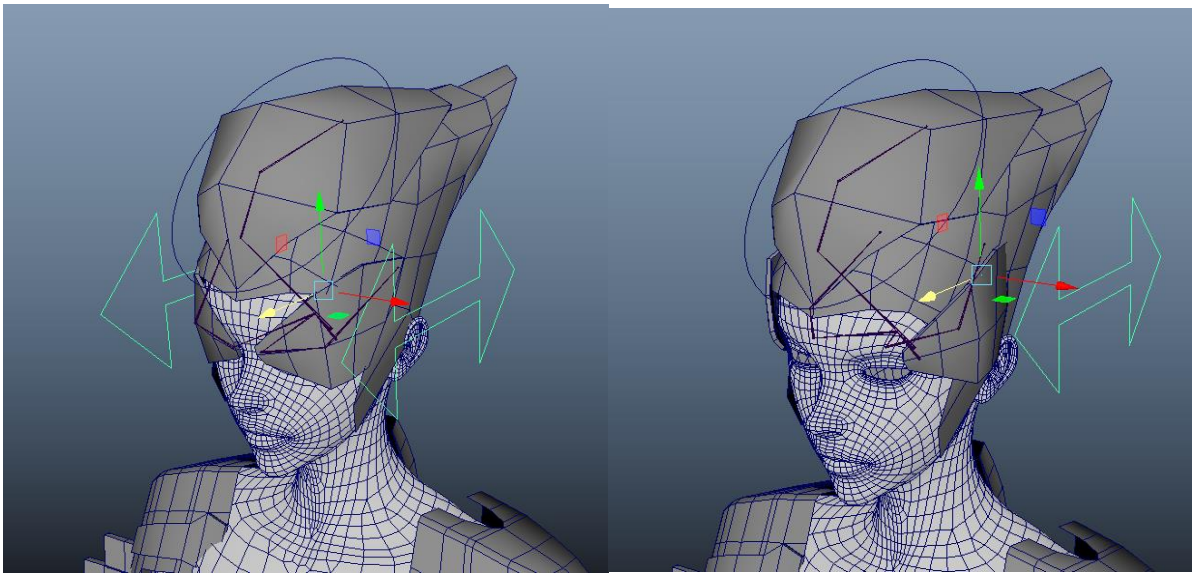
Then, I used a function called Set Driven Key, selecting the bones which constrained with eye cover and controller, regarding them as driven and driver separately. In this instance, I keyed controller's Z-Axis and all of movement of bones.

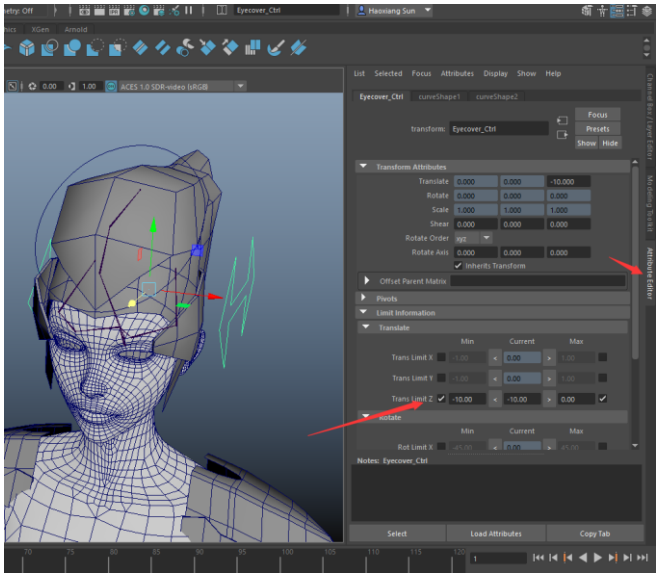


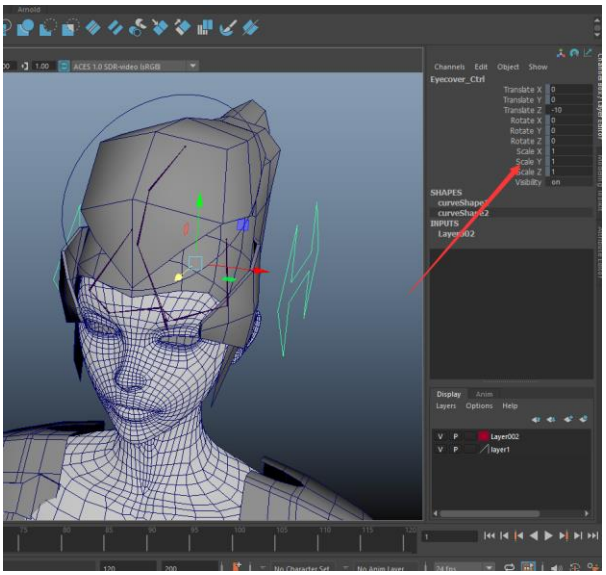
After that, I moved cover and controller to the right positions for opening the eye cover. Then key them again.



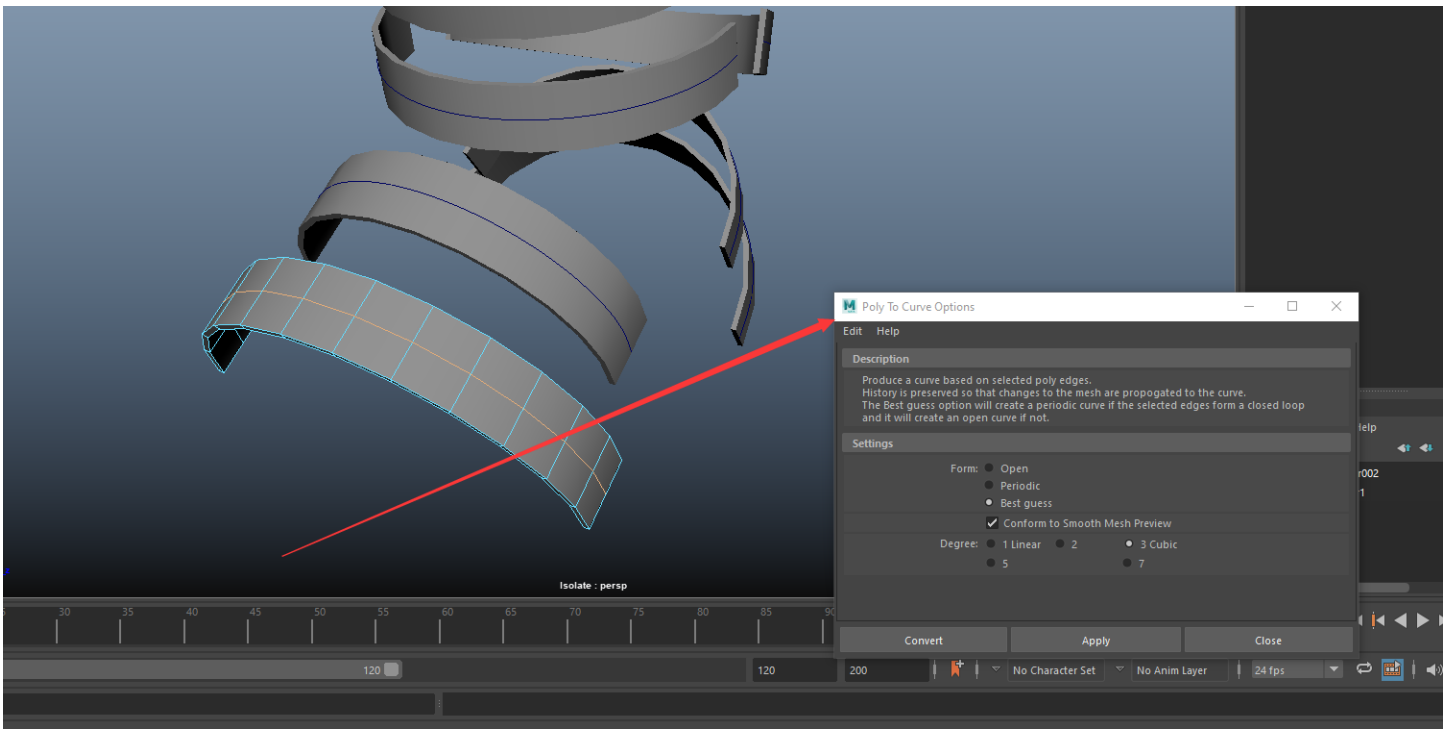
Now we can open and cloth the eye covers with moving the controller. Also need to limit the controller, letting it can only translate in X-Axis in a limited way.

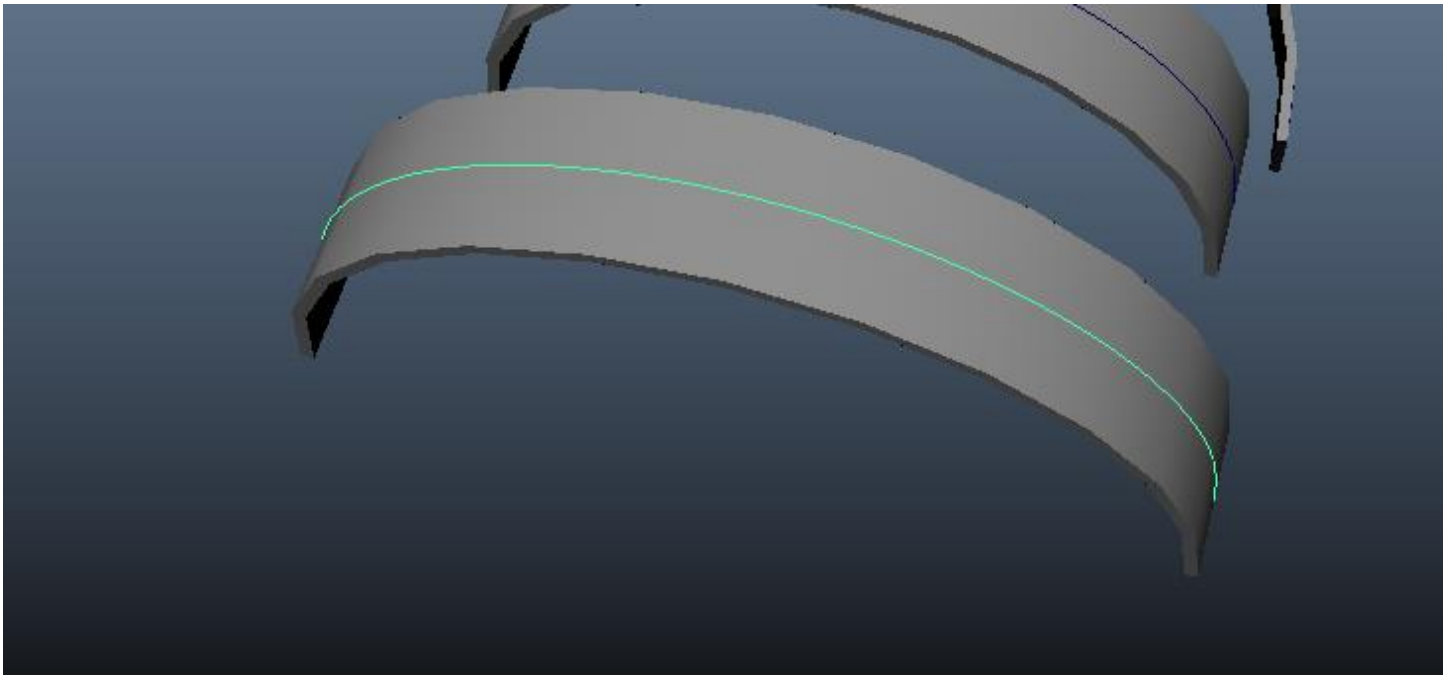




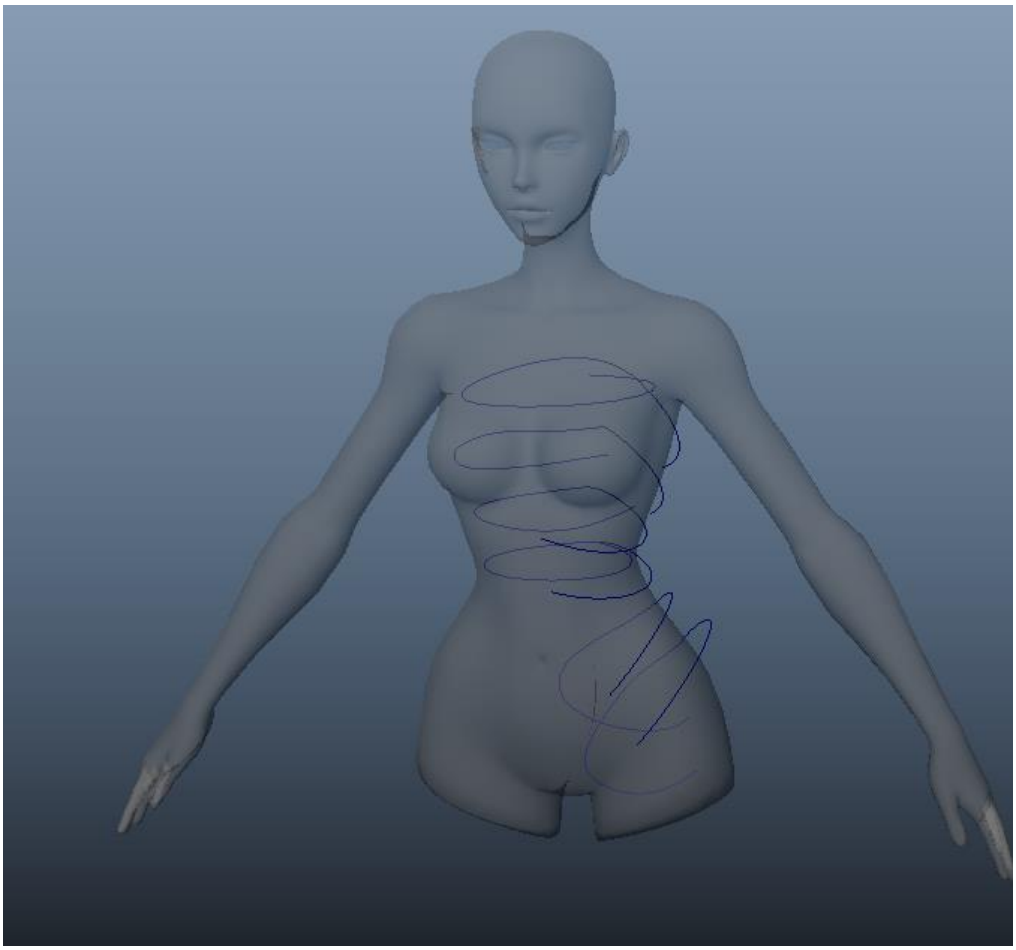


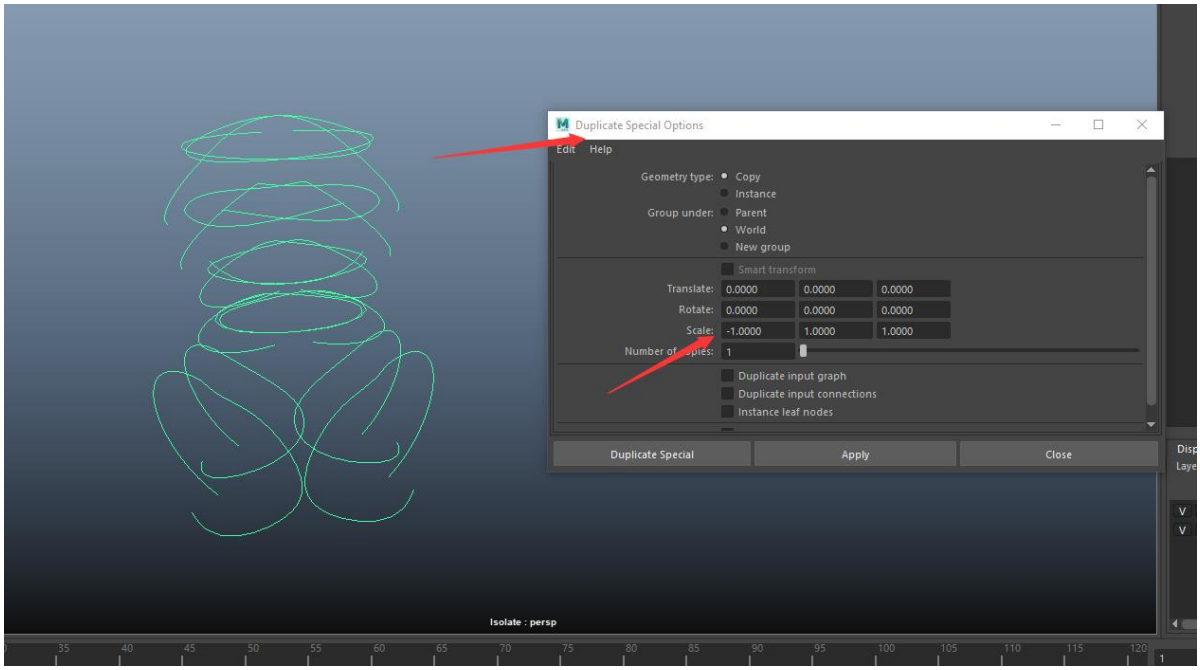
Next task is rigging rib armor proxy. In this task I use techniques called bind skin and create IK spline handle. First, I generated splines that followed surfaces of armors.



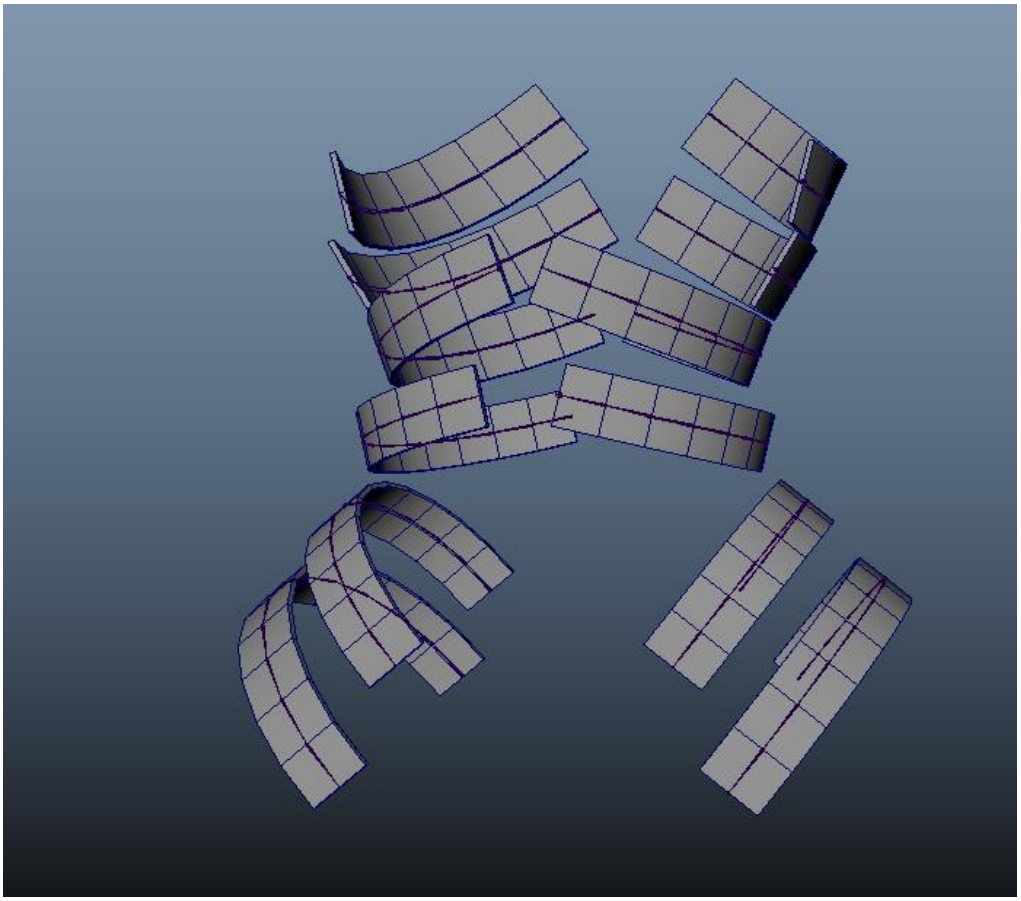


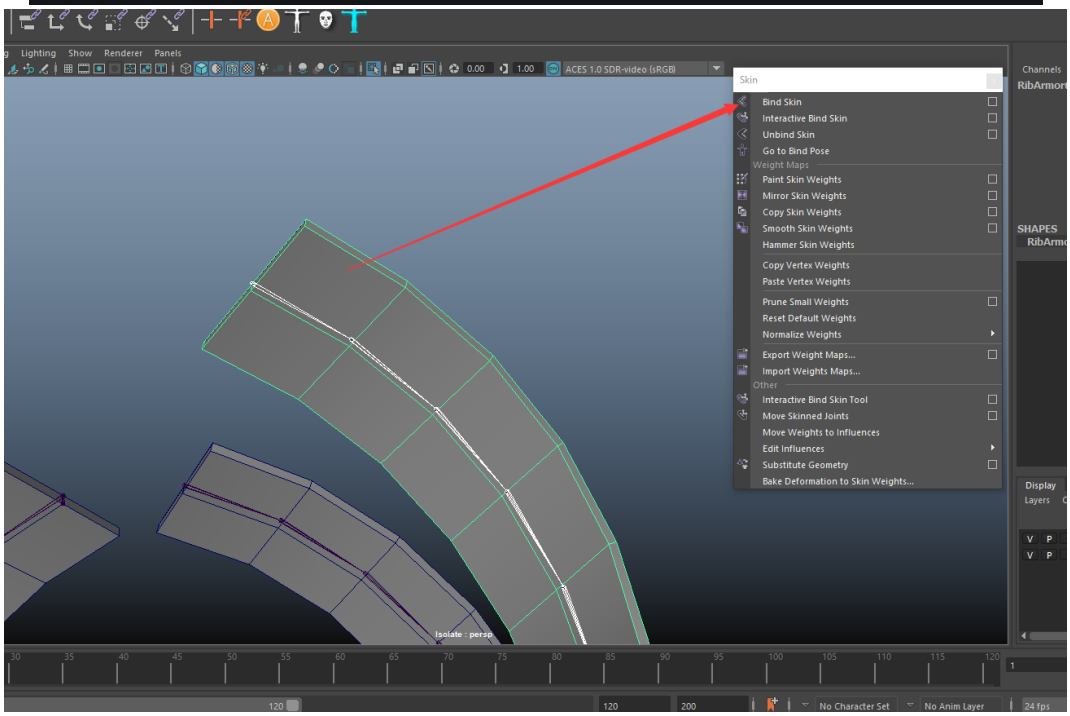
Then, I twisted those splines in to the mannequin and duplicated to another side. Those paths will be use as paths of retractable armors.



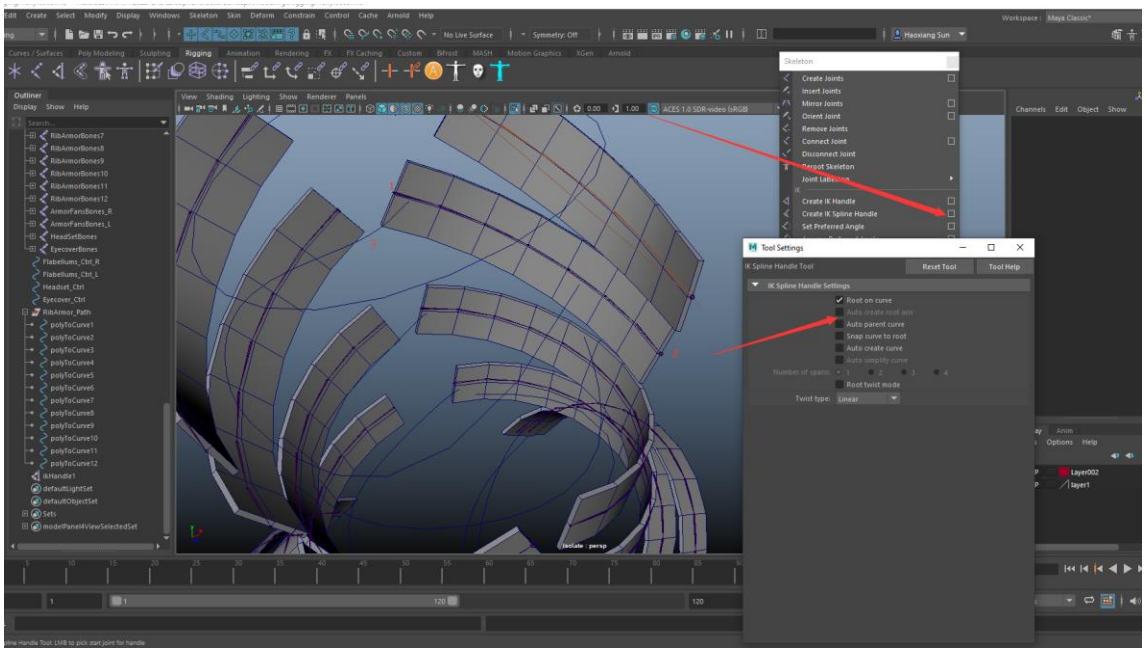


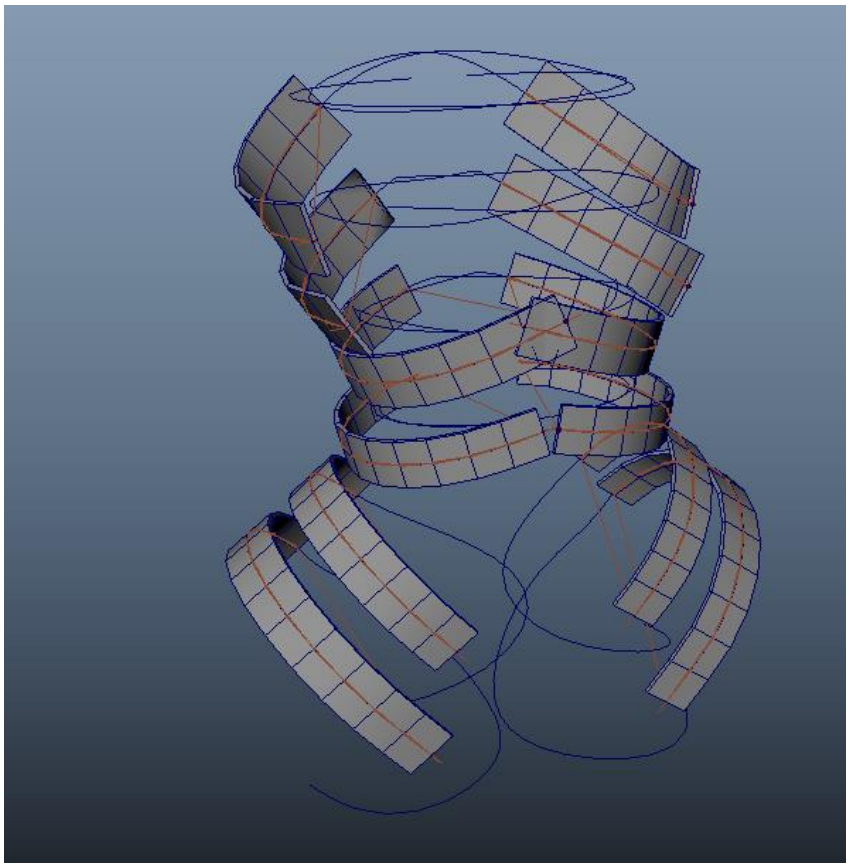
Next, I created bones which also followed surfaces of armors. Then, bind the corresponding bones to the corresponding meshes.



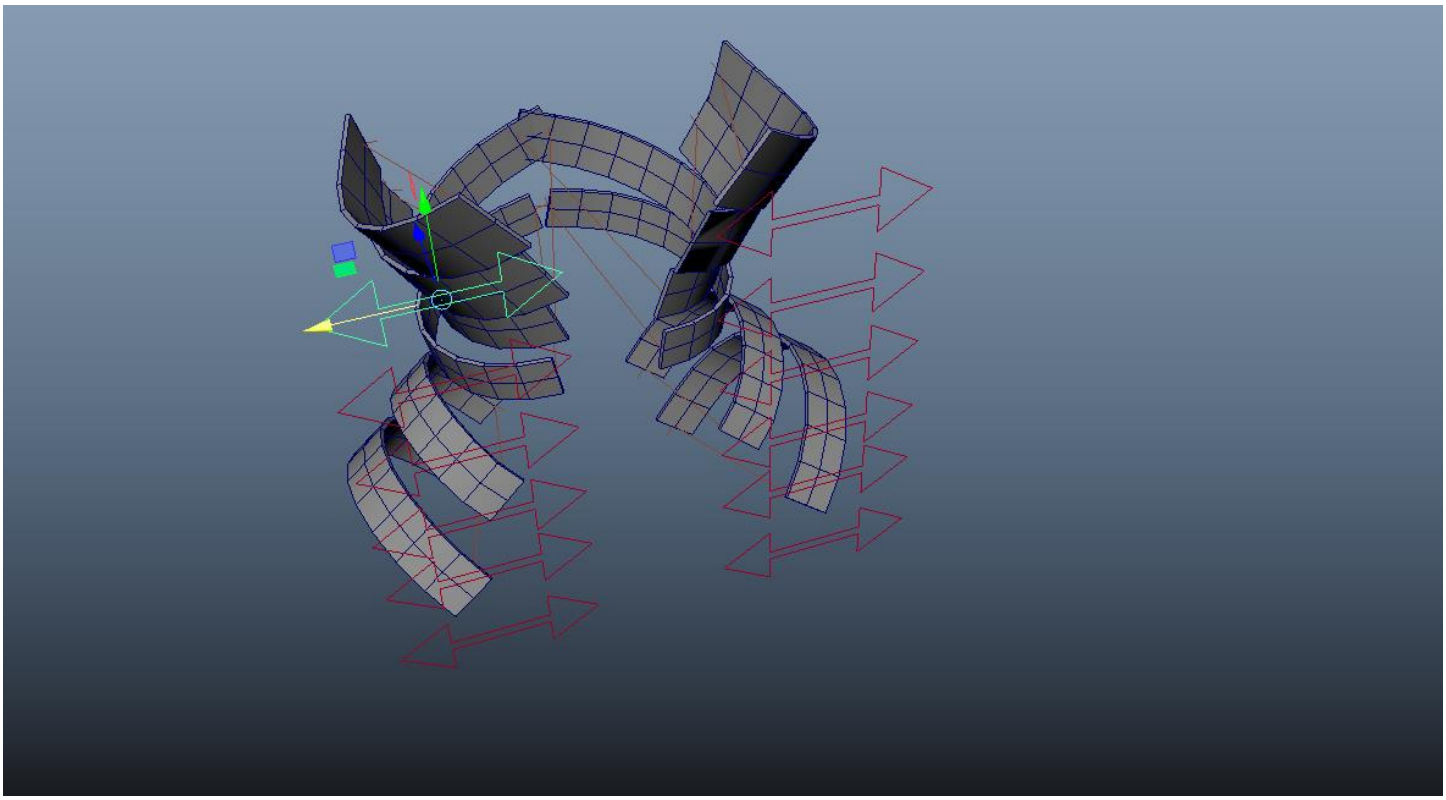


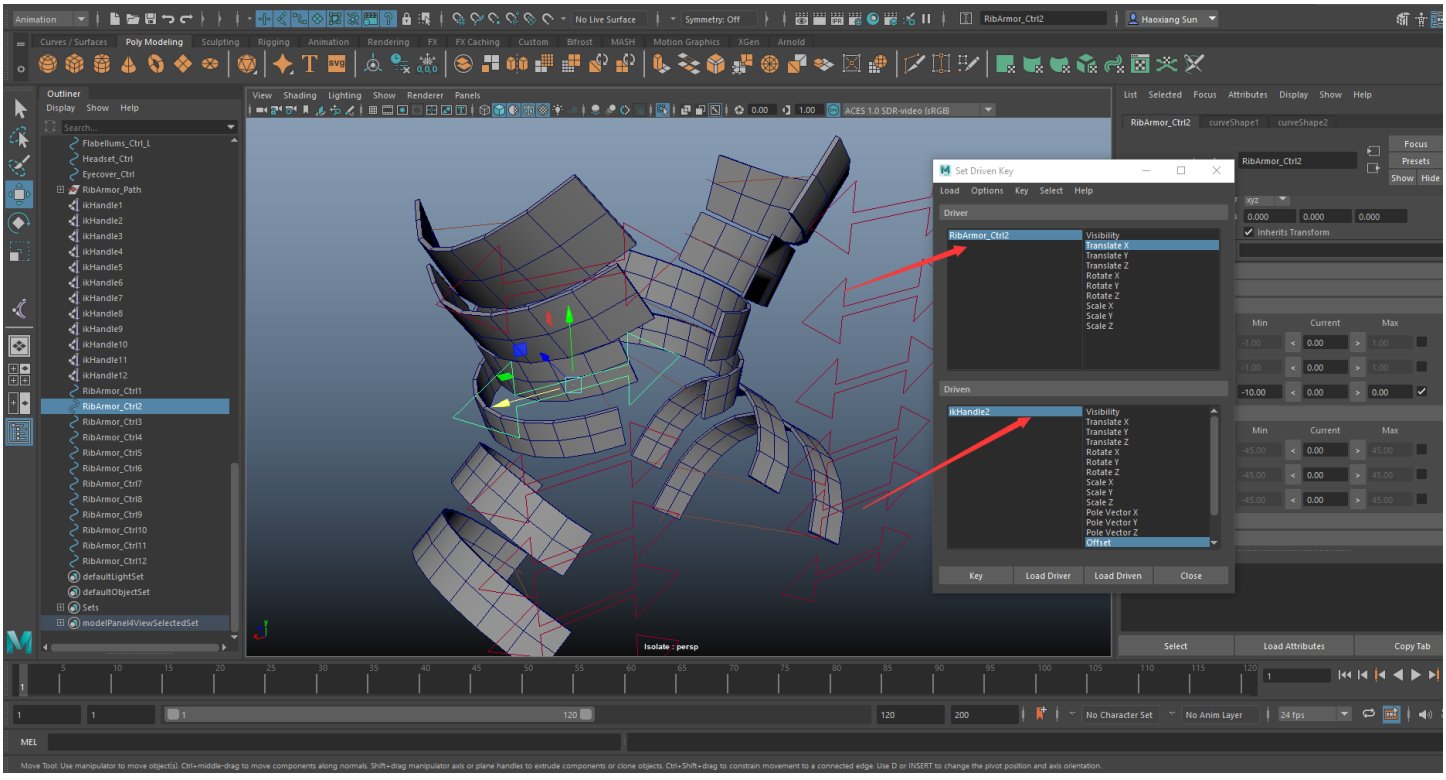
For next step, I selected the bones and the paths that fit to each other, using the create IK spline handle, I created handles that can force meshes move alone those spline paths.



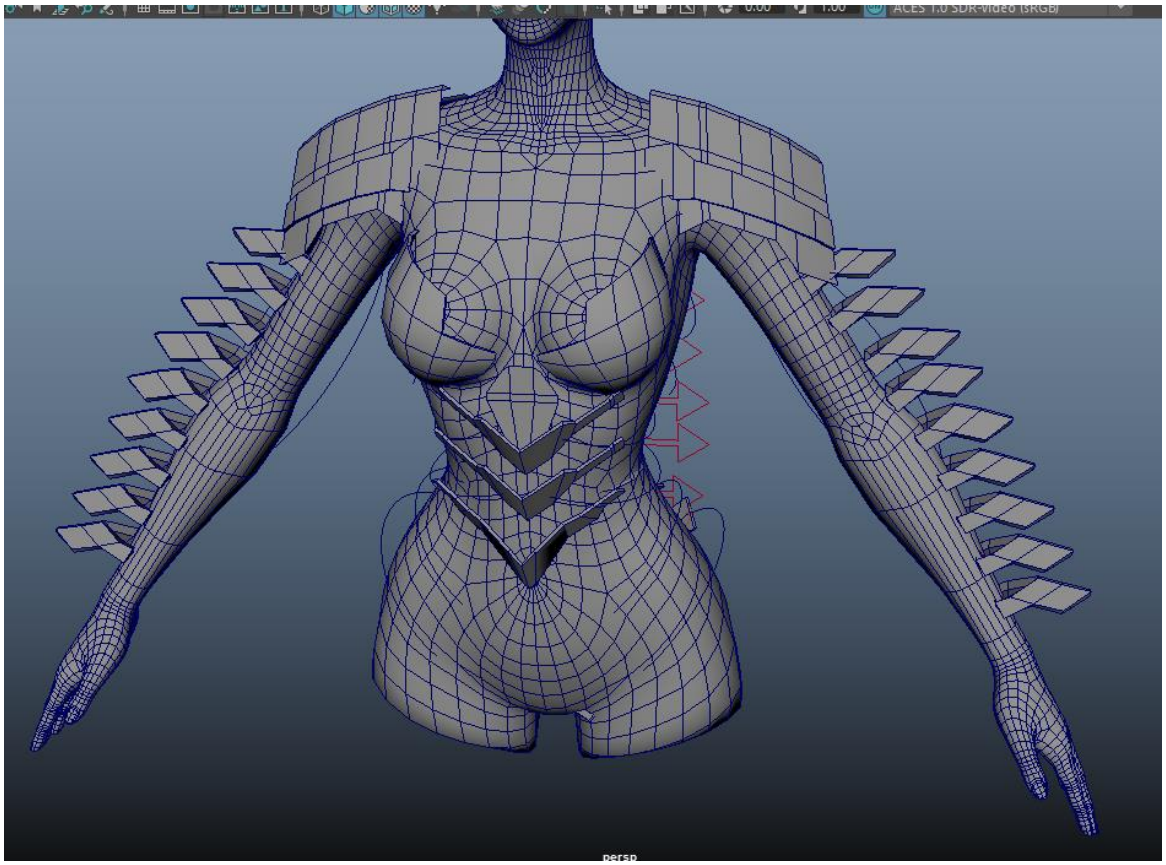


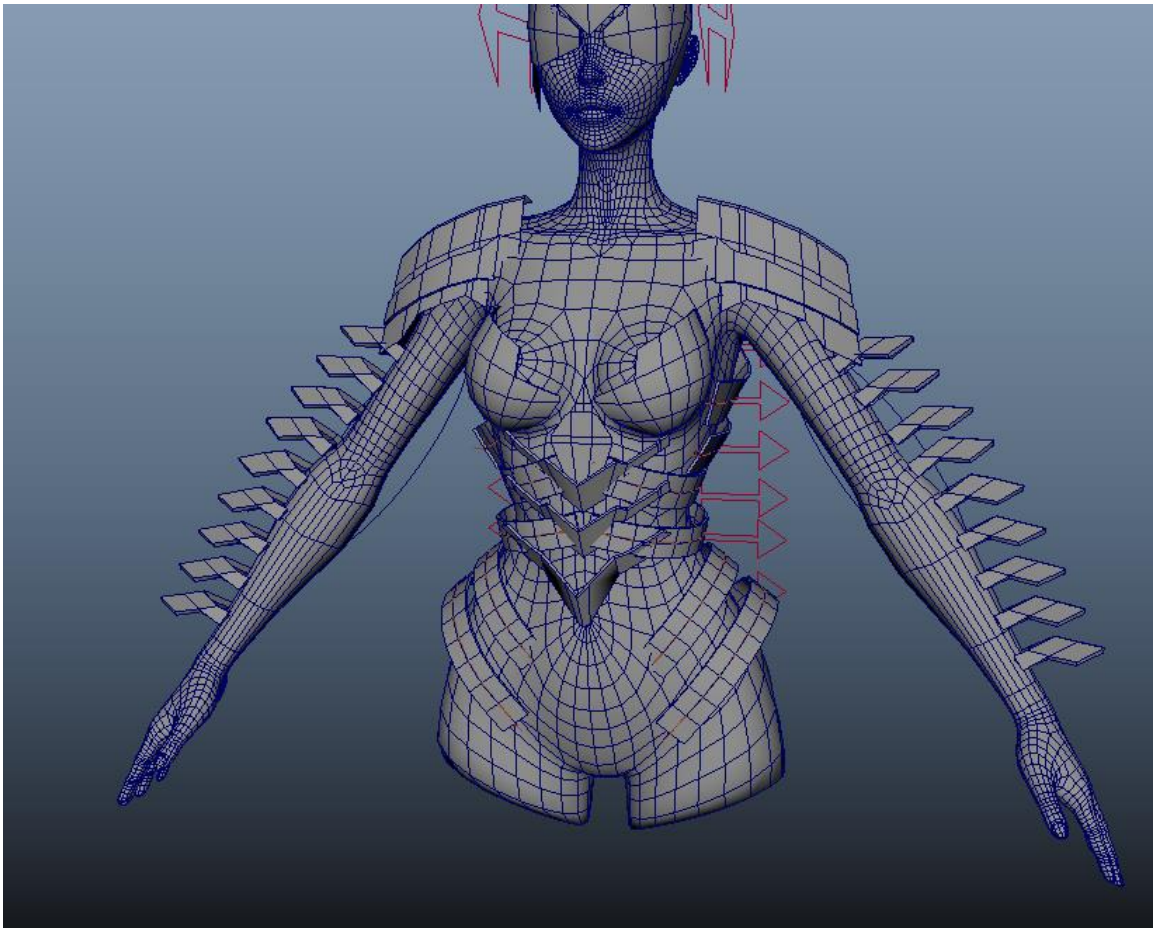
I also need controllers. Because I want these armors to open and close asynchronously, I gave each armor a separate controller. For these controllers, I also used Set Driven Key.



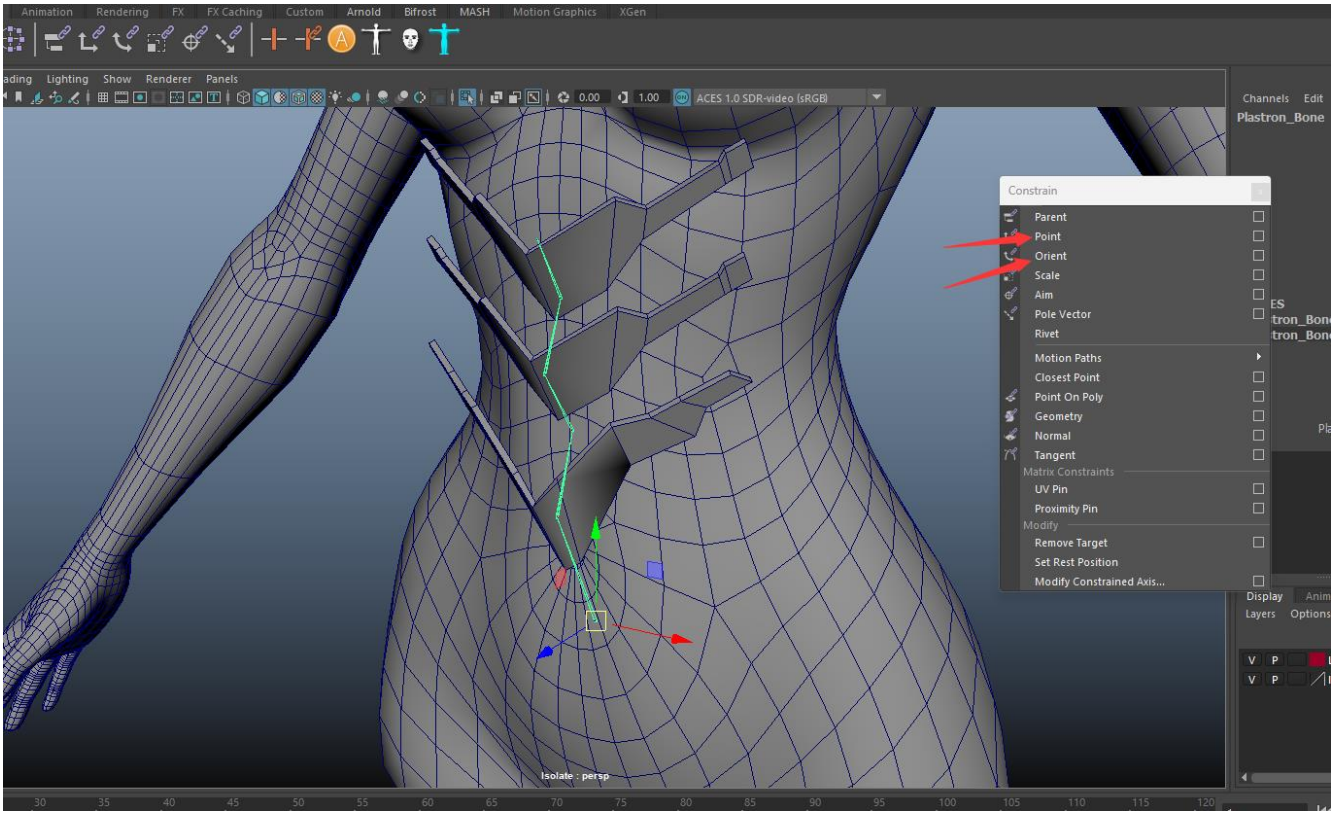

Set Driven Key
Load Options Key Select Help
Driver
RibArmor_Ctrl2
Visibility
Translate X
Translate Y
Translate Z
Rotate X
Rotate Y
Rotate Z
Scale X
Scale Y
Scale Z
Driven
ikHandle2
Pole Vector X
Pole Vector Y
Pole Vector Z
Offset
Key
Load Driver
Load Driven
Close

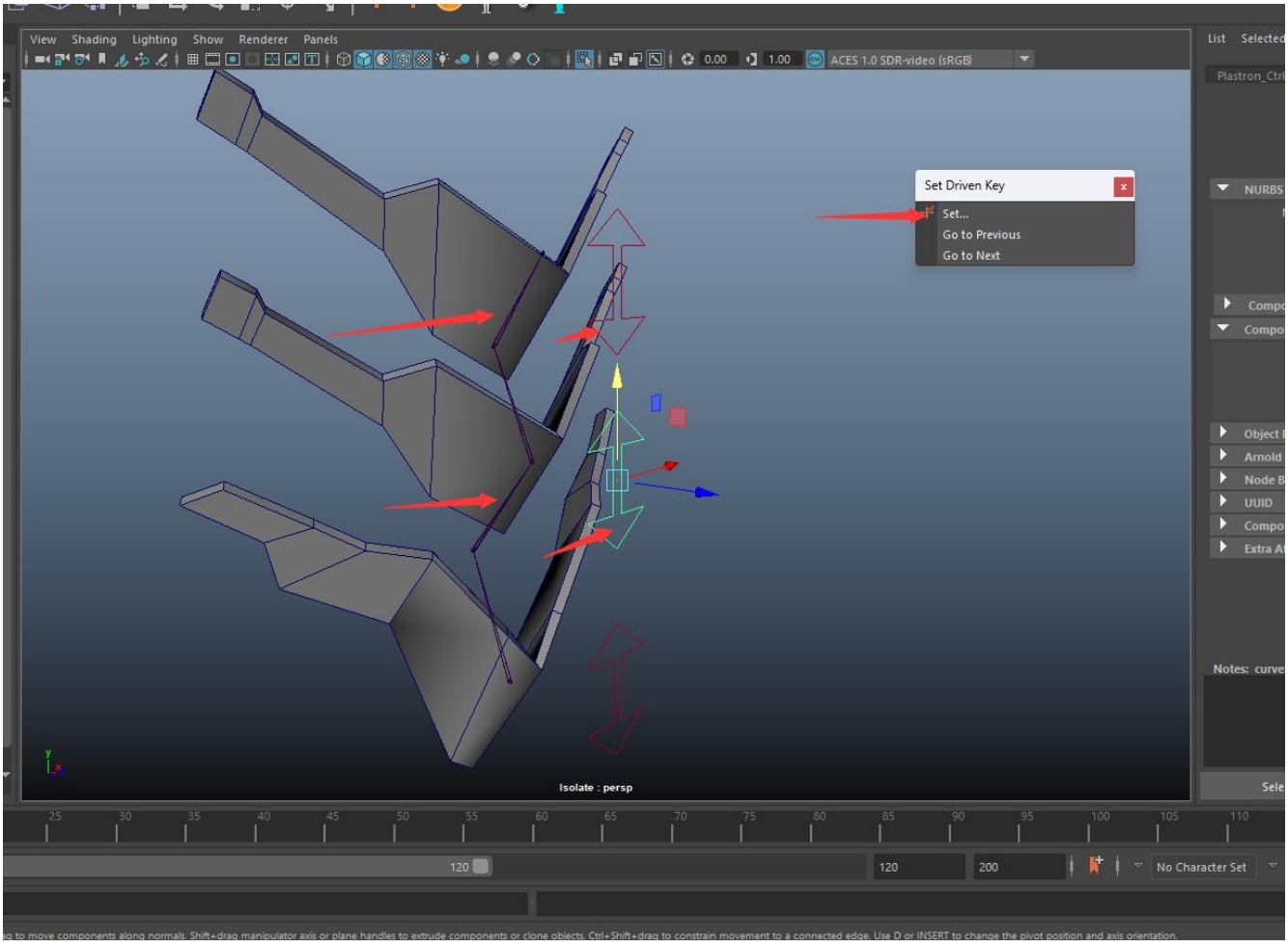
And then, I got those retracable armors.



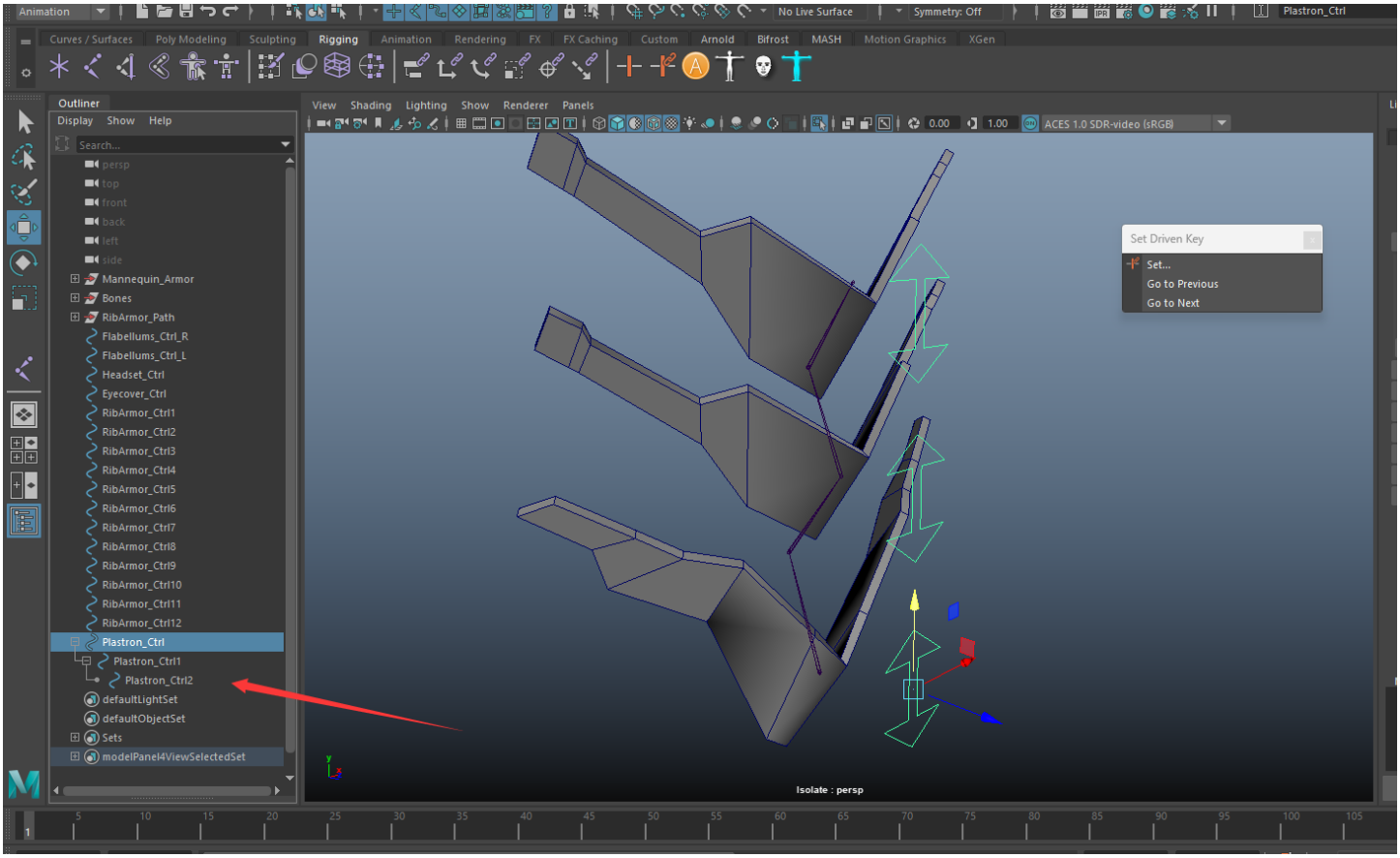


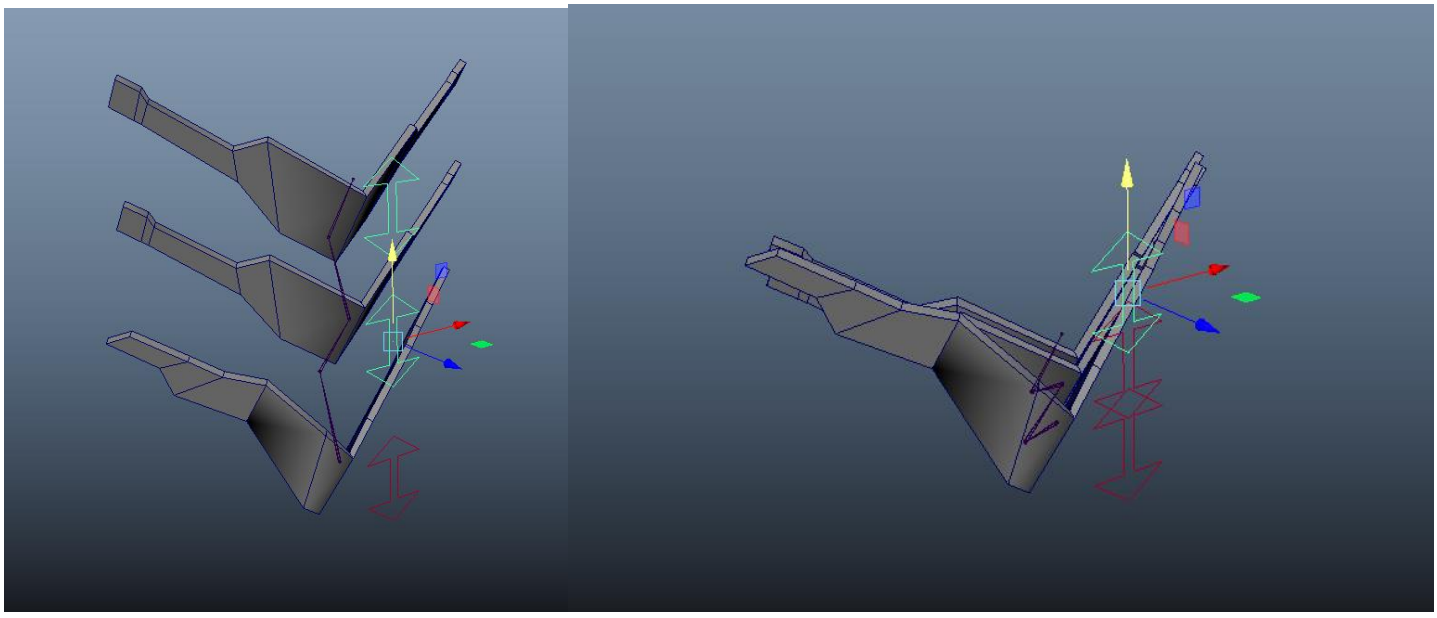
The plastron part also used same skills as above showed. Point and orient constrain to bones, and then using set key drive to constrain those bones to controllers.



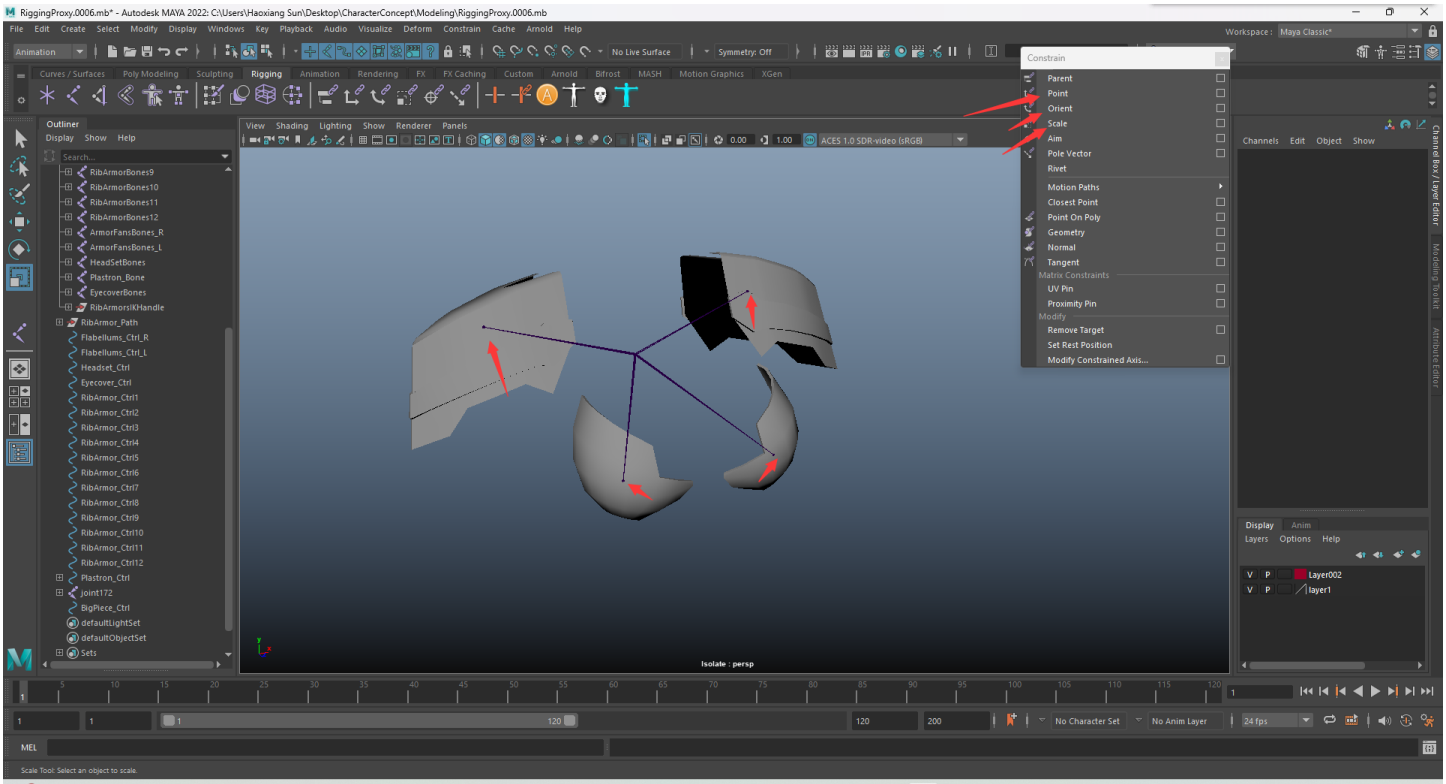


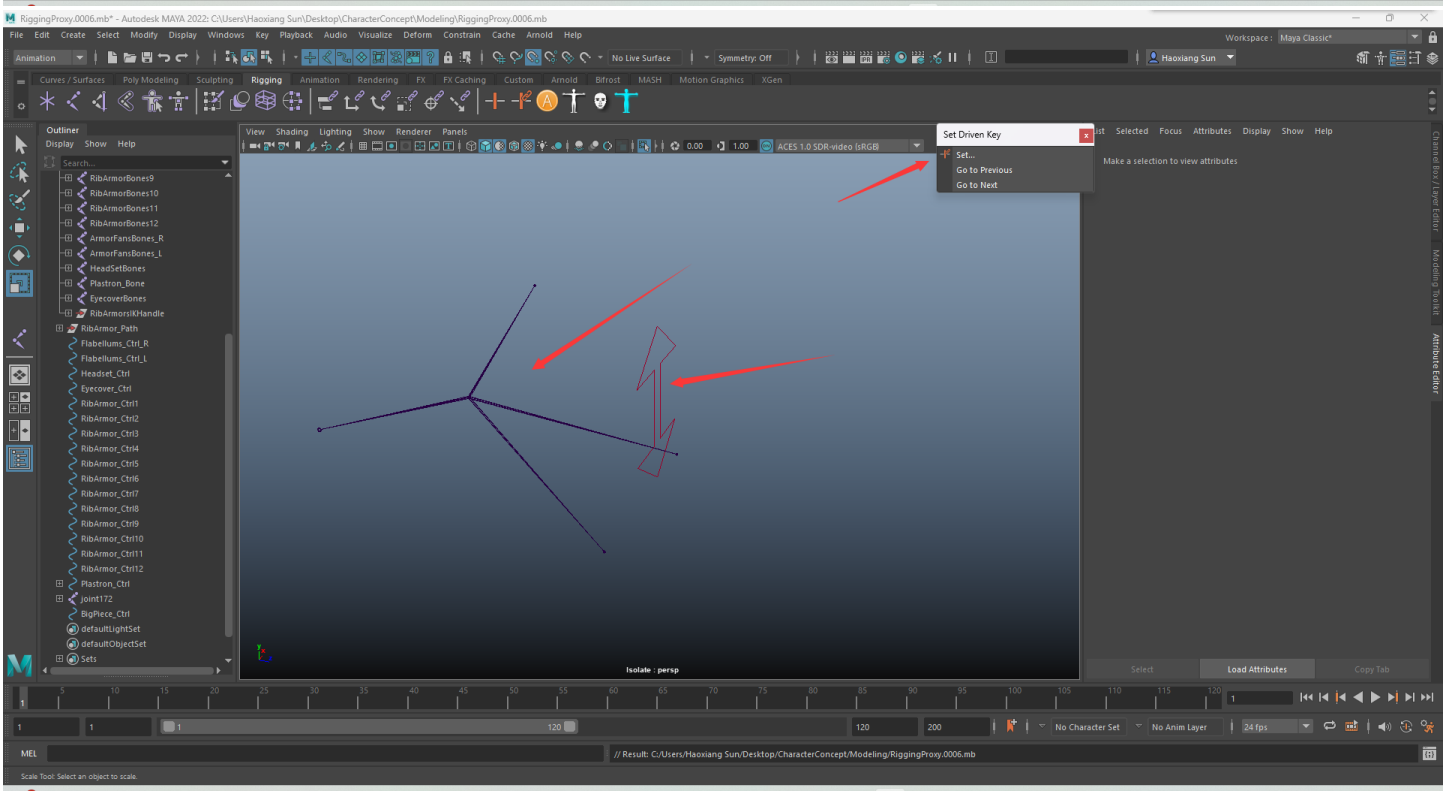
Because those plastron armors are affiliated, so I need to parent controllers to each other.

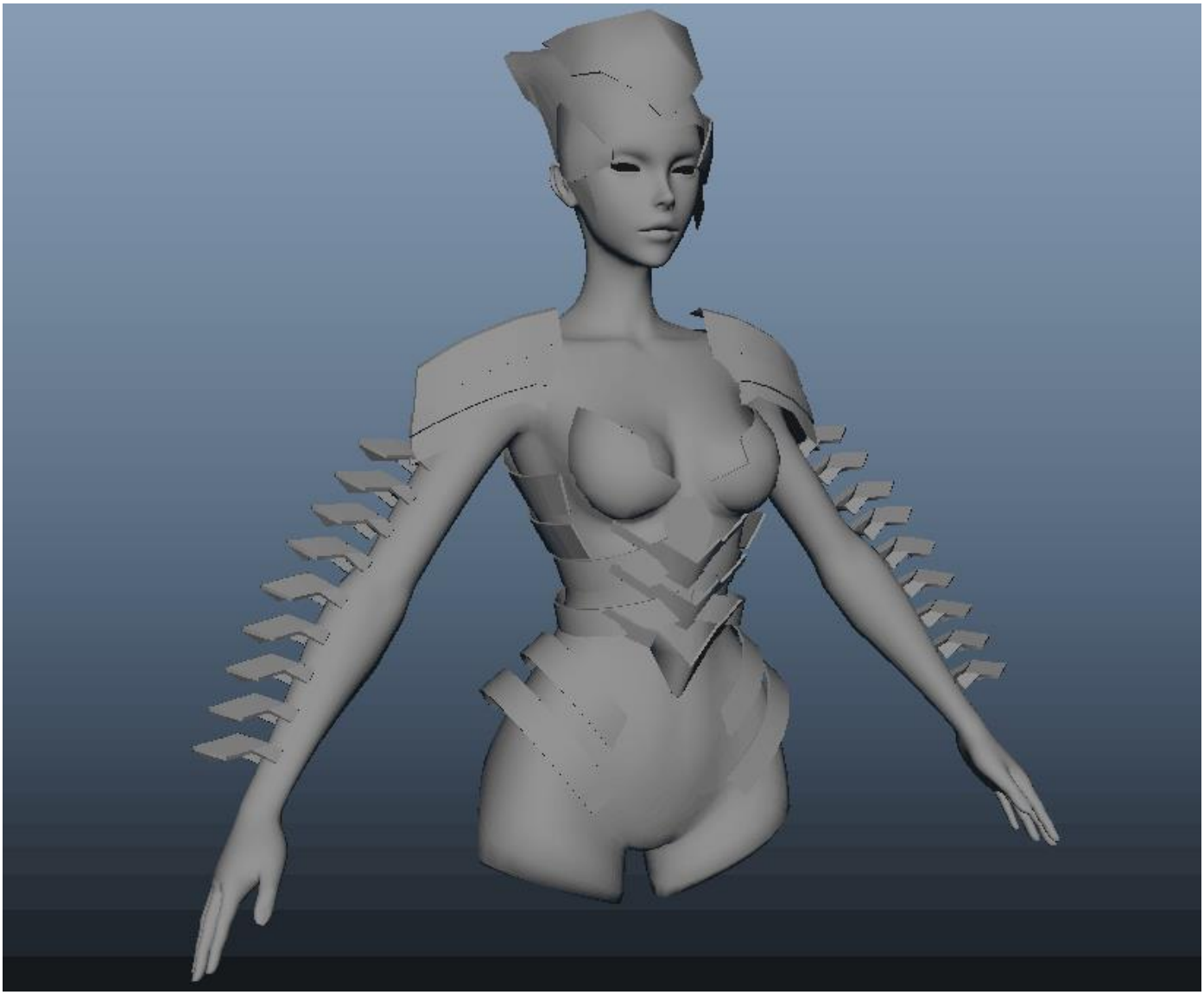




For the last part, I created a main bone to shoulder armors and chest armors. Constrained meshes to bones, and created a main controller r to them.

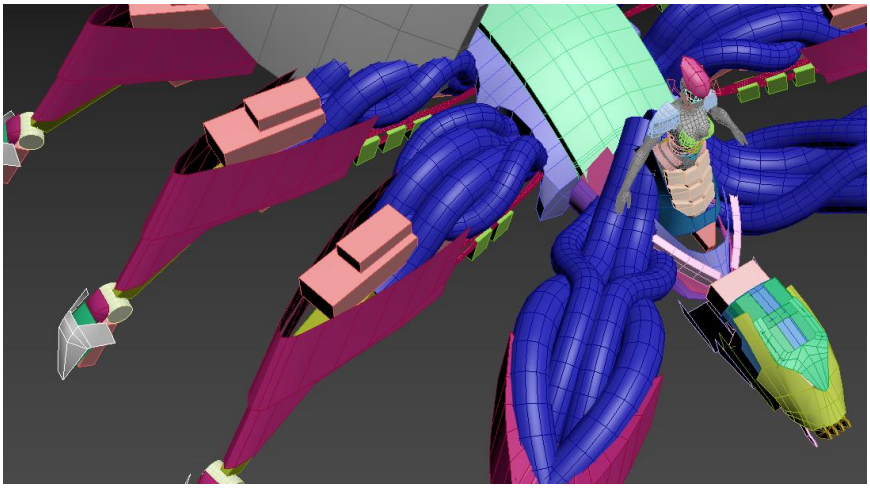


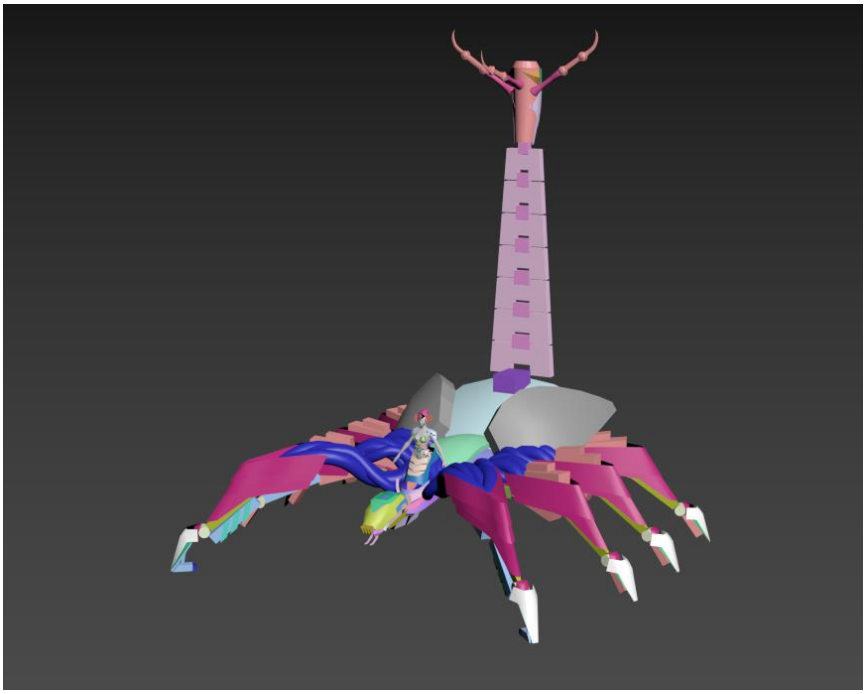




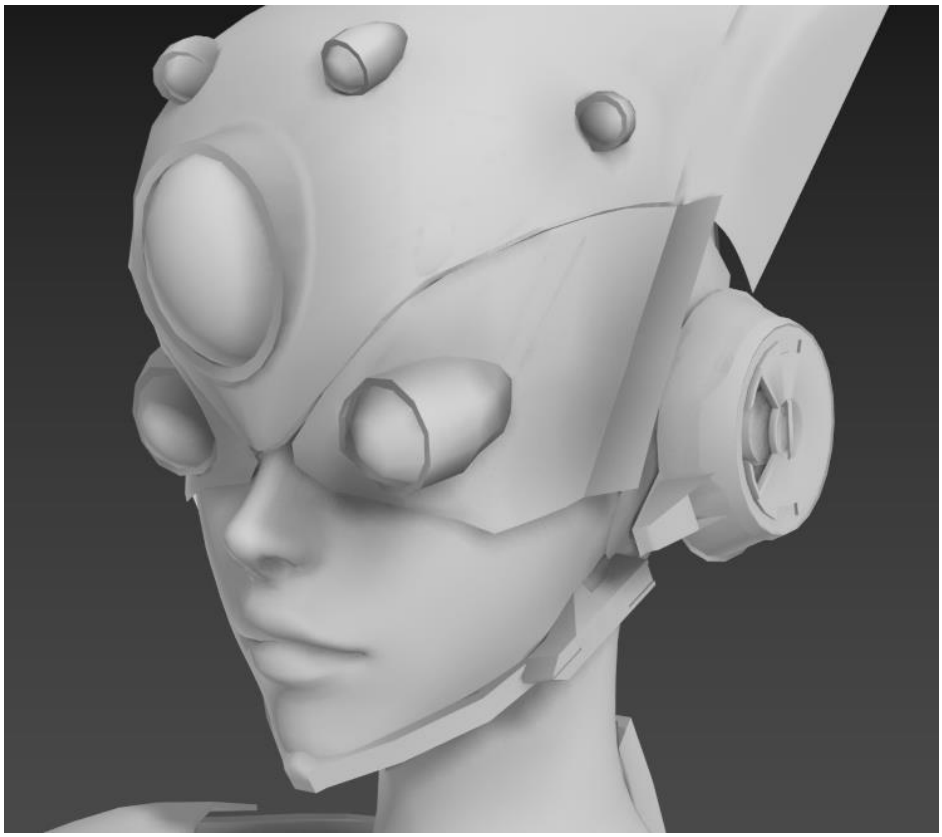
Now I need to focusing on modeling because I can only rigging the character aftrer I have meshes.

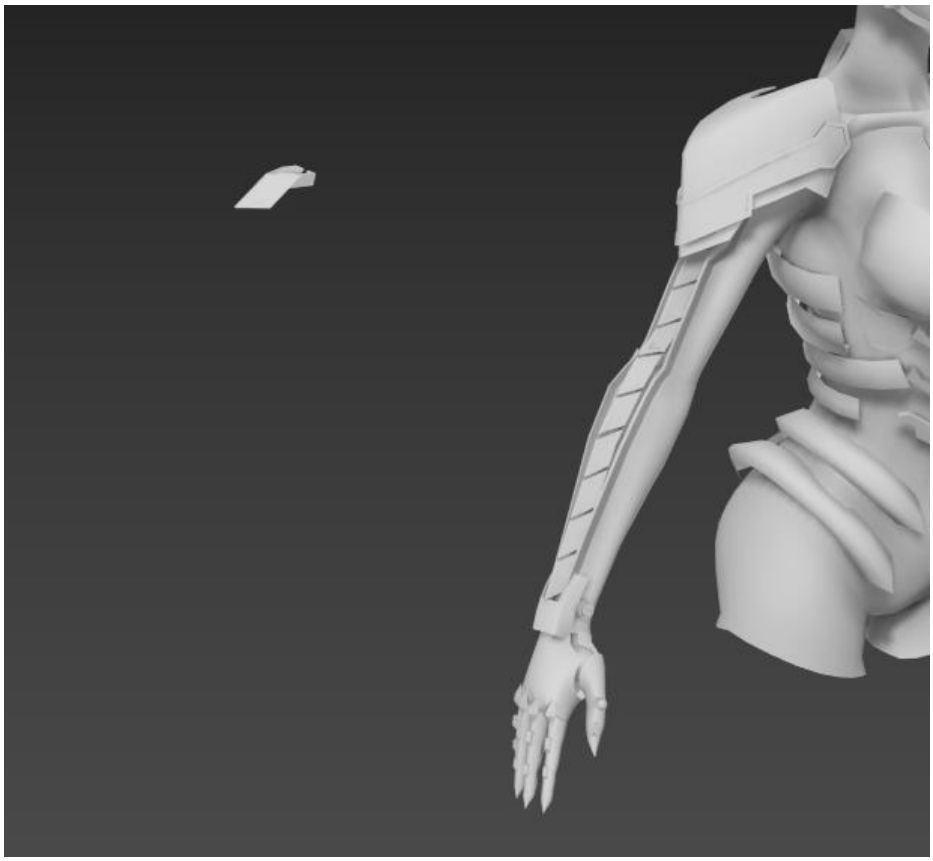
For the spider mech proxy, I made the with lots of planes which are easier to modeling. And for those fibrous leg connecting sections , I used splines and rendered them as cylinder in view port.





For refining armor pieces, I used skills such as pro boolean and path deformer.

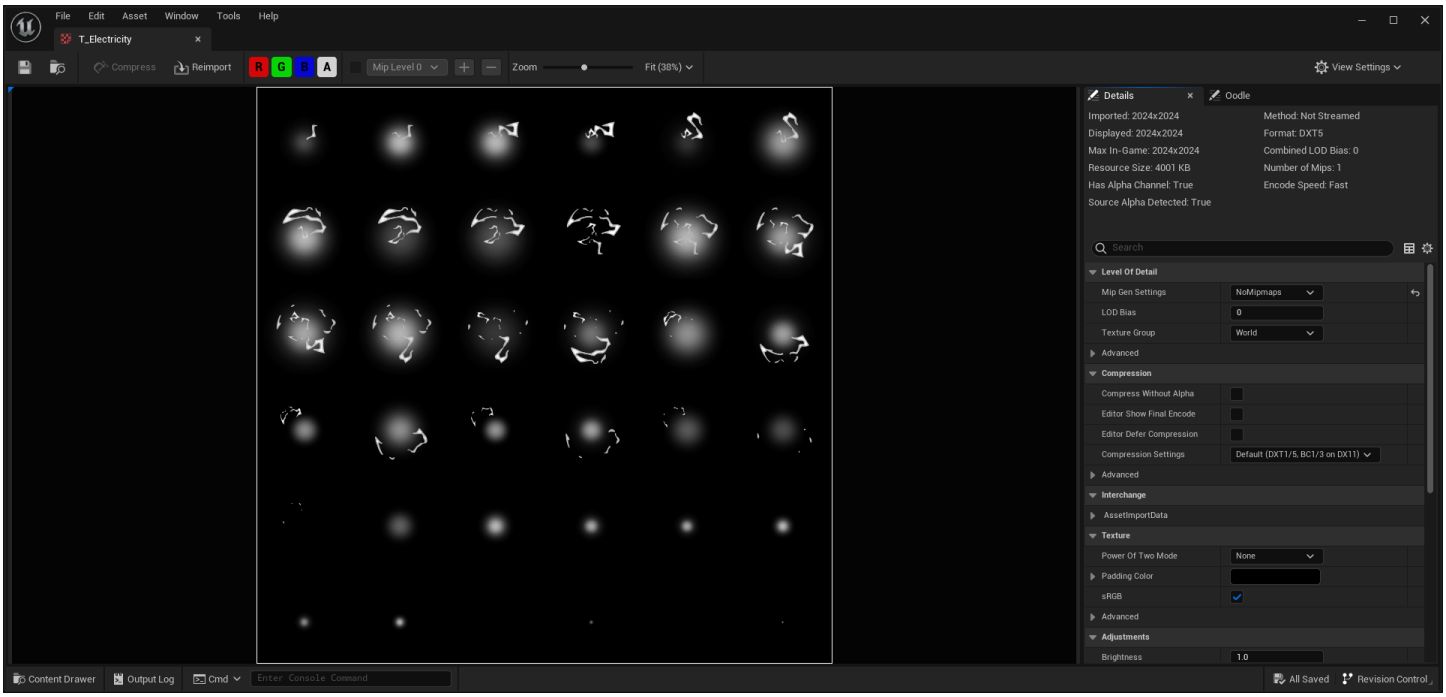




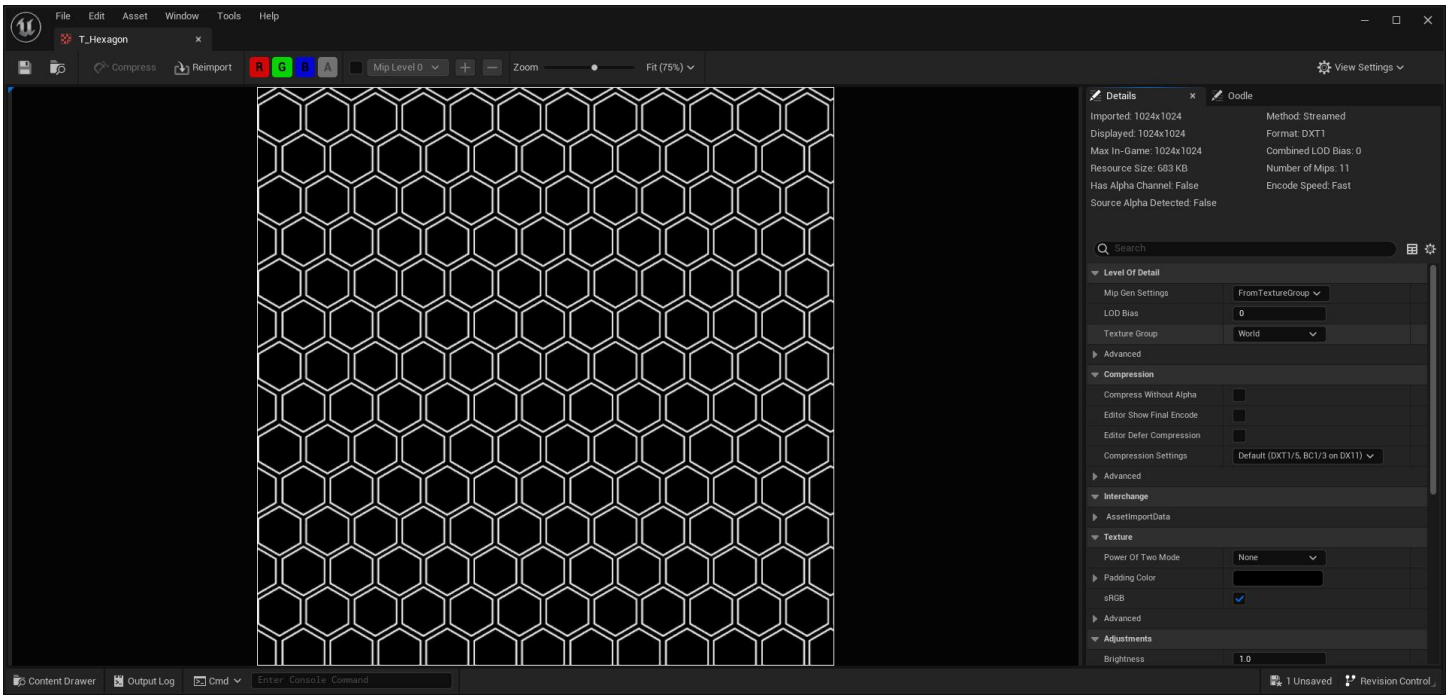
MASTERY TOPIC 3: VFX

Because my character is high-tech character, I want to use electronic and hexagon VFX to showcase the characteristic.

I followed tutorials of drawing sprite sheets for VFX. I laid it out following 6 by 6 grid therefore it could loop play the animation.

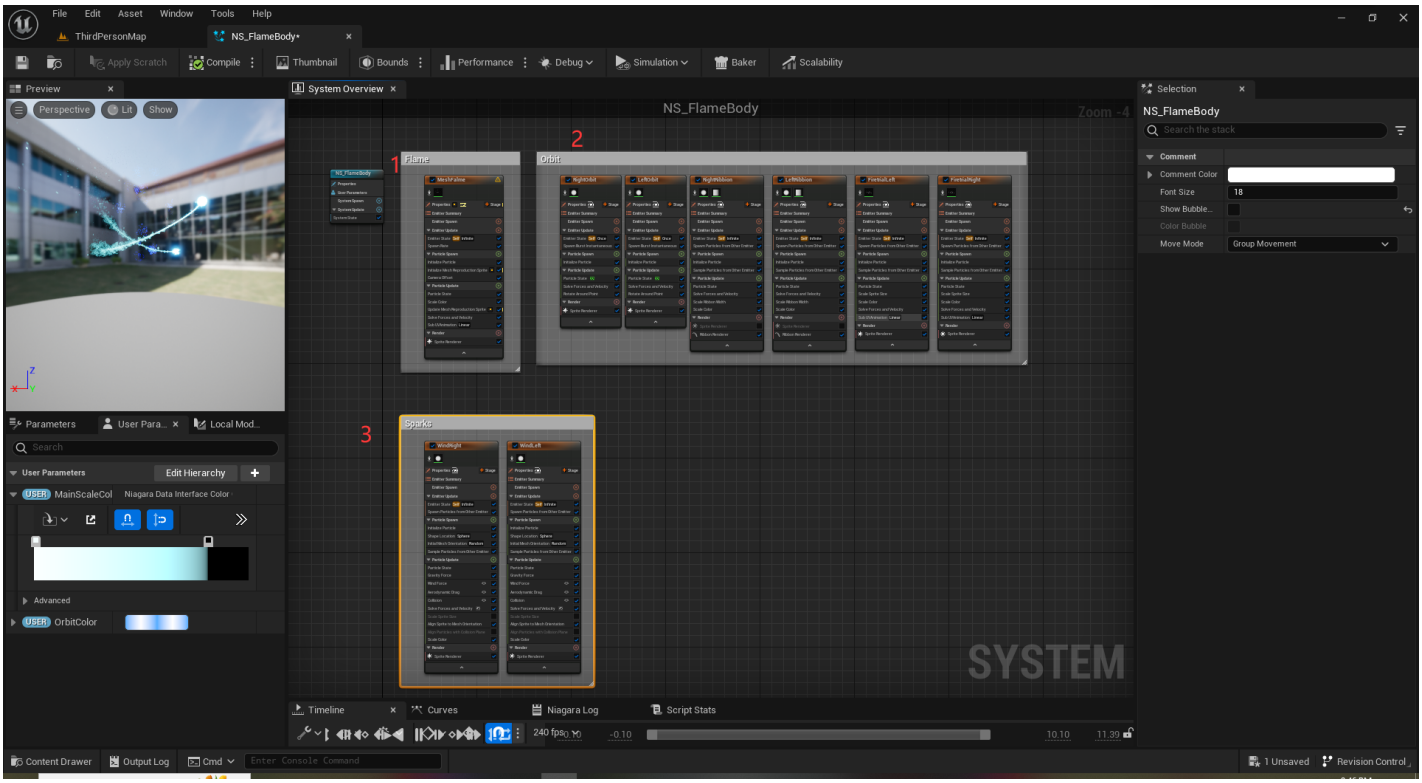


This hexagon texture is tile able.

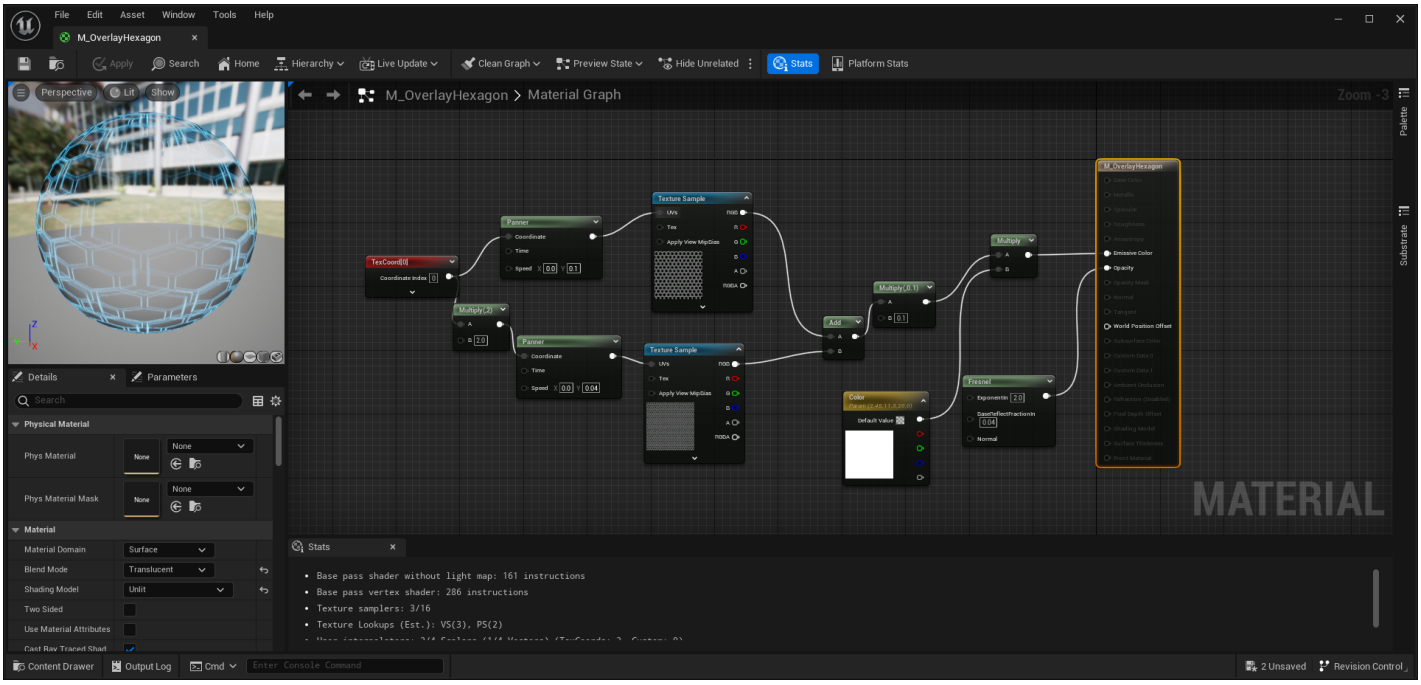


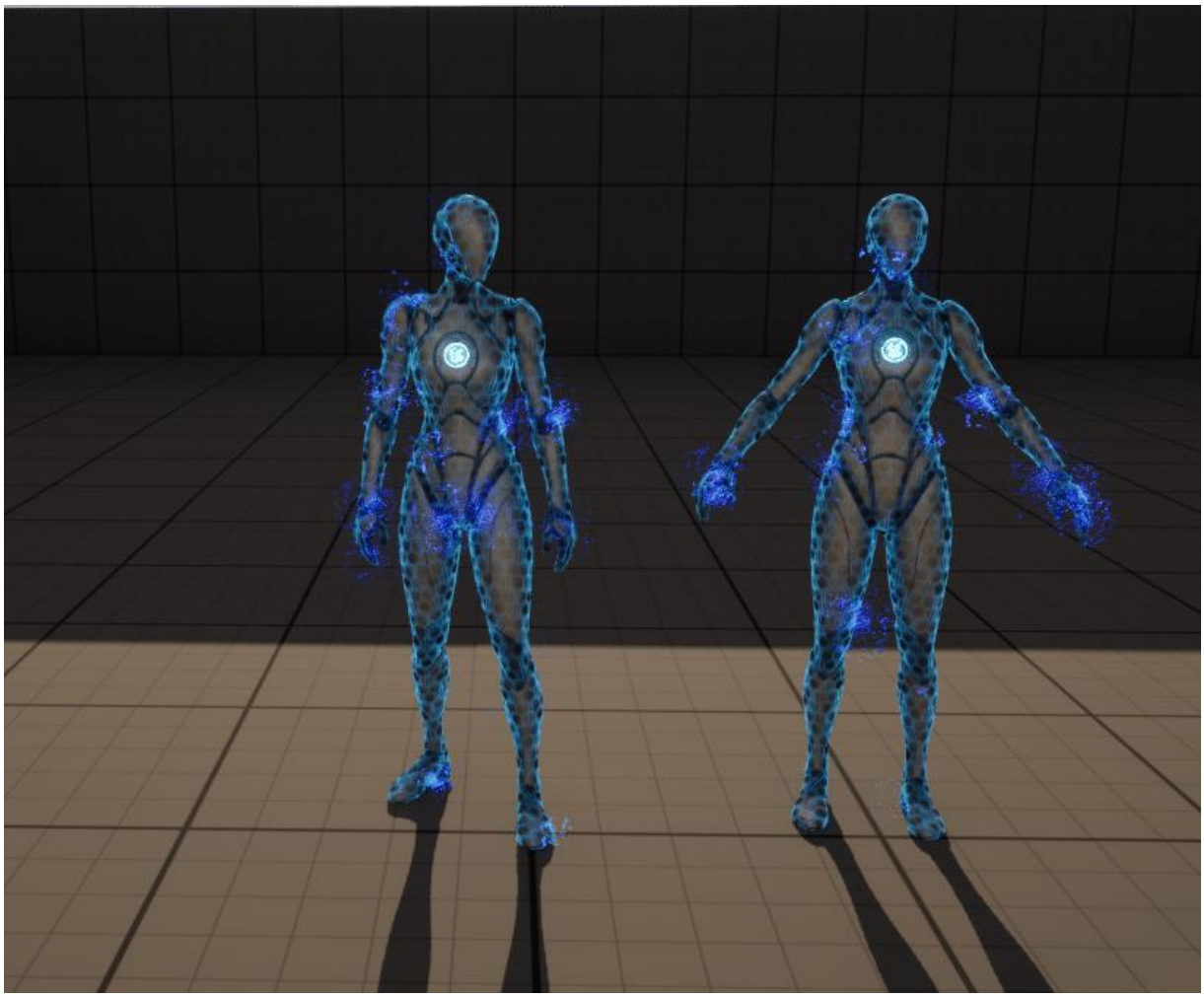
Then I created a Niagara system, started with fountain from. Created Electricity sprite and sparking VFX covering the mannequin. And following the tutorials I watched, I also created two orbits which I am planning to use for attacking VFX.

This panel is Niagara system. First blocker is electronic overlay. The next one blocker is for orbit VFX . The last part is sparking. All of them can be scaled and color changed.



This panel is hexagon overlay material. Also, can be color changed.





VERTICAL SLICE

DESCRIPTION

In this milestone, I will create at least 12 color schemes to explore the best color for my character and apply the best choice with my character's grayscale. In addition, I also need to create VFX concept for VFX development later on.

For rigging, first, I need to finish the whole model of mannequin part and fully rig it, including limps and armors. Also, the spider mech also needs to be rigged. In the end of the milestone, I will need demo animations to show my rigs.

For the VFX, I will fully finish those VFX for the character's attacking methods.

SCHEDULING / PLANNING

THESIS II PRODUCTION - SCHEDULE

WEEK	TASKS / HOURS / JOURNAL
1	Fix issues of the front view original art of character with advisor's feedback. - 12 hours Start to build transform armor's proxy. – 6 hours

	Creating iterations based on previous silhouette. – 3 hours Exploring new silhouettes based on one new draft. – 3 hours Refine details of origin art. – 8 hours Refine armor pieces draft. – 6 hours
2	Fix issues of the front view original art of character with advisor's feedback. - 12 hours Keep on building transform armor's proxy. – 6 hours Keeping refined origin art details, focusing on spider mech. -8 hours Keeping refined armor and mannequin details, both front and back views. – 8 hours Researching how armors goanna transform. – 2 hours
3	Fix issues of the front view original art of character with advisor's feedback. - 12 hours Keep on building transform armor's proxy. – 6 hours Refine line draft of concept of transform armor. -6 hours Refine transform process concept. – 2 hours Refine original art of character. -6 hours Create mannequin mesh. - 5 hours Create torso armor proxy. – 2 hours
4	Finishing the front view original art of character. - 4 hours Refine the back view draft line of the character and color it. - 4 hours Refine the line draft of transformation process of the character's armor. – 8 hours Finishing facial expressions' concept sheet. 4 hours Creating gray scale for origin art of character. - 8 hours Create different color schemes for investigation. – 6 hours
5	Start to build proxy of the character's body. – 6 hours Build basic skeleton for the character's body. –4 hours Making VFX proxy. – 12 hours Creating gray scale for origin art of character. - 6 hours Create different color schemes for investigation. – 6 hours Rigging the fan blades on character's arm. – 4 hours
6	Rigging the transform armor proxy. – 12 hours Apply VFX to the proxy – 4 hours.

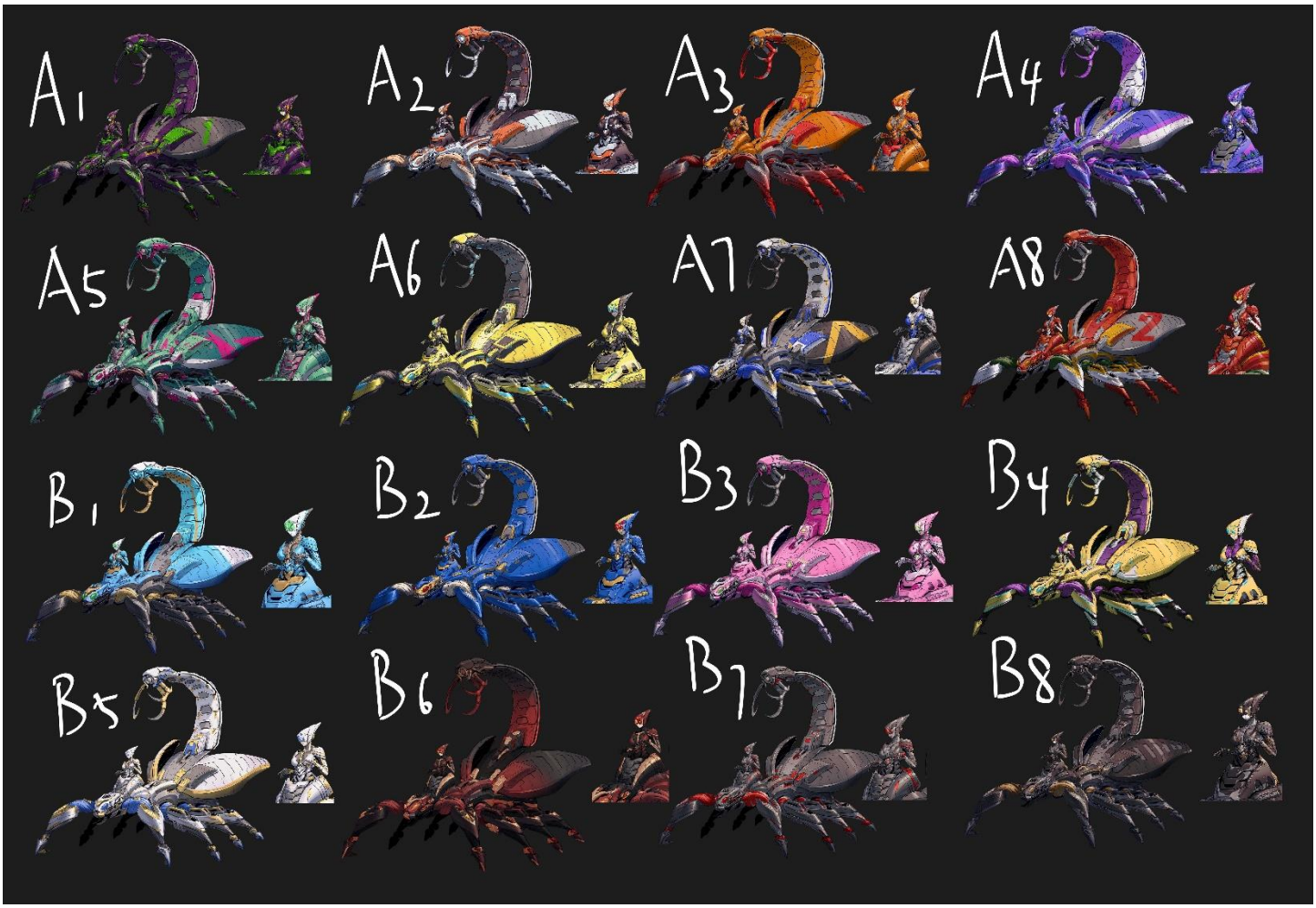
	Research for rigging tutorials. – 4 hours Rigging the headset of character. – 4 hours Rigging the rib armor of character. – 6 hours Rigging the plastron armors of character. – 1 hours Rigging the big pieces armor of character. – 1 hours
7	Prototype - MIDTERM PRESENTATION – TBD Fix issues according to feedback. - 16 hours Fix rigging issues. - 2 hours Analyze data from color scheme research and choose the best scheme. - 4 hours Refine color scheme and summarize idea of color. - 8 hours
8	Refine the skeleton of character's bust armor. – 18 hours Build spider mech proxy (main body) – 6 hours. Build spider mech proxy (Legs) – 4 hours. Build spider mech proxy (Tail part) – 2 hours. Refine gray scale and color scheme of character. - 8 hours
9	Start to build high res of character's armor. 18 hours Learning and trying to build a bullet blueprint that can recognize different surfaces. - 8 hours. Making a circle impact material and making it to a Niagara VFX. – 2 hours Making a black hole material that can be changed in instance panel. (For attacking VFX). - 1 hour. Build a flipbook VFX of electricity. - 3 hours. Apply VFXs to bullet impact blueprint. – 1 hour
10	Keep on building high- res of character's armor. 18 hours Build helmet mid poly model. -8 hours. Build spine mid poly model. - 2 hours. Build hand mid poly model. - 4 hours. Build armor pieces mid poly model. - 2 hours.
11	State of the Vertical Slice Start to make game res for the character's armor – 21 hours. Start to build interior mannequin. - 10 hours Explore method of making hard surface objects in ZBrush and Topo gun. -10 hours

12	Rigging the game-res armor and adding controller to it. – 16 hours Refine the VFX of the armor- 6 hours. Refine interior mannequin. - 12 hours Build tail skeleton and controllers. – 5 hours Build blackhole beam in UE5.- 6 hours
13	Critical Reviews Fix issues according to feedback. – 5 hours Creating basic materials to the character's armor by substance painter. - 10 hours Build low poly mesh in topo gun. – 12 hours Bake test for low mesh. 2- hours Build skeleton for spider mech. 5 hours. Constraint skeleton to spider mech mesh. - 5 hours
14	Refine Skeleton system of armor. – 10 hours Refine VFX system of armor. – 10 hours Unwarping and packing UVs of mannequin. - 4 hours Bake high poly mesh of mannequin to low poly mesh. – 10 hours Making materials to low poly mesh of mannequin. - 6 hours
15	Refine materials of the armor. – 10 hours Create a showcase level and animation to present the armor. 10 hours Using Advanced Skeleton to build mannequin skeleton and skin tit to mannequin mesh. - 12 hours Import bones from armor prototype and adjust them to low poly armor. – 8 hours Combine bones and controllers of armors and mannequin together and fix issues. – 6 hours Making demo animations for my character. - 4 hours Fixing issues in Unreal. – 6 hours Writing documents. – 4 hours.
16	Vertical Slice - FINAL – PRESENTATION Fix issues according to feedback from vertical slice. – 16 hours

METHODOLOGIES

MASTERY TOPIC 1: CHARACTER CONCEPT

Based on the gray scale I created, I used Overlay layers and rough colored 16 color schemes. I divided color schemes for this character into complementary color schemes (A1-A8) and monochromatic color schemes(B1-B8).



During this milestone, I refined the concept sheet. The color scheme referred dark green unknown scorpion from Thailand and hymen opus coronates. Also, I refined VFX demonstrations for its attacking methods.

Figure 28 -dark green scorpion on the floor at camping area in Thailand nation Forest

https://cn.dreamstime.com/%E6%B3%B0%E5%9B%BD%E5%9B%BD%E5%AE%B6%E5%85%AC%E5%9B%AD%E9%87%8E%E8%90%A5%E6%97%B6%E6%B7%B1%E7%BB%BF%E8%89%B2%E8%9D%8E%E5%AD%90-image146835368

Figure 29 - Hymen opus coronates

https://www.epochtimes.com/gb/20/8/18/n12340172.htm

In order to research user experiences, to know more about their ideas of preference, I created a questionnaire and let art students and art faculties express their ideas about color schemes.

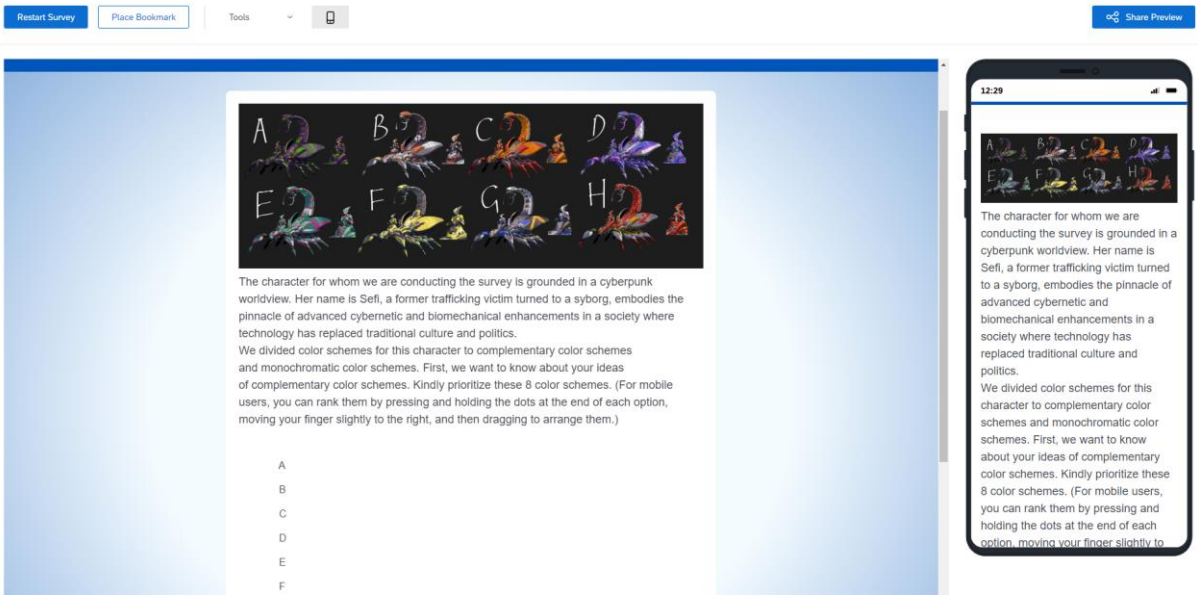
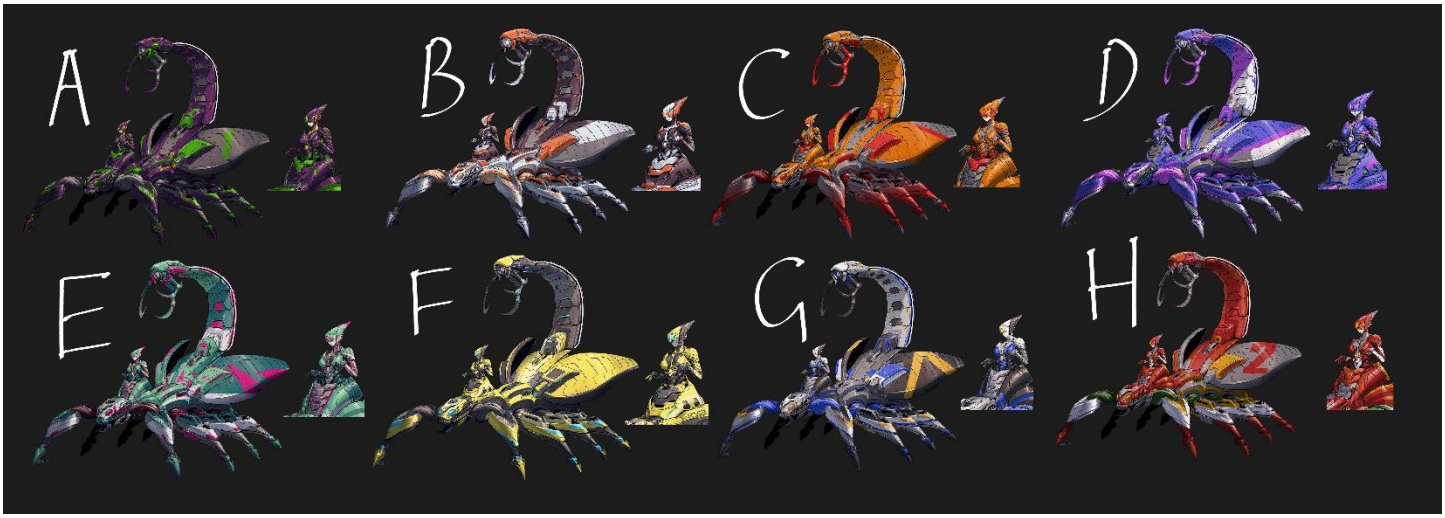
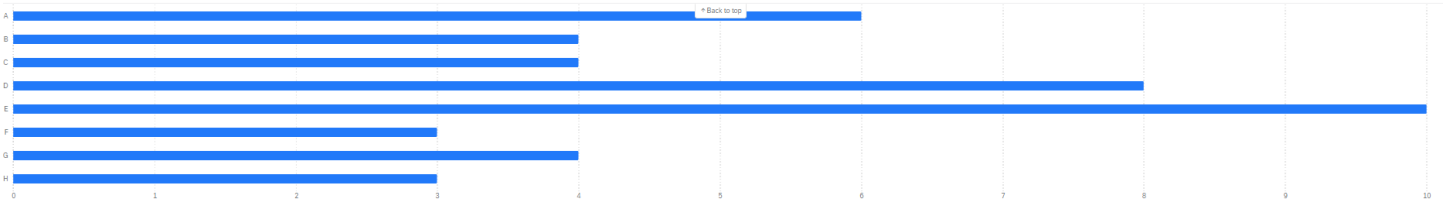


Figure 30 – Color Scheme Survey

https://smu.az1.qualtrics.com/jfe/form/SV_9ztee1NtEetX12u

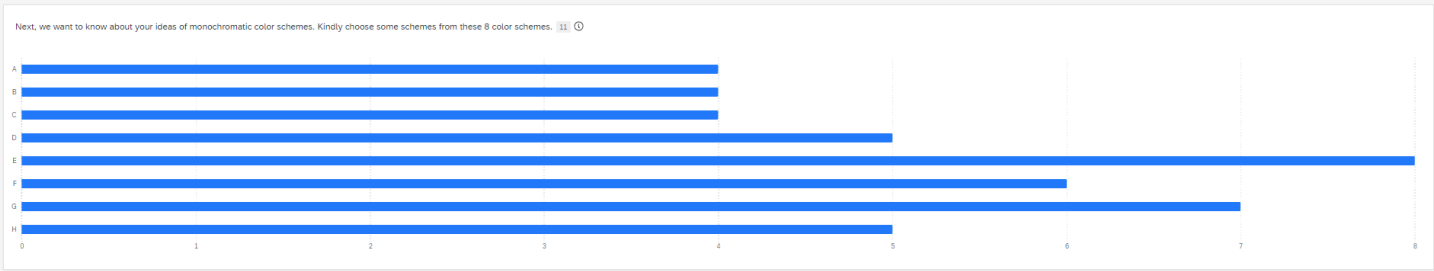


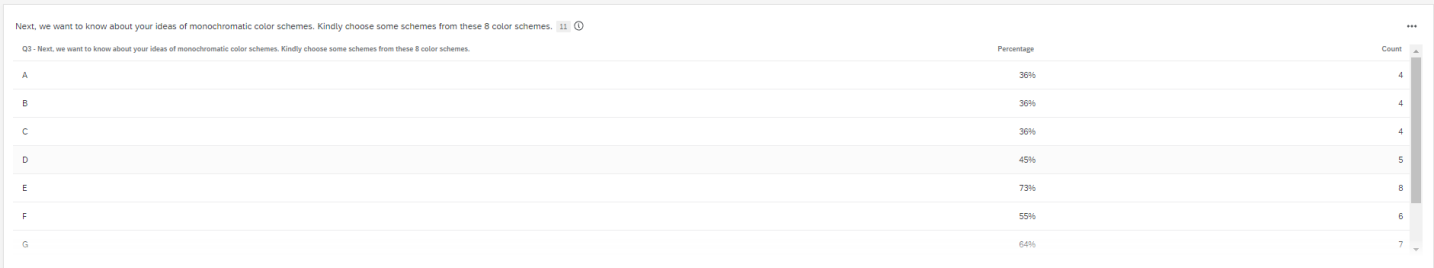
Responses: 17

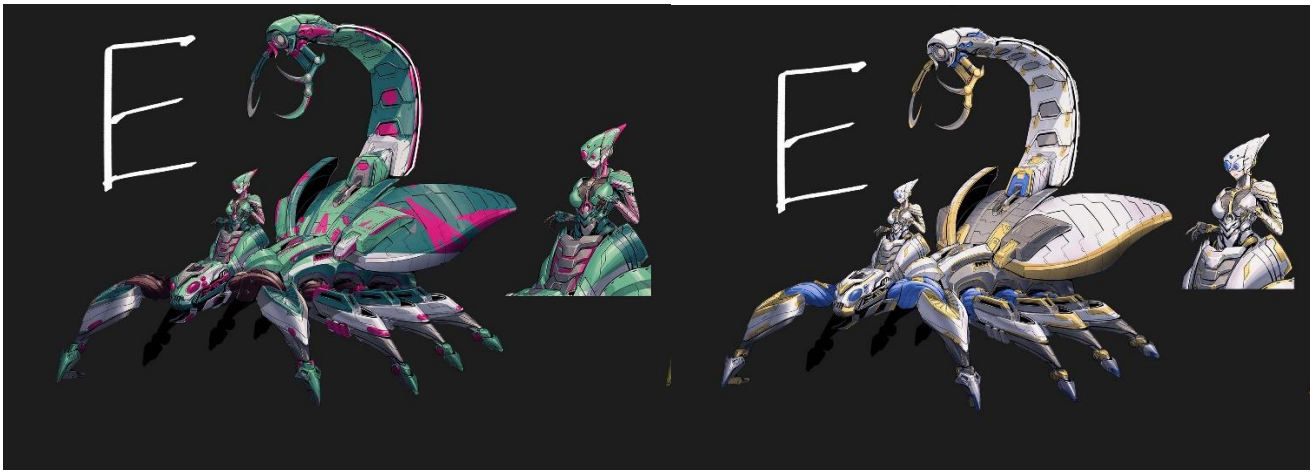


The character for whom we are conducting the survey is grounded in a cyberpunk worldview. Her name is Sefi, a former trafficking victim turned to a syborg, embodies the pinnacle of advanced cybernetic and biomechanical enhancements in a society where technology has replaced traditional culture and politics. We divided color s... 12

Q2 - The character for whom we are conducting the survey is grounded in a cyberpunk worldview. Her name is Sefi, a former trafficking victim turned to a syborg, embodies the pinnacle of advanced cybernetic and biomechanical enhancements in a society where technology has replaced traditional culture and politics. We divided color schemes for this character to complementary color schemes and monochromatic color schemes. First, we want to know about your ideas of complementary color schemes. Kindly choose some schemes from these 8 color schemes.	Percentage	Count
A	50%	6
B	33%	4
C	33%	4
D	67%	8
E	83%	10
F	75%	9





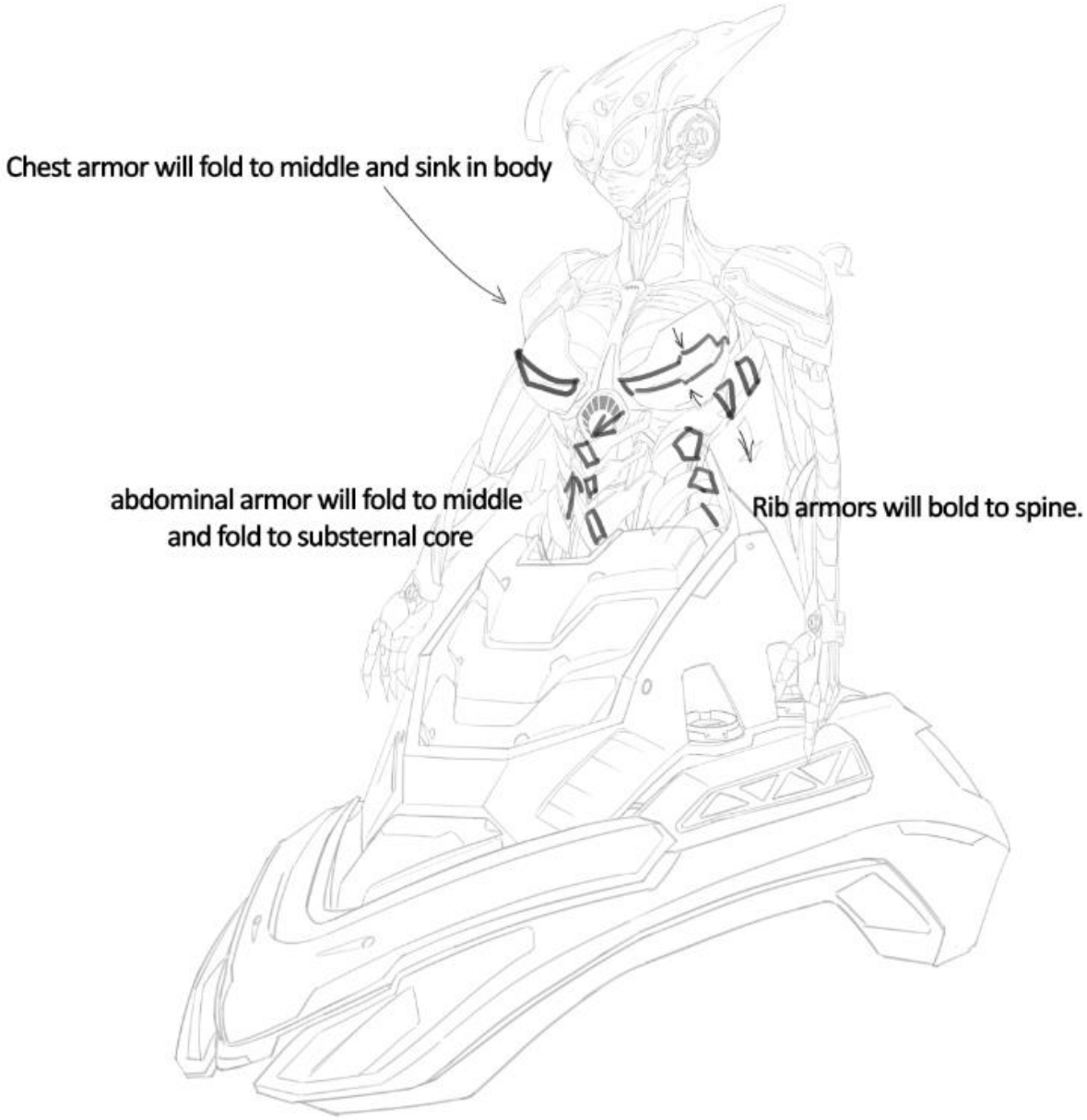


After collected 12 art students and faculty's opinions, this two color schemes are most popular among complementary color schemes and monochromatic color schemes.

Considering the characterization and the challenge to my personal color matching skills, I decided to choose the complementary one. The characer is an aggressive character with toxic personality, like poison insects in nature, the light green and water red color could emphasis what I want to express. And this is more difficult to compose the color which could help me to build my ability of character concepting more.

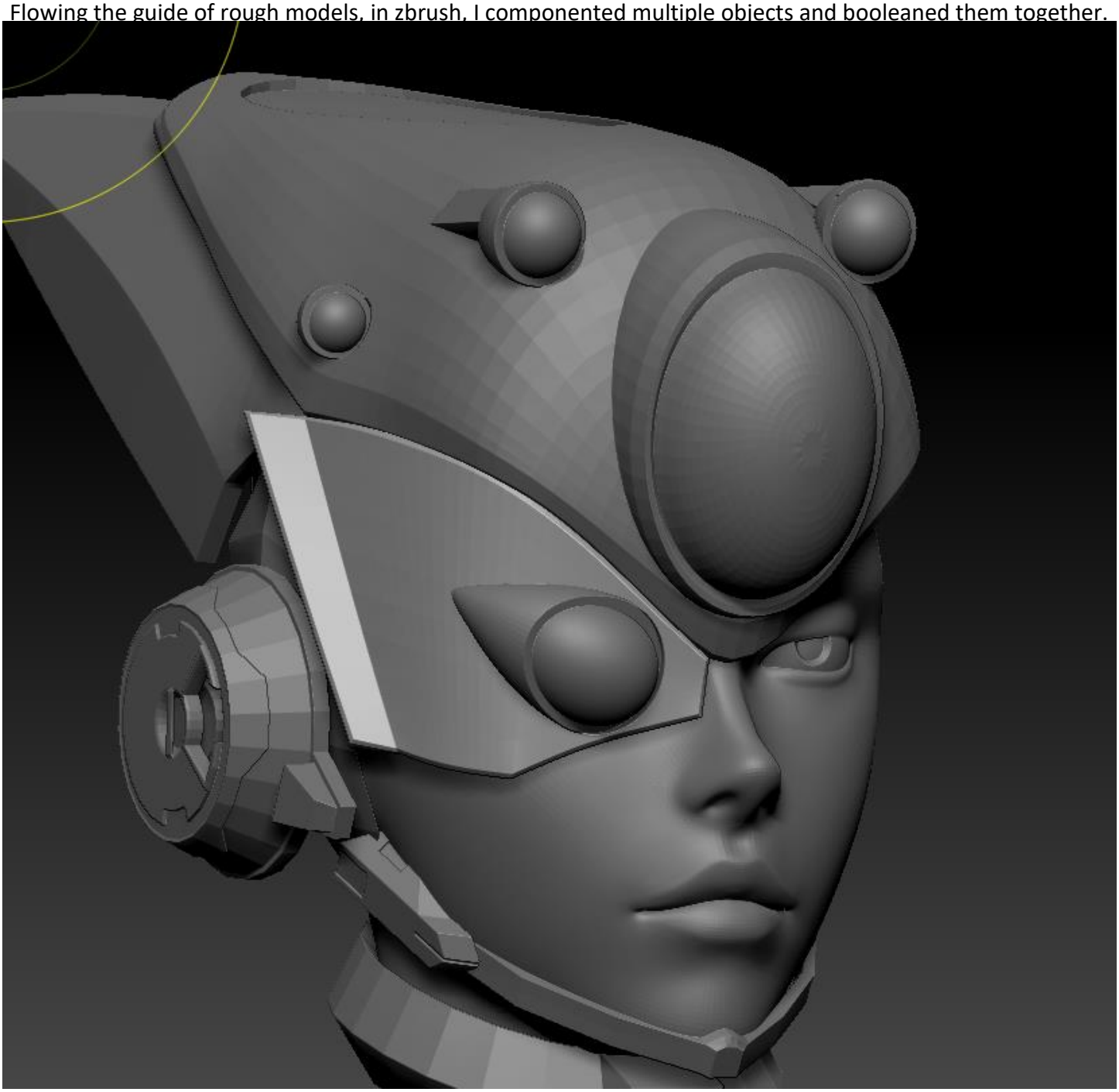
I merged line layers and gray sacle layers together in order to get better results, also I added more details in there.

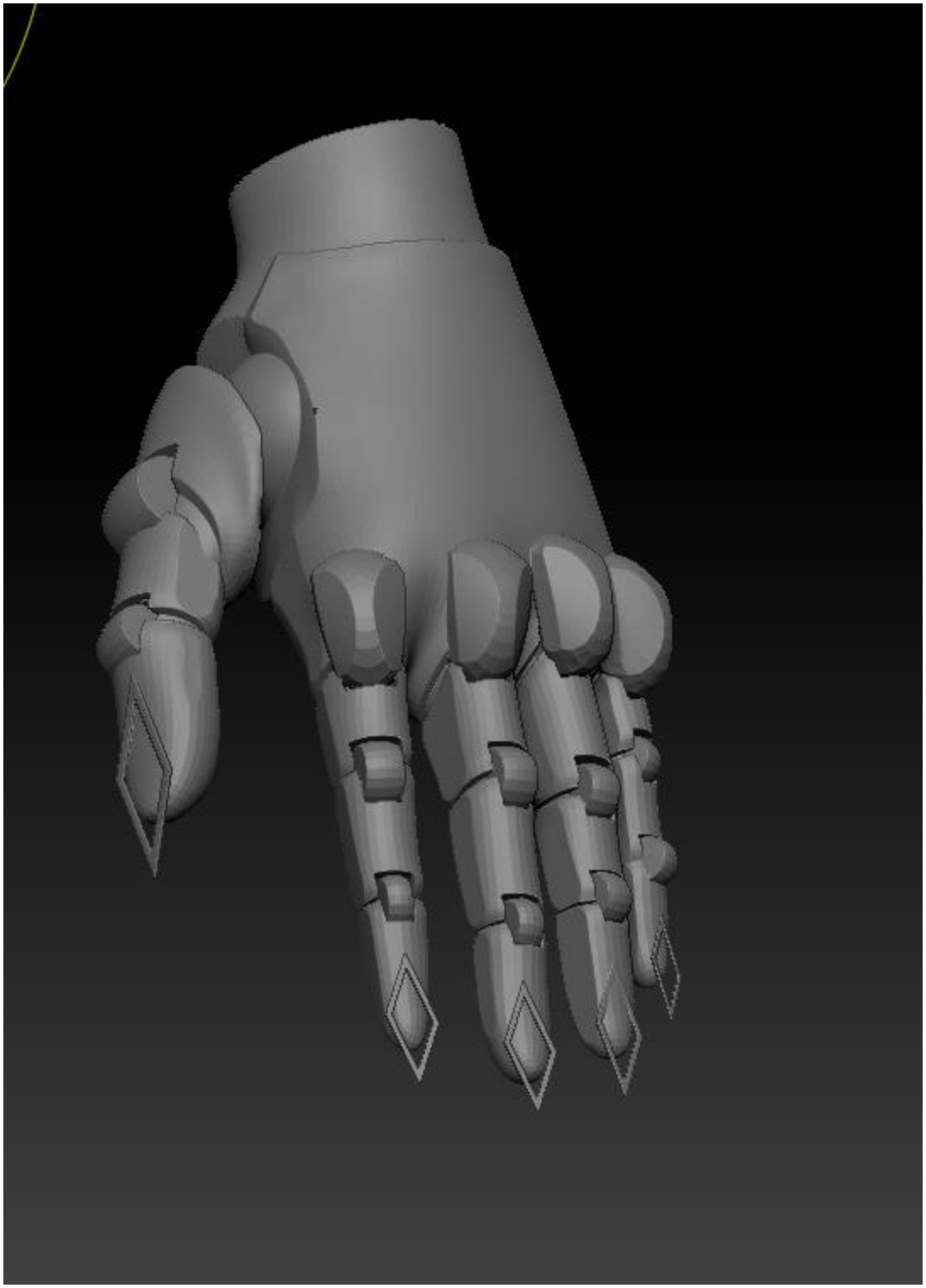
For better understanding, I added this instruction of how armors will transform.



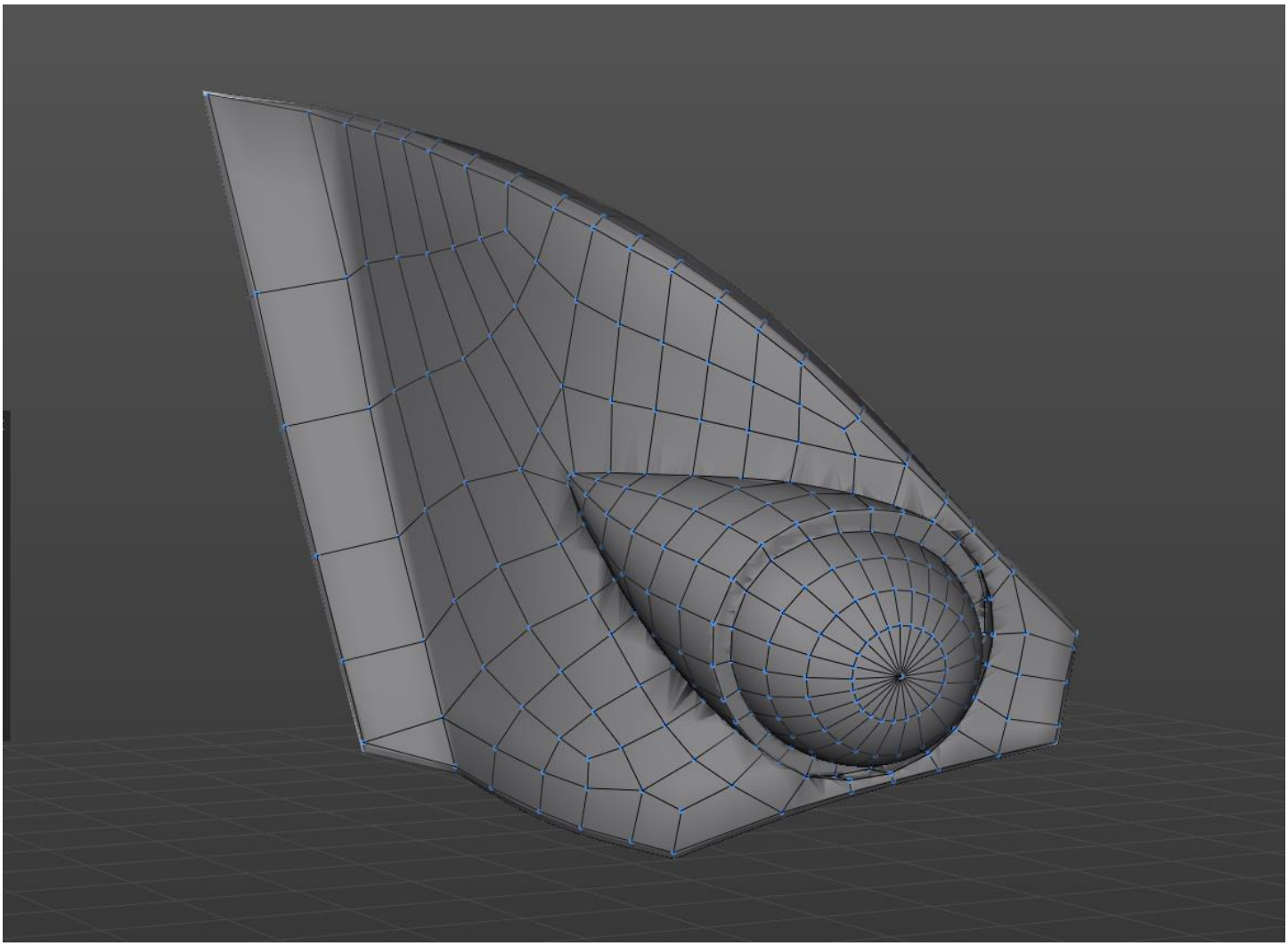
MASTERY TOPIC 2: ADVANCED RIGGING

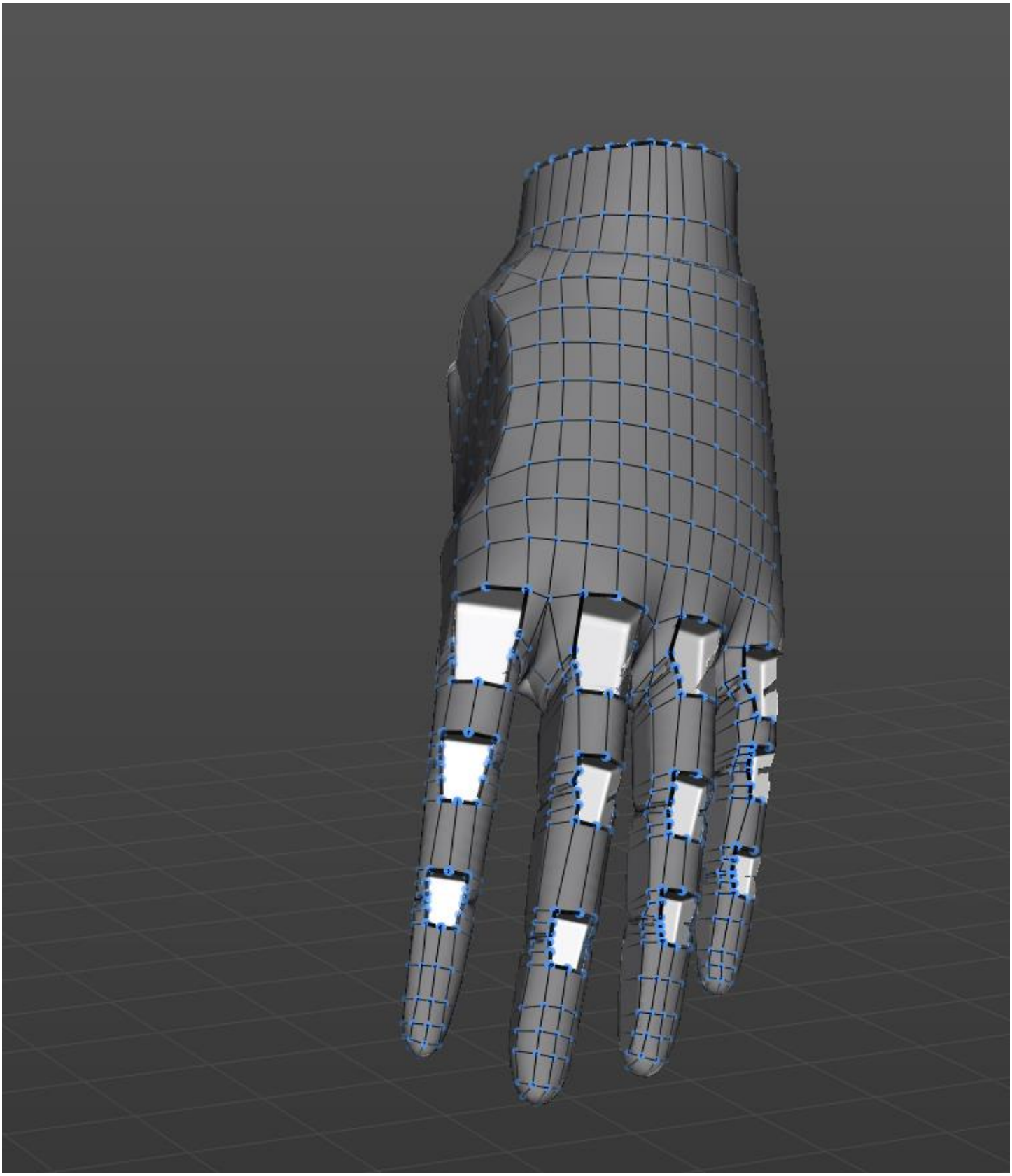
Flowing the guide of rough models, in zbrush, I componented multiple objects and booleaned them together.

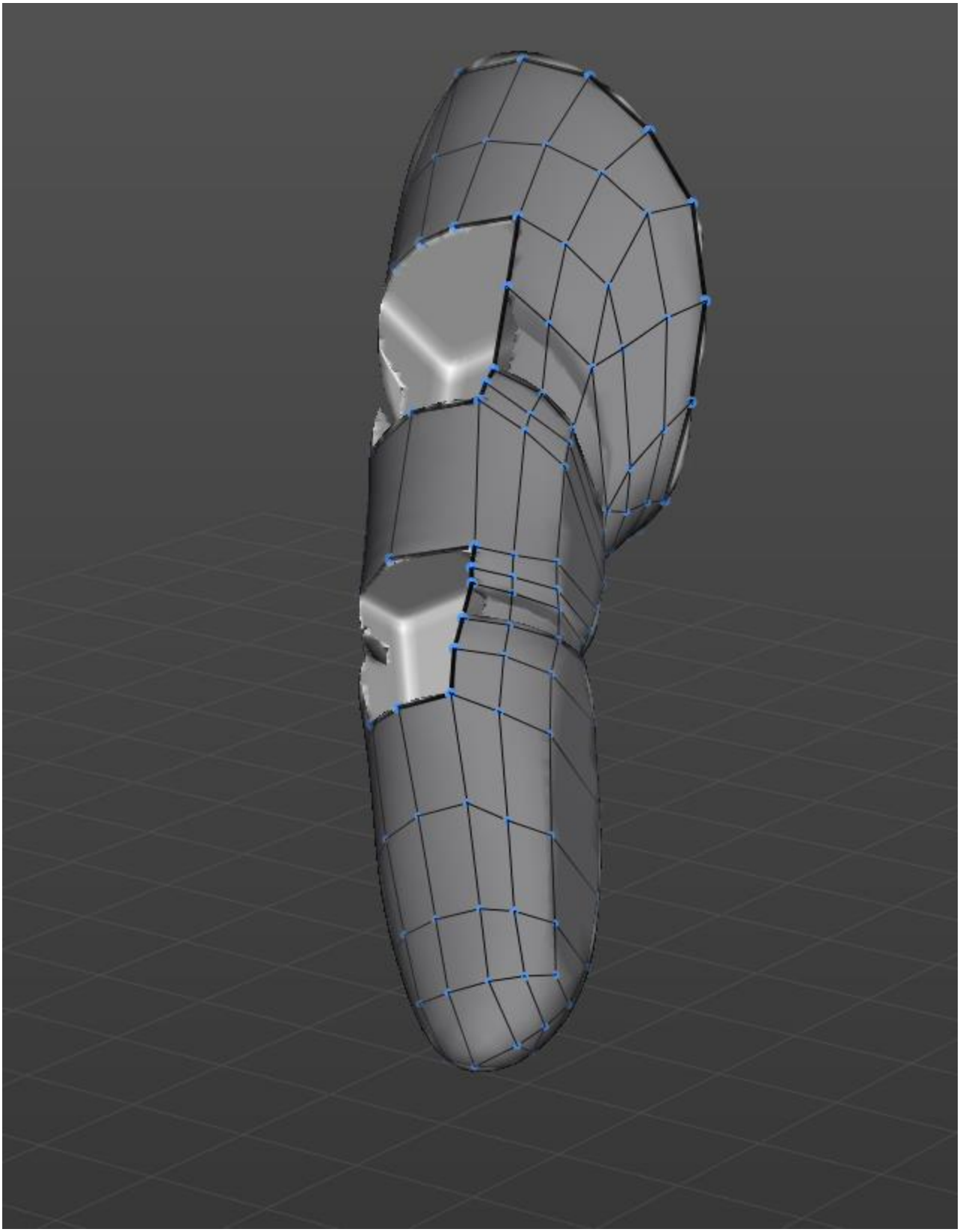




Then, I exported booleaned objects to Topo gun. Using create tool and other tools in Topo gun, I can create air thight object easily.





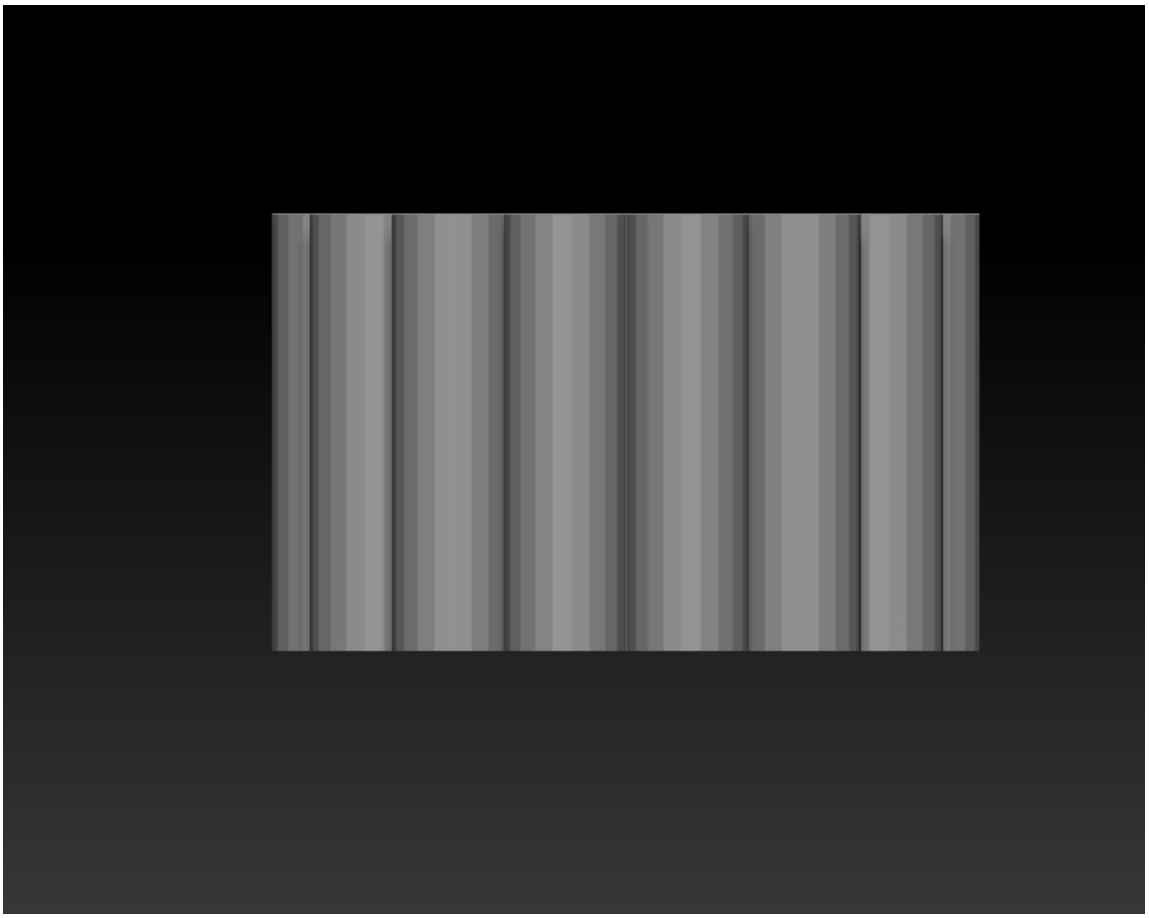


For this milestone, I retopoed headset and hand in topogun. I used crease tool in Zbrush and creating highpoly models based on low polys.

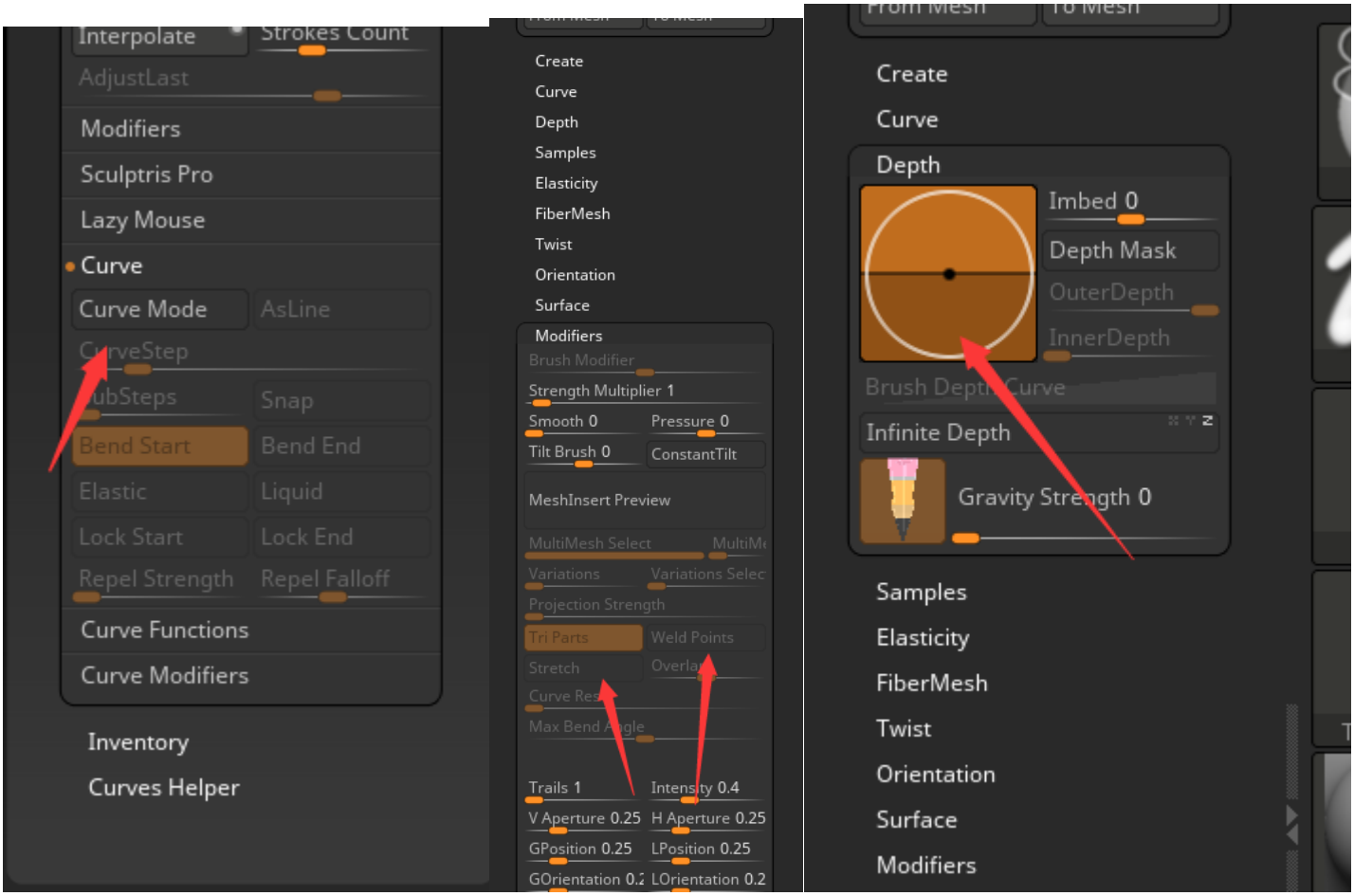
Also, I watch some records of some artist sculting face model. By watching how those faces come out, I tried to build my character'

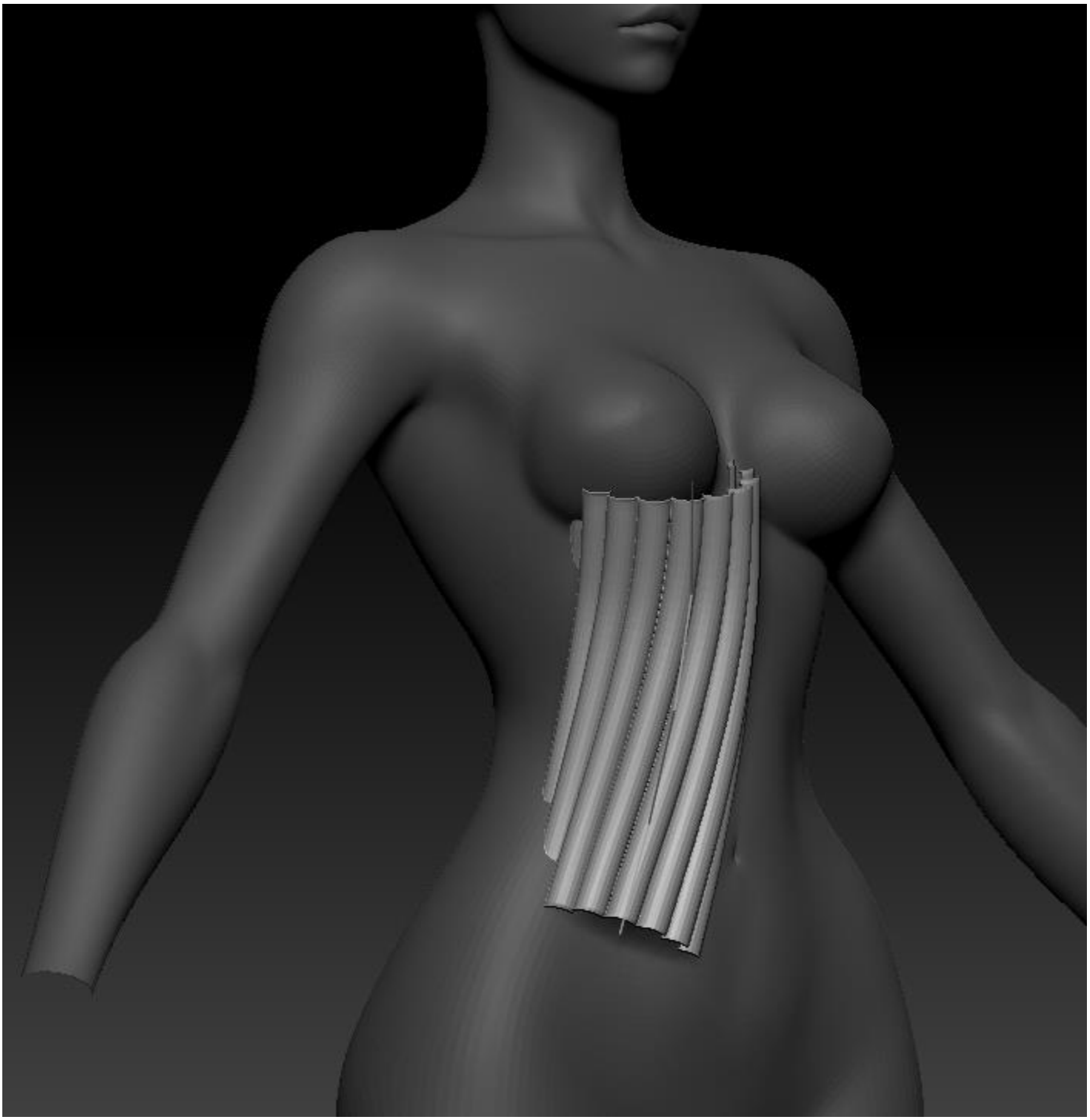
What is more, in this milestone I explored a way to make tubes that could cover character's body.

First duplicate some tubes in ZBrush. Define it as a new brush.

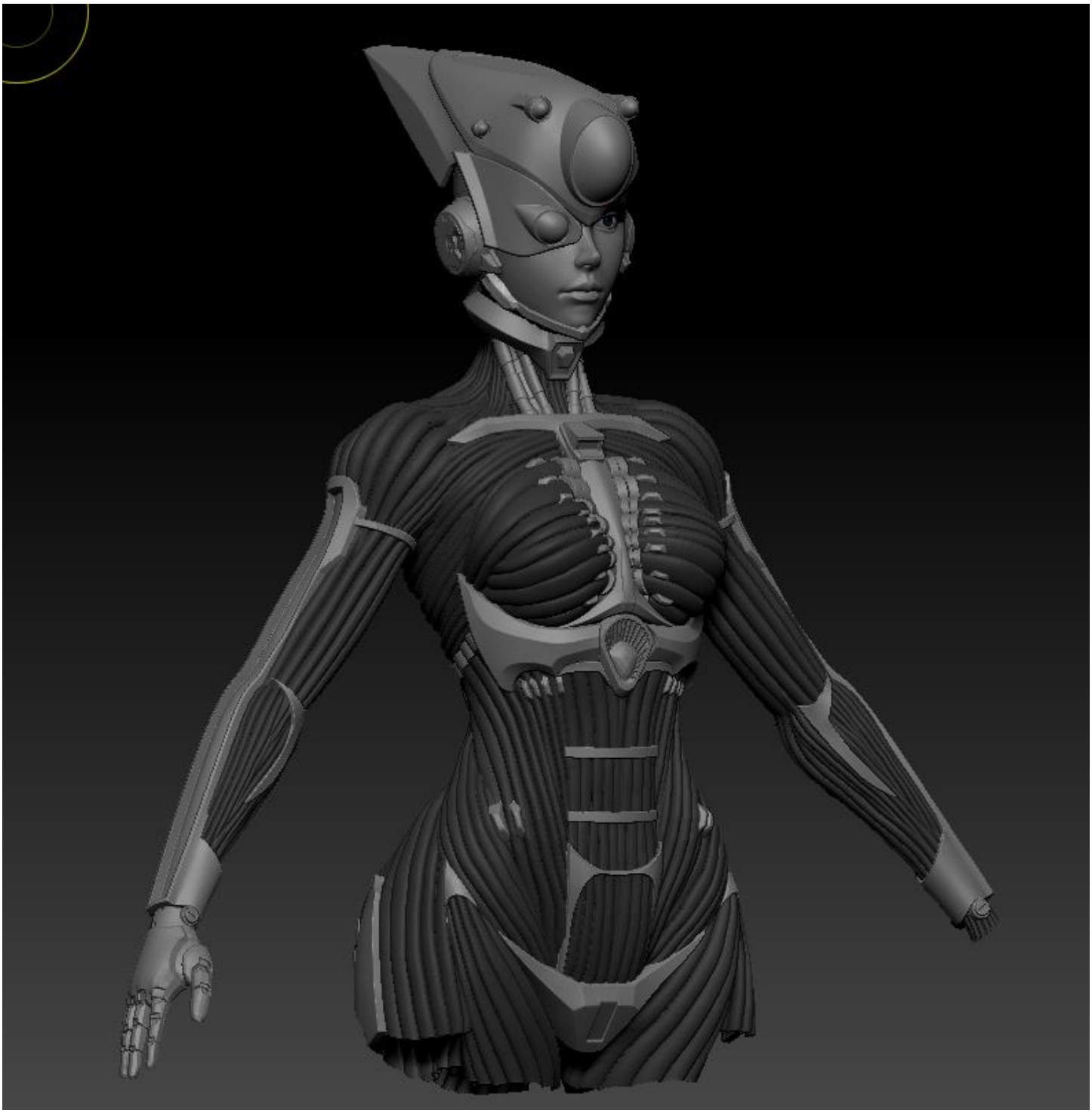


Then, turn on curve mode and weld points and stretch, then you can use this brush to draw on any surfaces. If you need to adjust the position of tubes, you can adjust the depth in brush pannel. Or you can use move brush to do some adjustment.

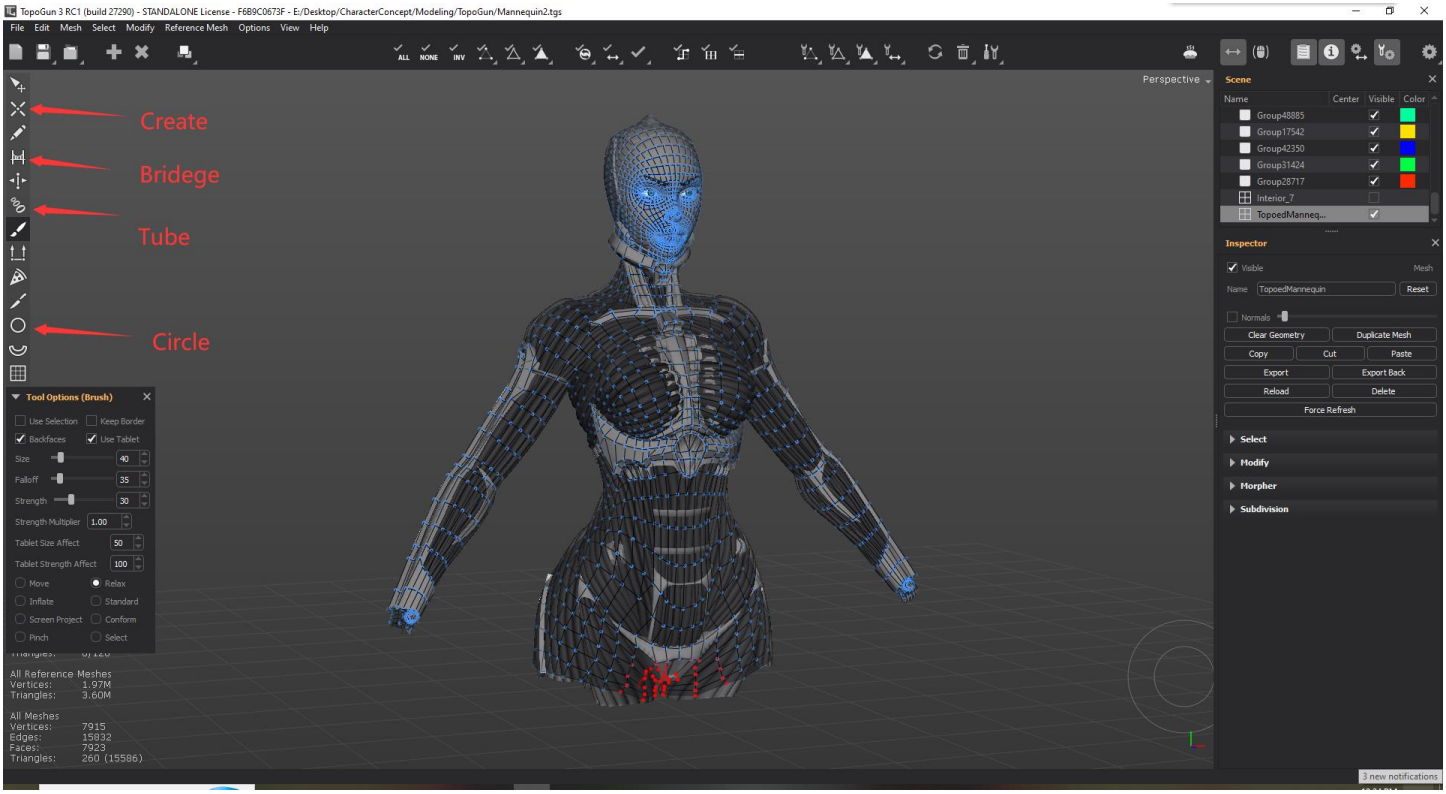


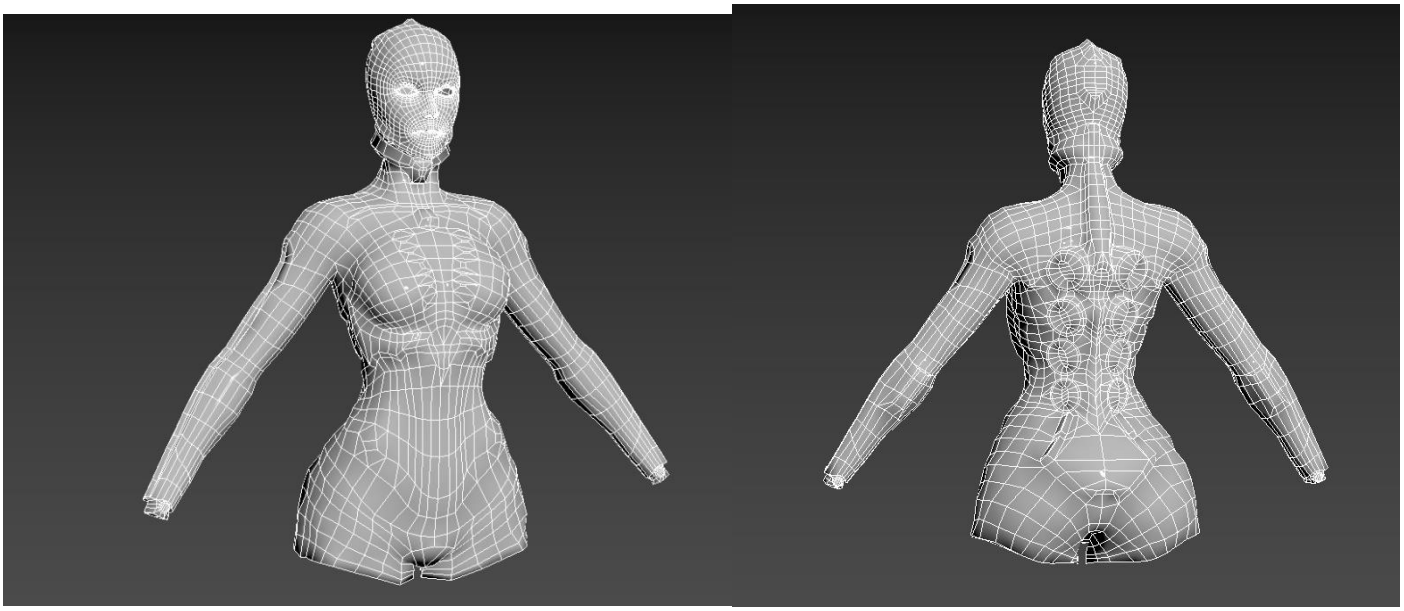


This is the highpoly I got for interior mannequin.



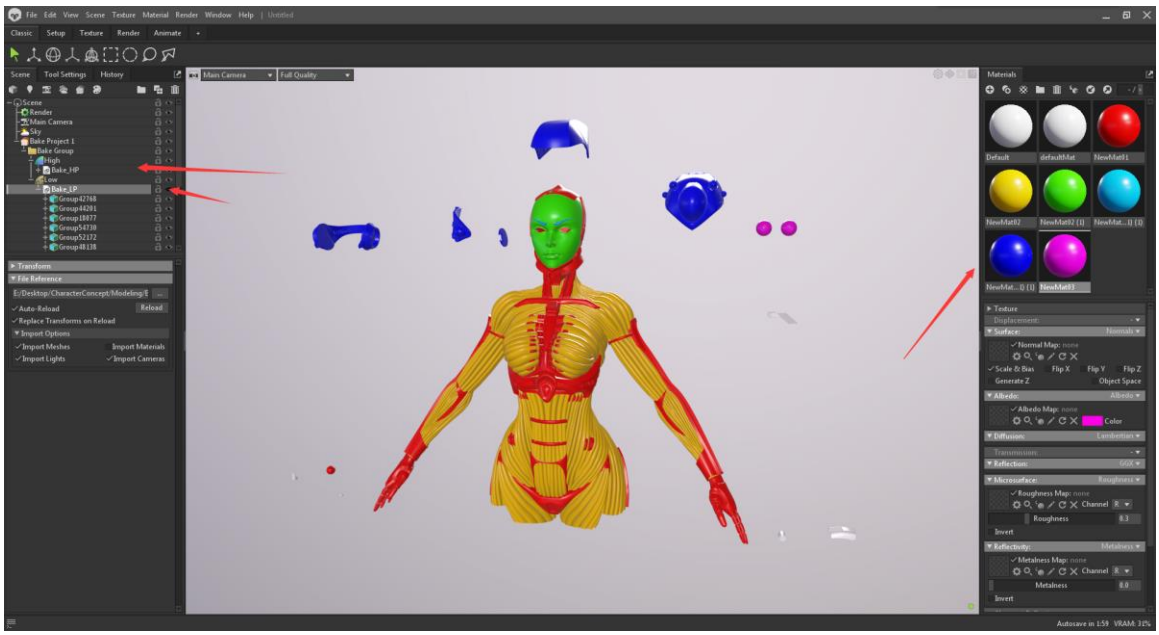
I retopoted this character in Topogun. Basicly is using create to to create those poly.

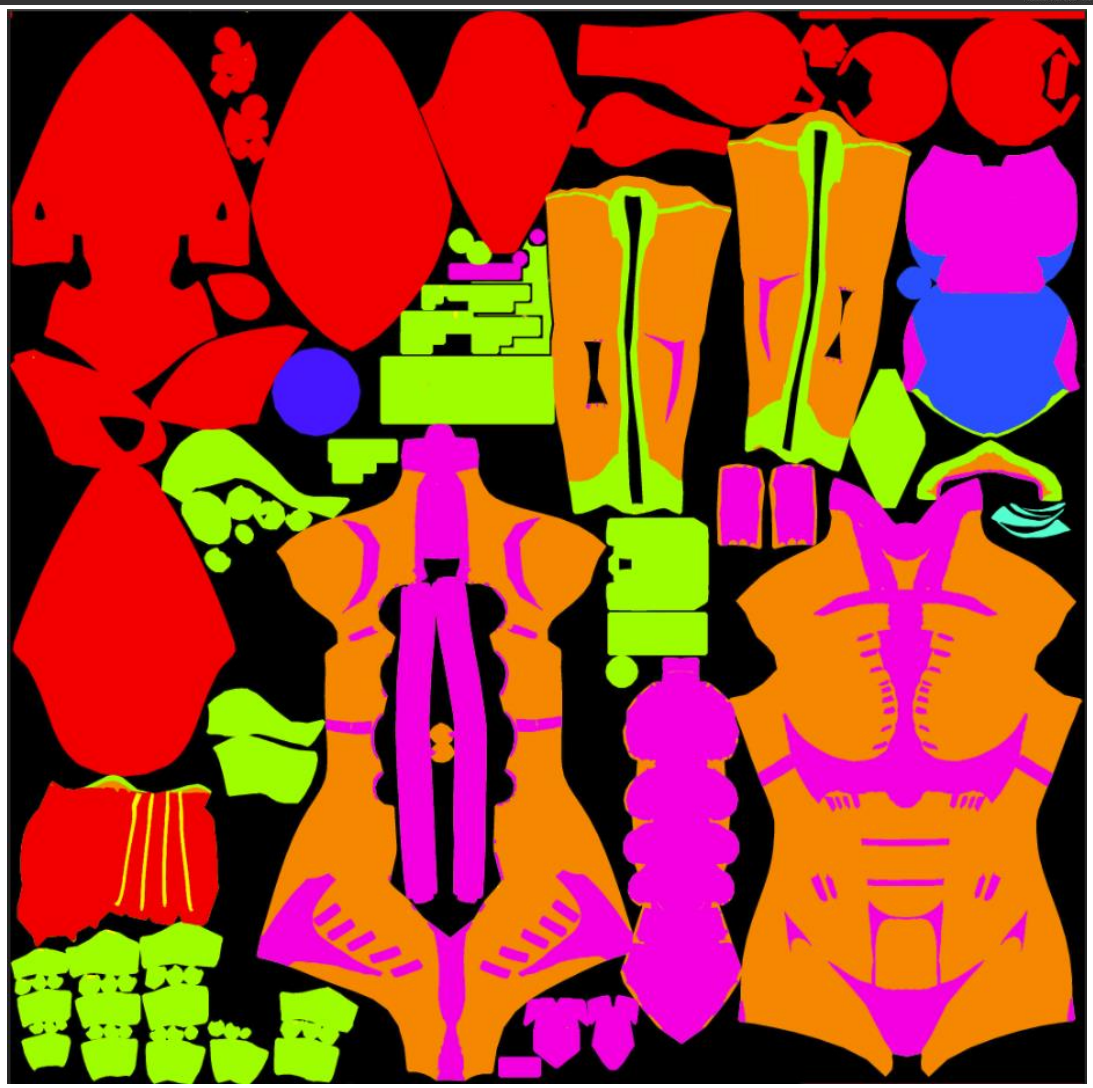




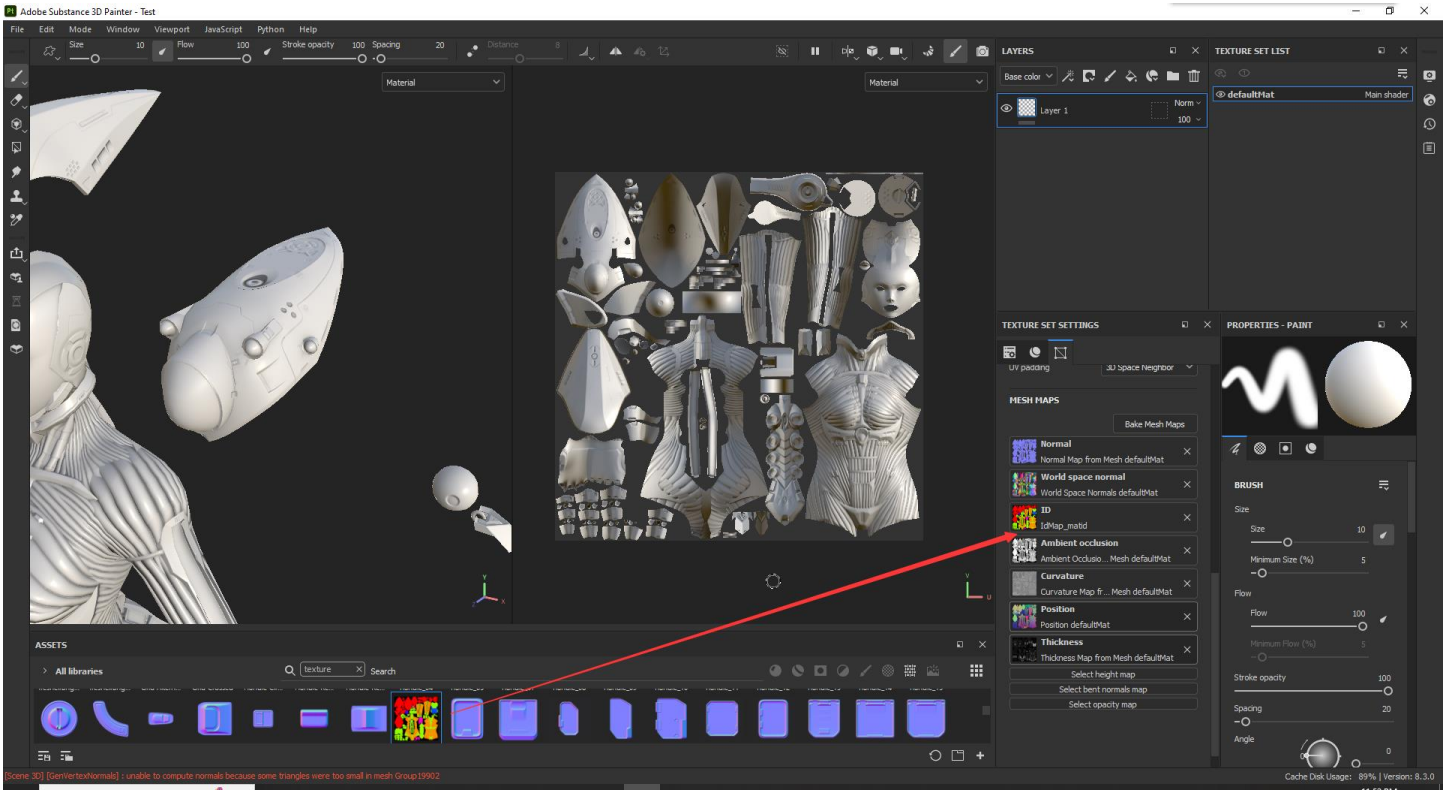
After unwarp the mesh in Max, I can have normal and AO maps for the interior of character.

In Marmoset ToolBag, I imported highpoly of mannequin with polygroups, and applying different colors od materials to different groups. And then I can bake material colors to a material Id map.

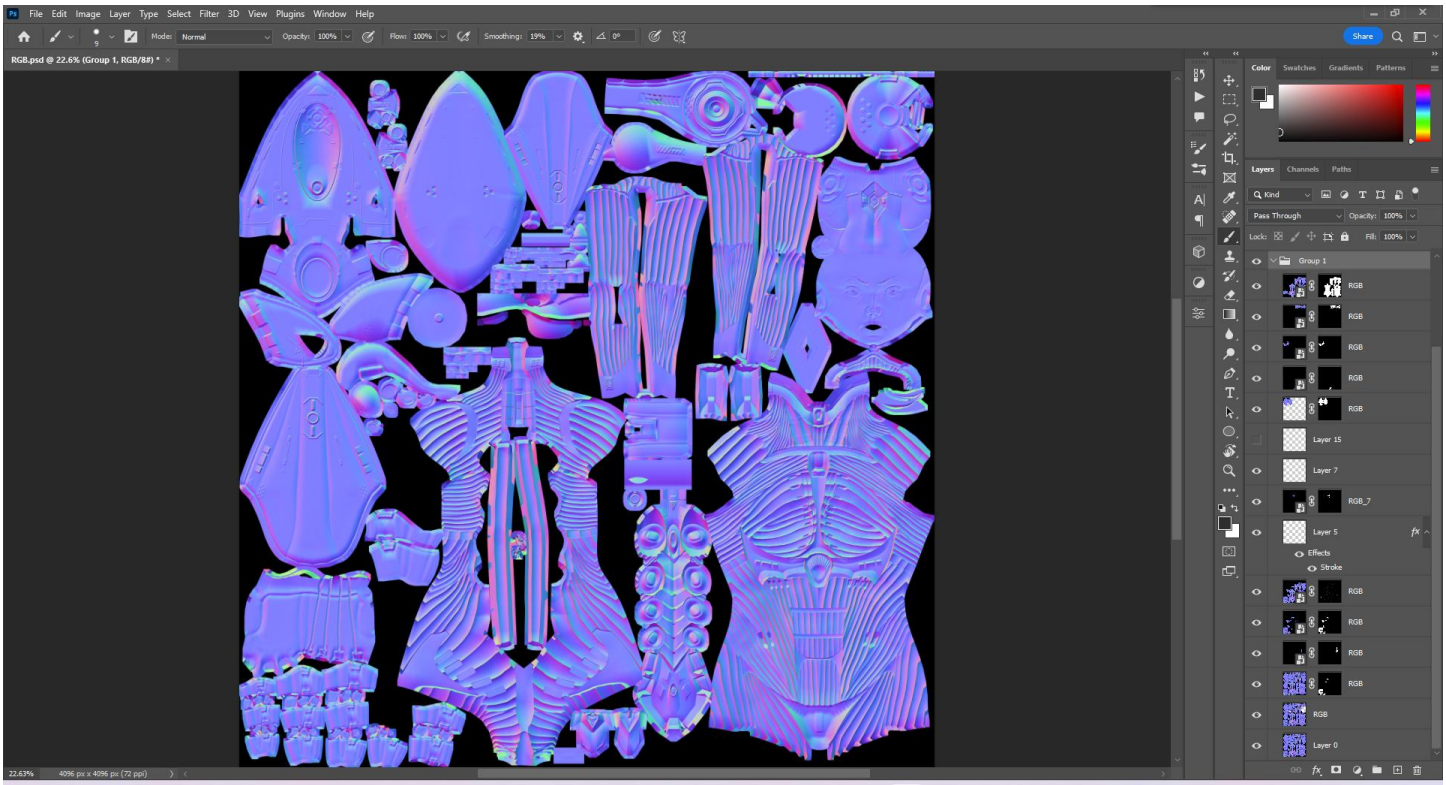




In substance painter, I can apply this material id map to the id channel. Base on that, I could create accurate black mask by simply choose different colors.

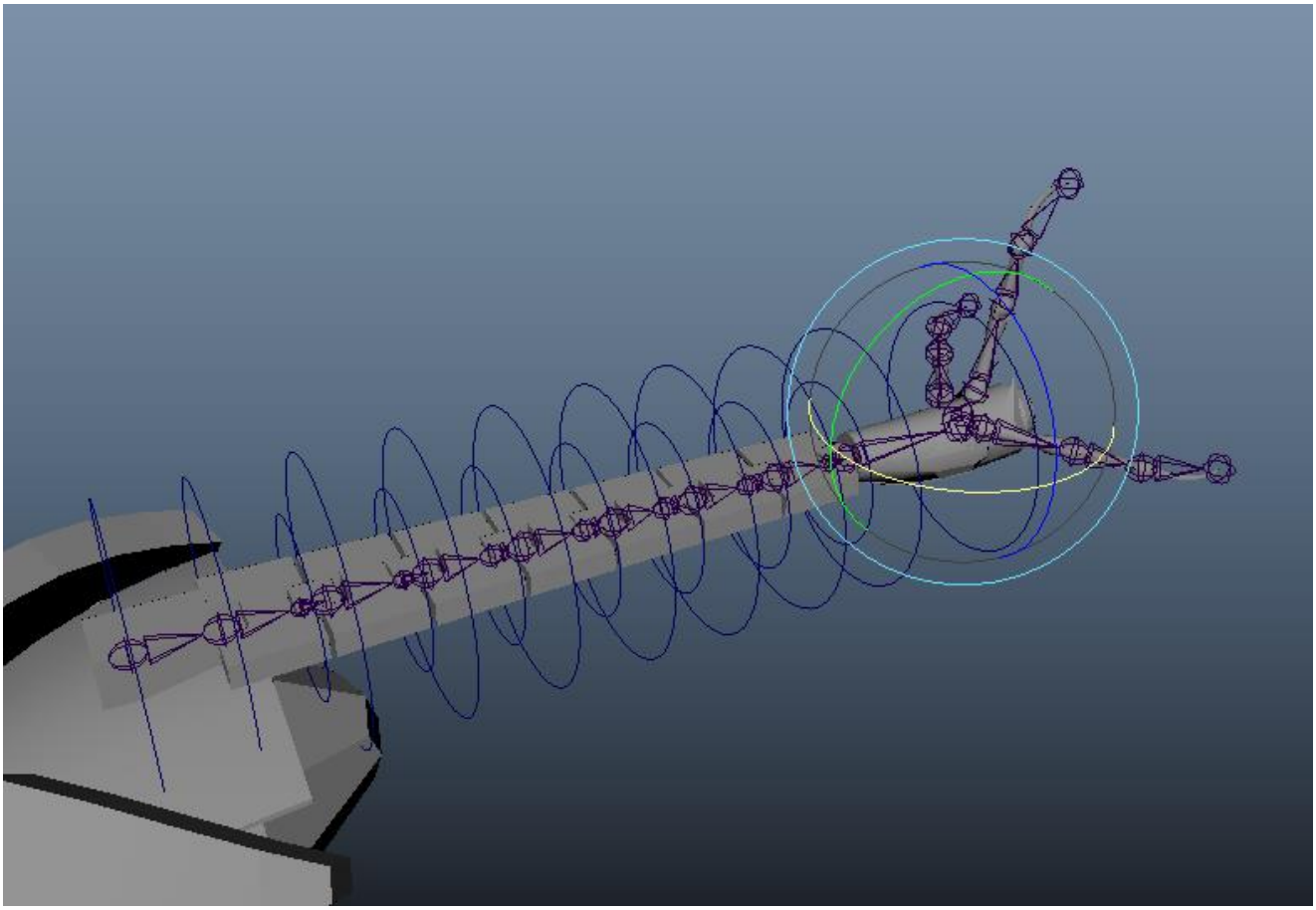


Because this is a complex entity, so at frist I baked the whole mannequin at once. And with the development process, I found different areas have bake isuues. So I baked several times and getting lots of map patches. I combined them all together in Photoshop.

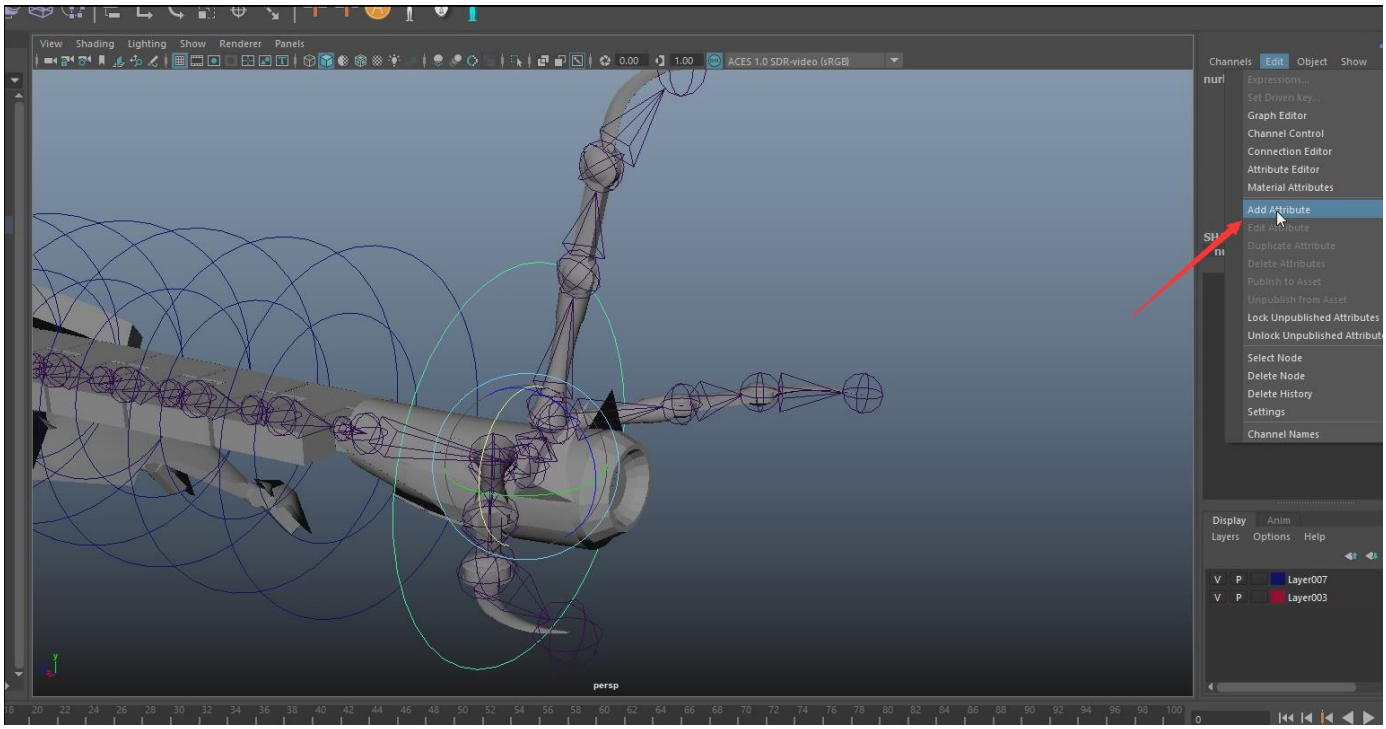


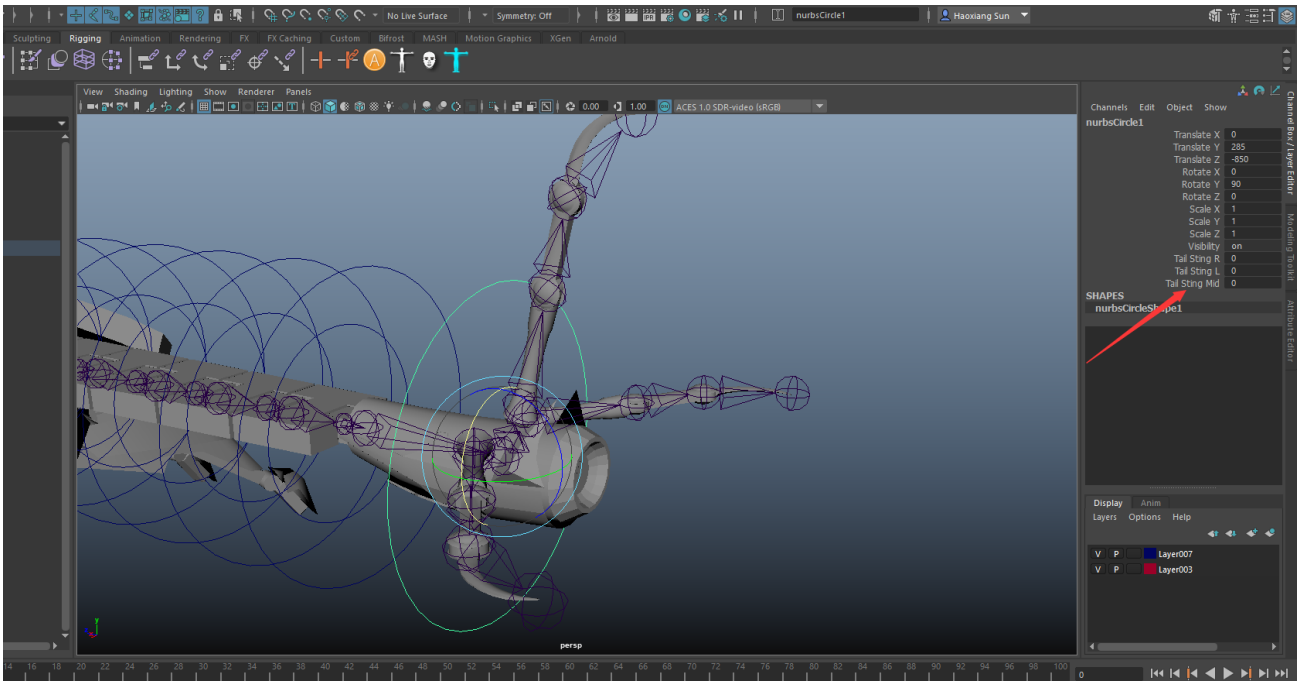
After baking map are ready, I applied different material on the modle and trying to match my concept as much as possible.

For rigging the mech. I created bones and controllors for its tail.

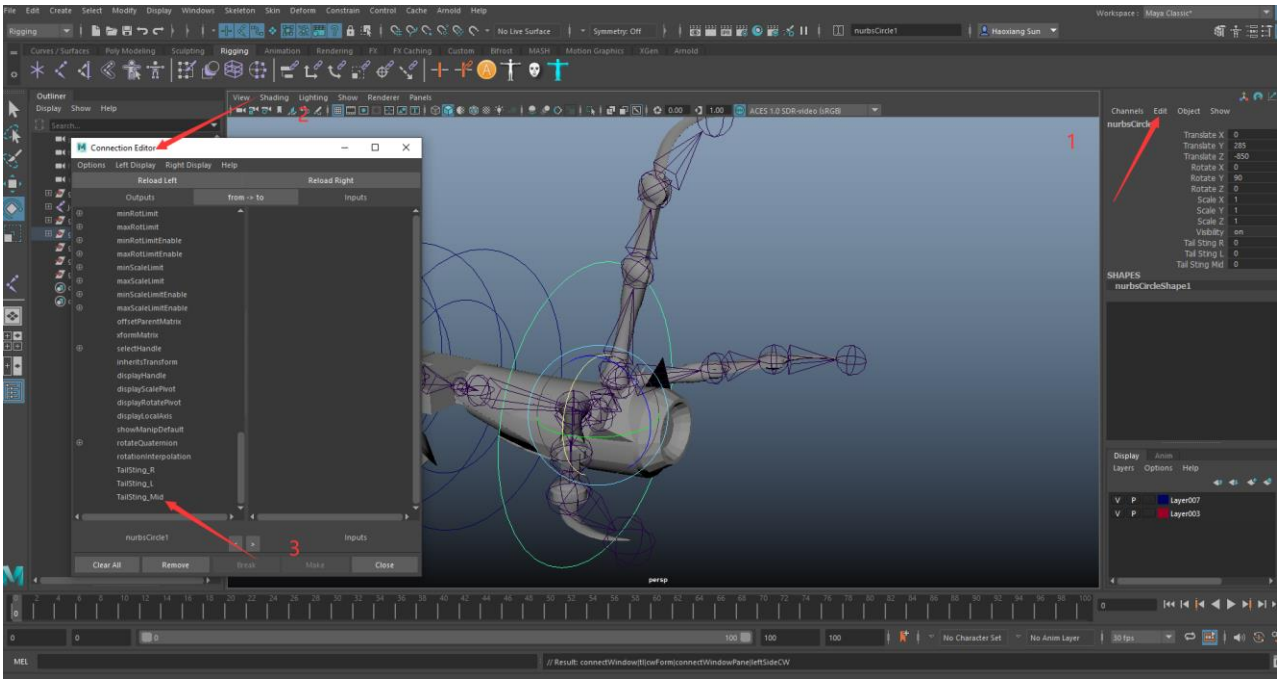


For the paws of the tail, I added three saperate attributes for the controllor of paws.

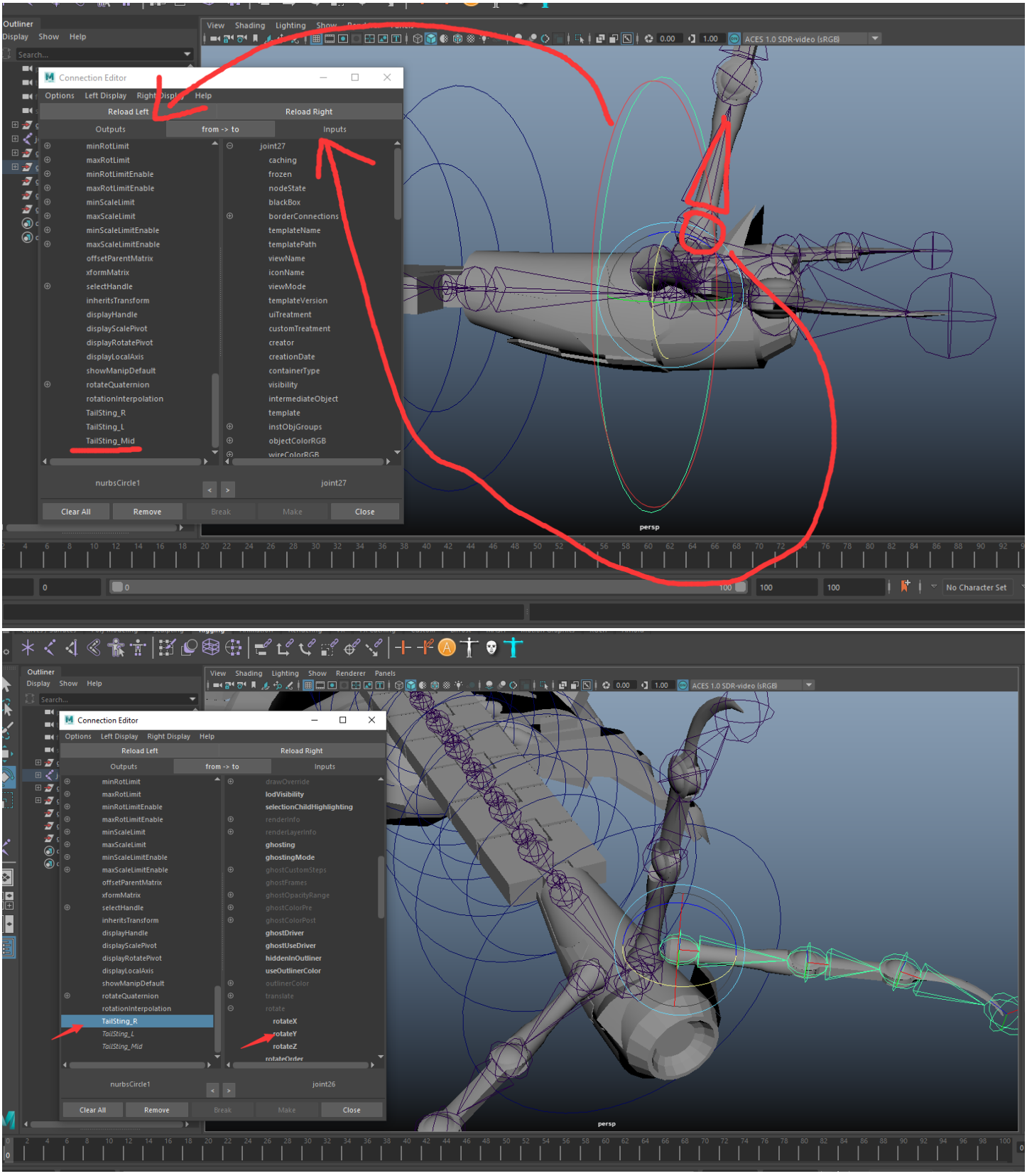




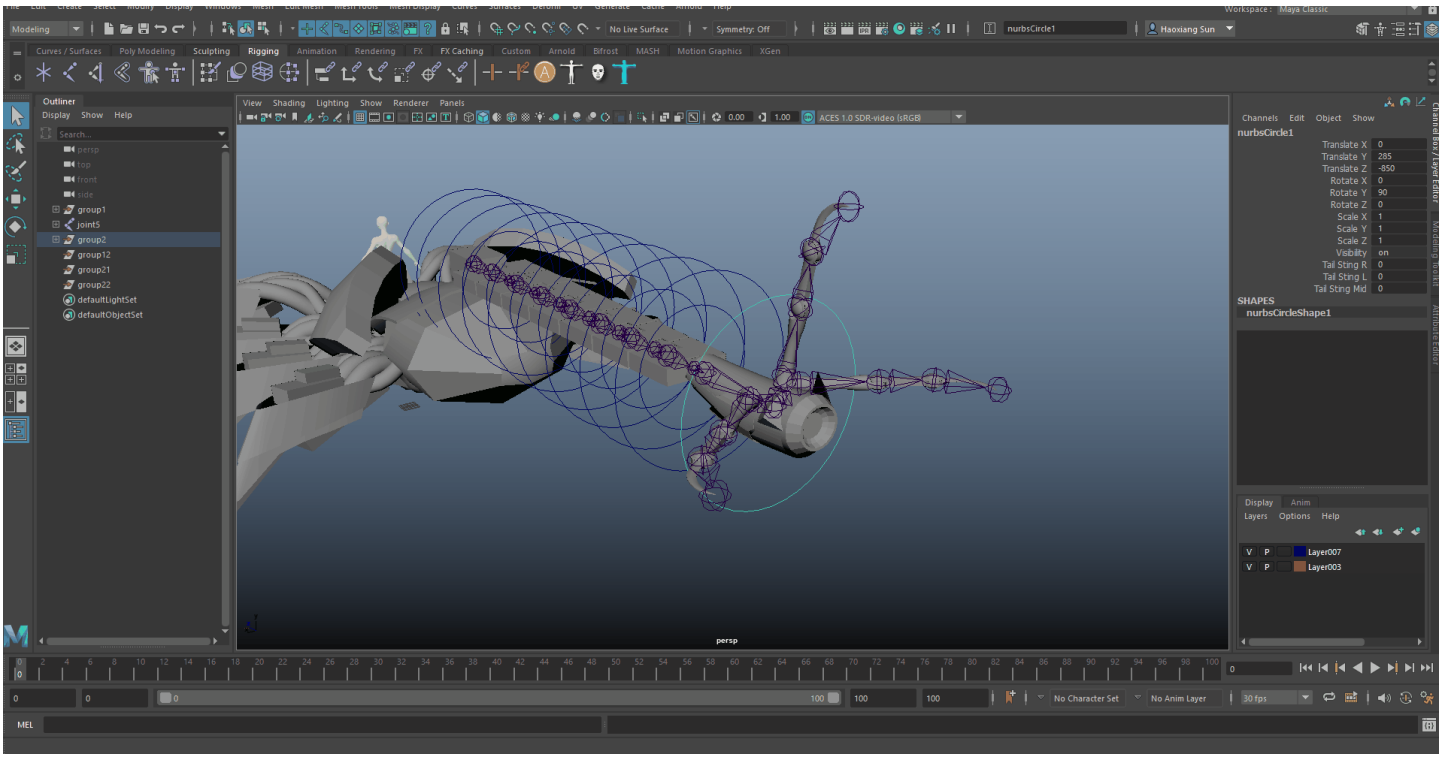
Go to the connection editor,loading the contollor to the left side.



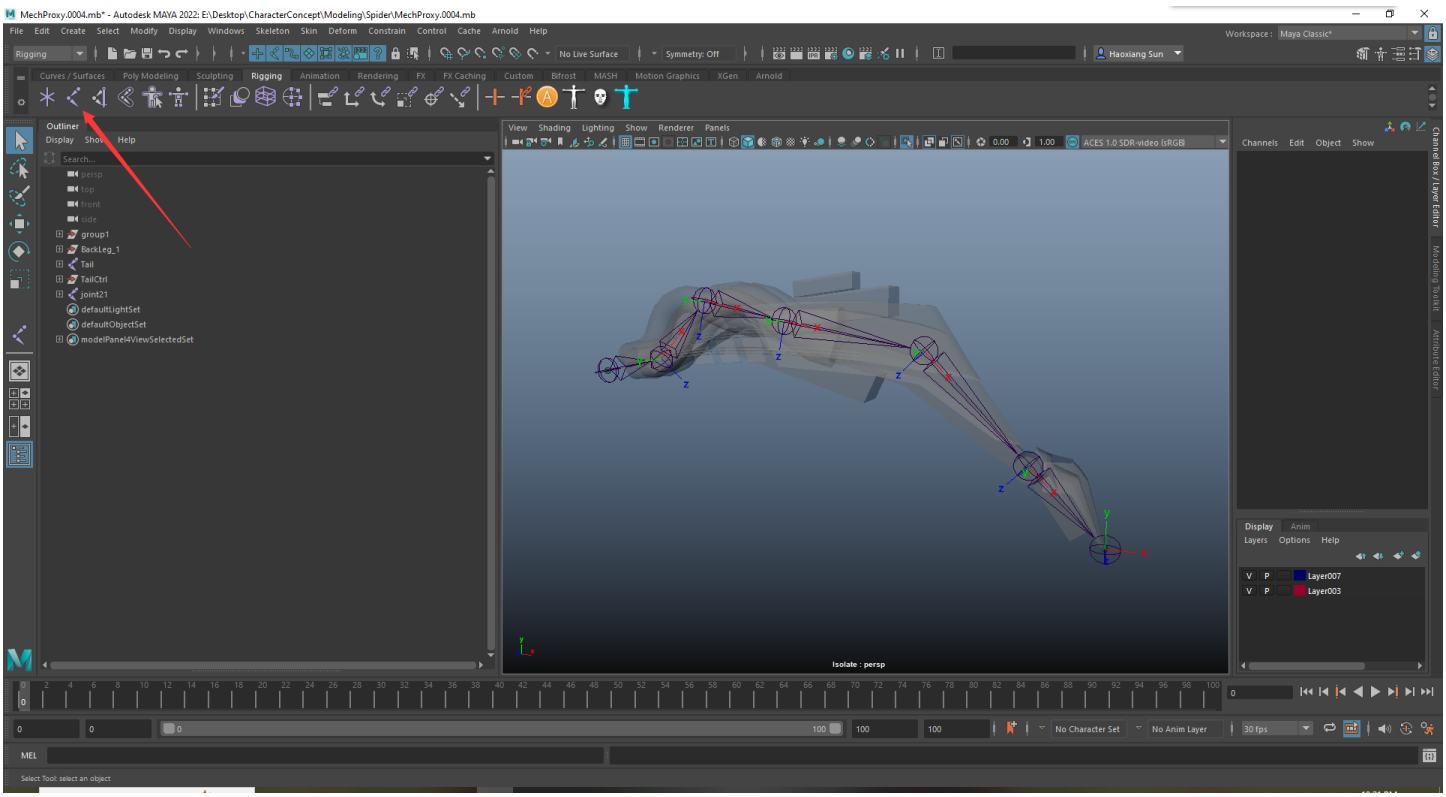
And then Set the corresponding attributes to control the corresponding bones.



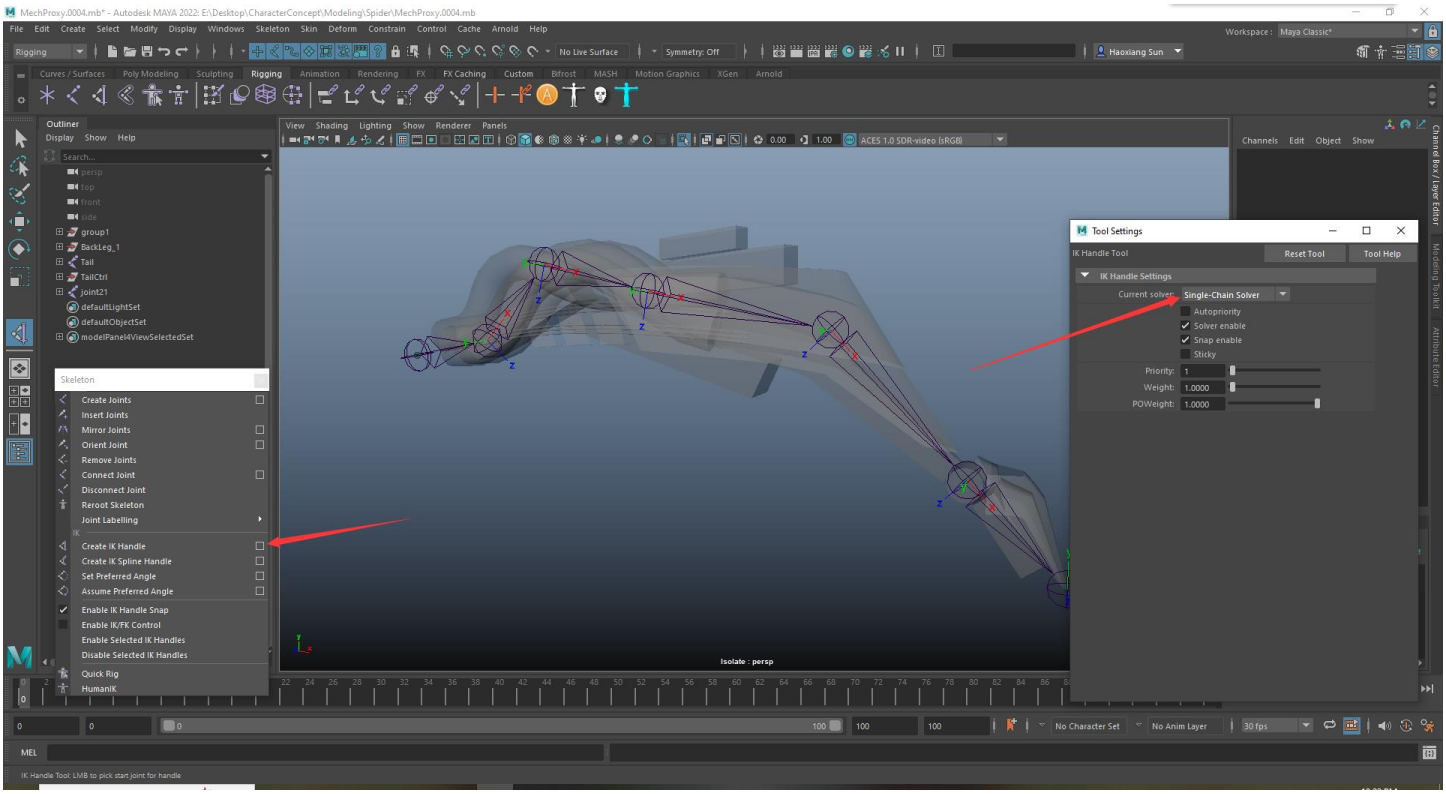
And now you can open and close the claws by adjusting the corresponding attribute.

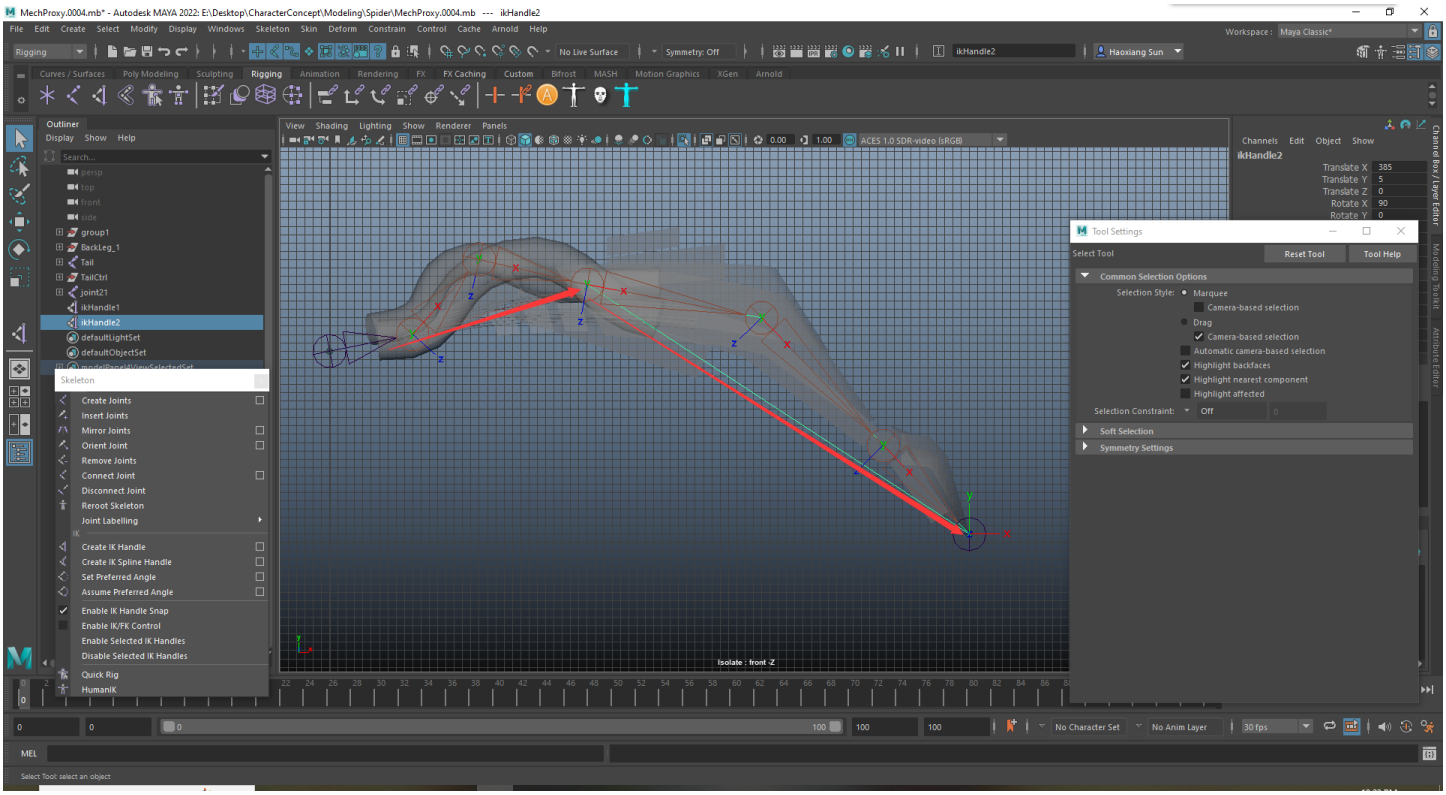


For the legs part, I used bone tool to create bones, I need to snap those bone's nobs to the position that I want to bend.

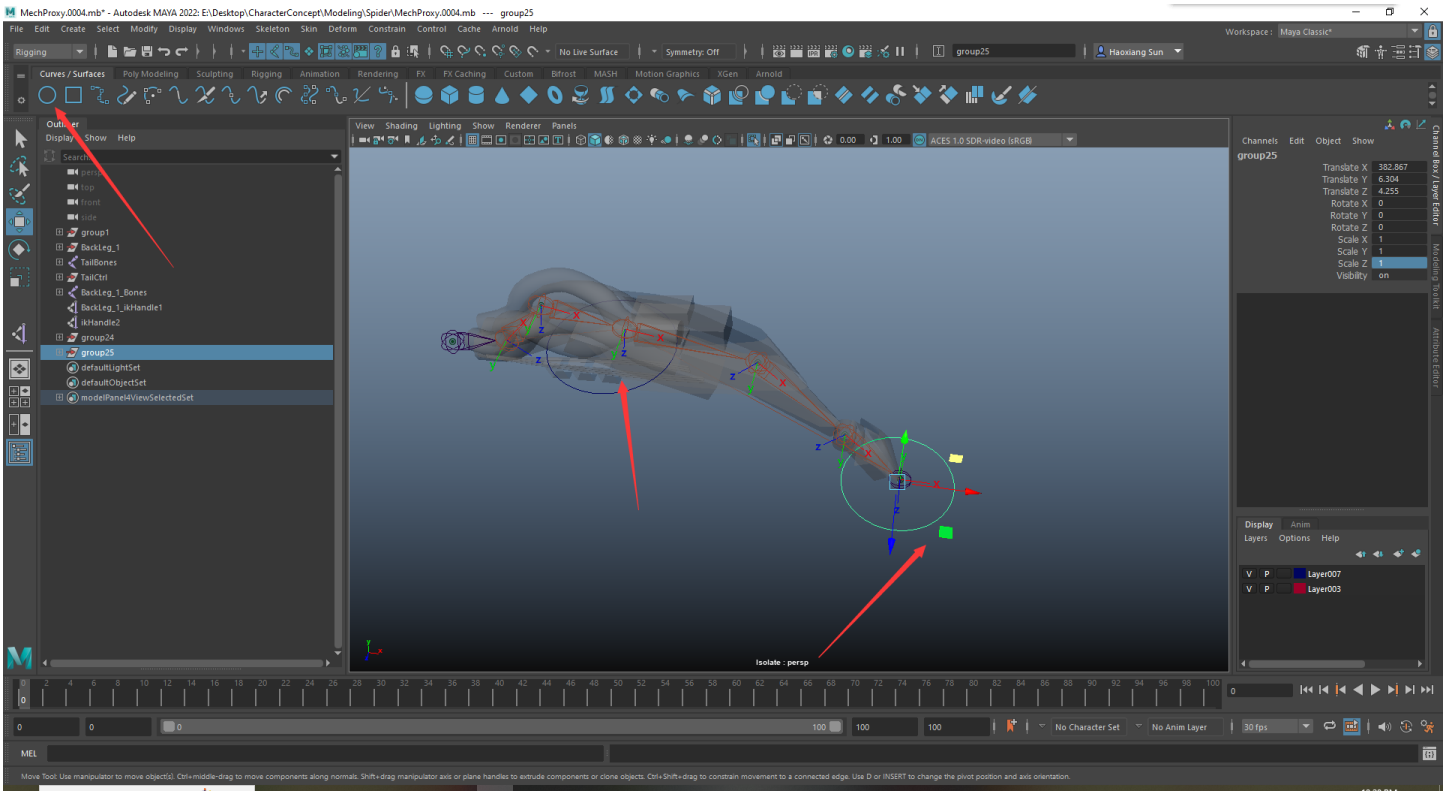


Because legs are different from other bones. I need to set IK handle foe the leg, which making it easier to use postion imformation tokey frame the legs. And leges only need to move in one direction, in IK handle option, I selected single-chain solver.

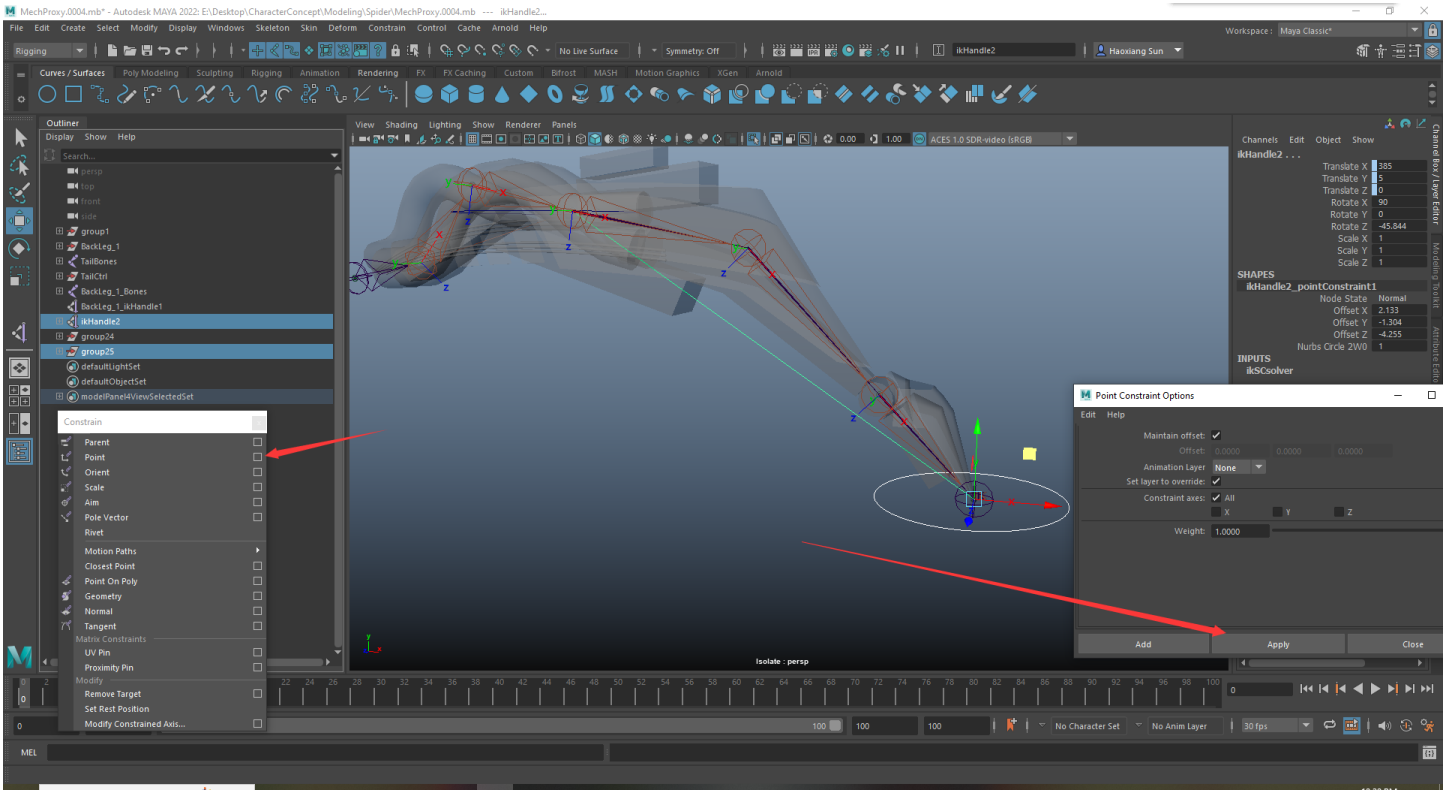

Tool Settings
IK Handle Tool
Reset Tool
Tool Help
IK Handle Settings
Current solver:
Single-Chain Solver
Autopriority
Solver enable
Snap enable
Sticky
Priority:
Weight:
POWeight:
Create Joints
Insert Joints
Mirror Joints
Orient Joint
Remove Joints
Connect Joint
Disconnect Joint
Reroot Skeleton
Joint Labelling
Create IK Handle
Create IK Spline Handle
Set Preferred Angle
Assume Preferred Angle
Enable IK Handle Snap
Enable IK/FK Control
Enable Selected IK Handles
Disable Selected IK Handles
Quick Rig
HumanIK
Isolate : persp

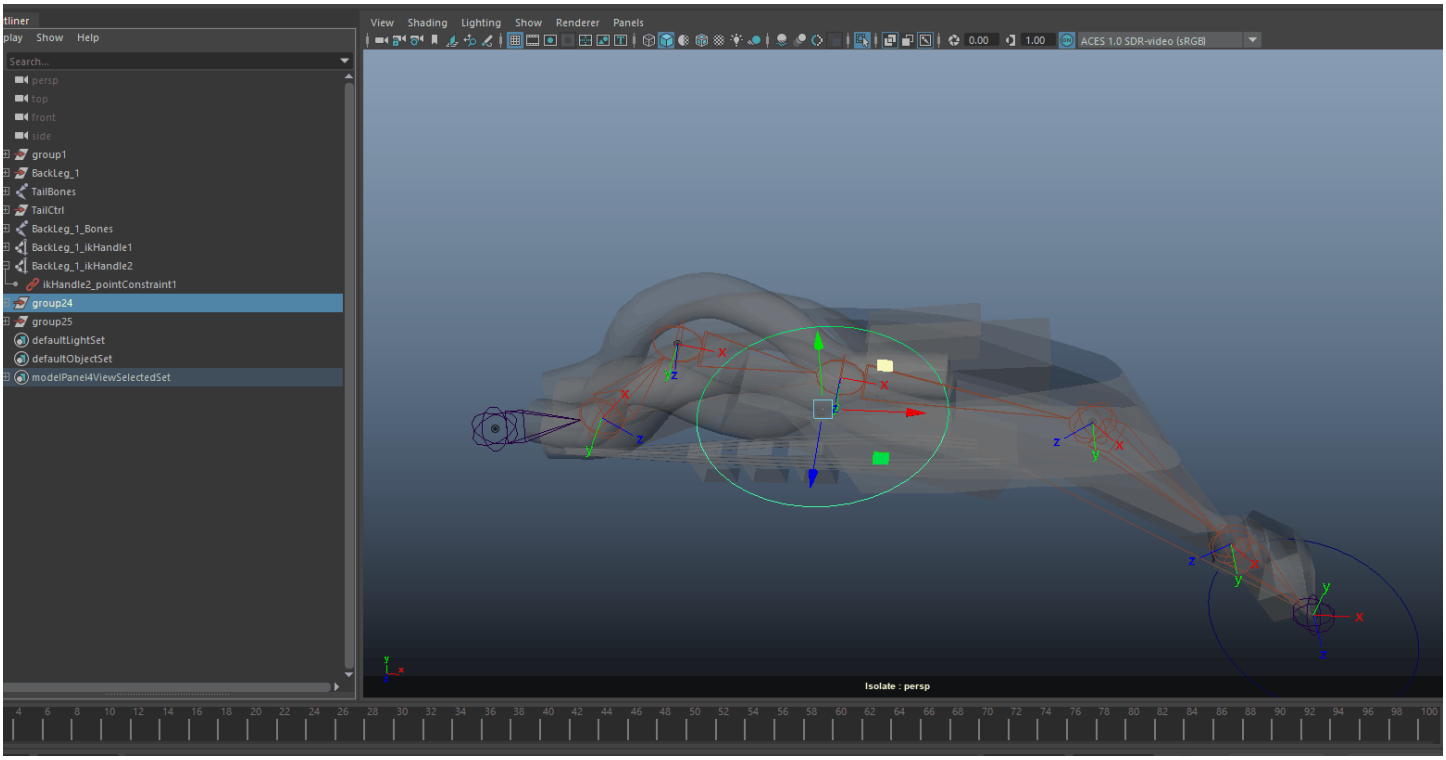

Tool Settings
Select Tool
Reset Tool
Tool Help
Common Selection Options
Selection Style:
Marquee
Camera-based selection
Drag
Camera-based selection
Automatic camera-based selection
Highlight backfaces
Highlight nearest component
Highlight affected
Selection Constraint:
Soft Selection
Symmetry Settings
Create Joints
Insert Joints
Mirror Joints
Orient Joint
Remove Joints
Connect Joint
Disconnect Joint
Reroot Skeleton
Joint Labelling
Create IK Handle
Create IK Spline Handle
Set Preferred Angle
Assume Preferred Angle
Enable IK Handle Snap
Enable IK/FK Control
Enable Selected IK Handles
Disable Selected IK Handles
Quick Rig
HumanIK
Isolate : front -Z

I set 2 controllers for each leg, the upper one can make various movement to the legs. The down part can set feet's position directly.

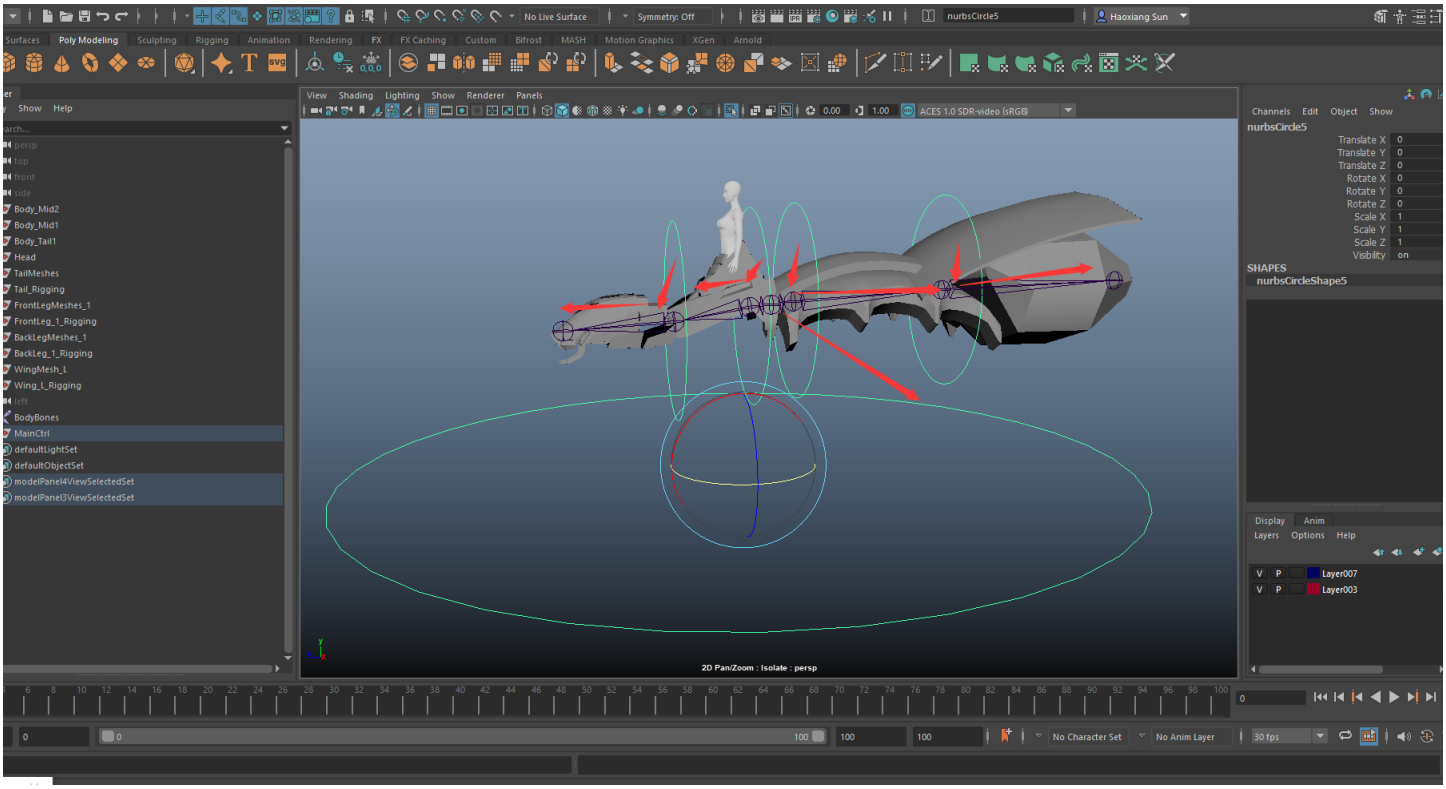


Then, I just need to use position constrain option to constrain those tow handles.

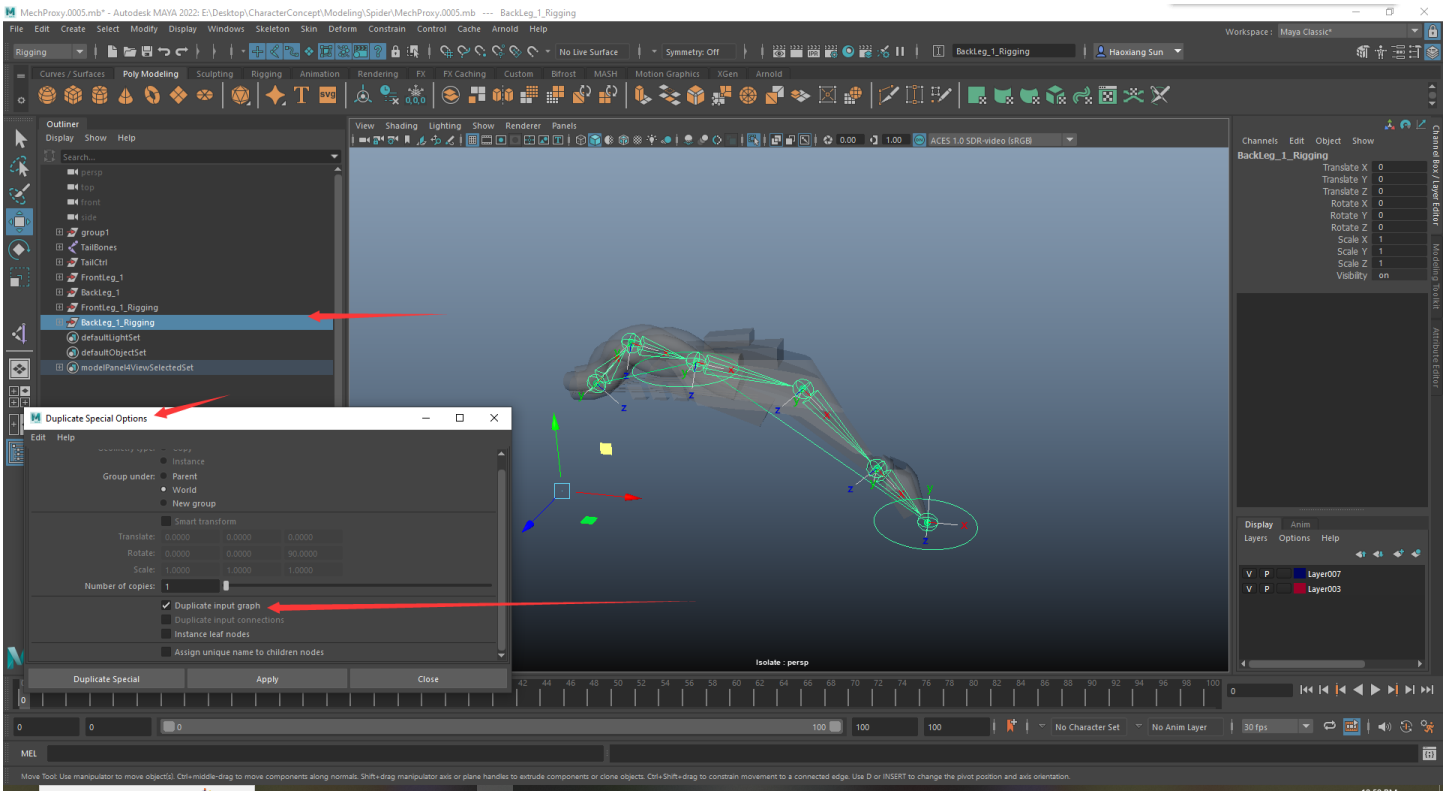




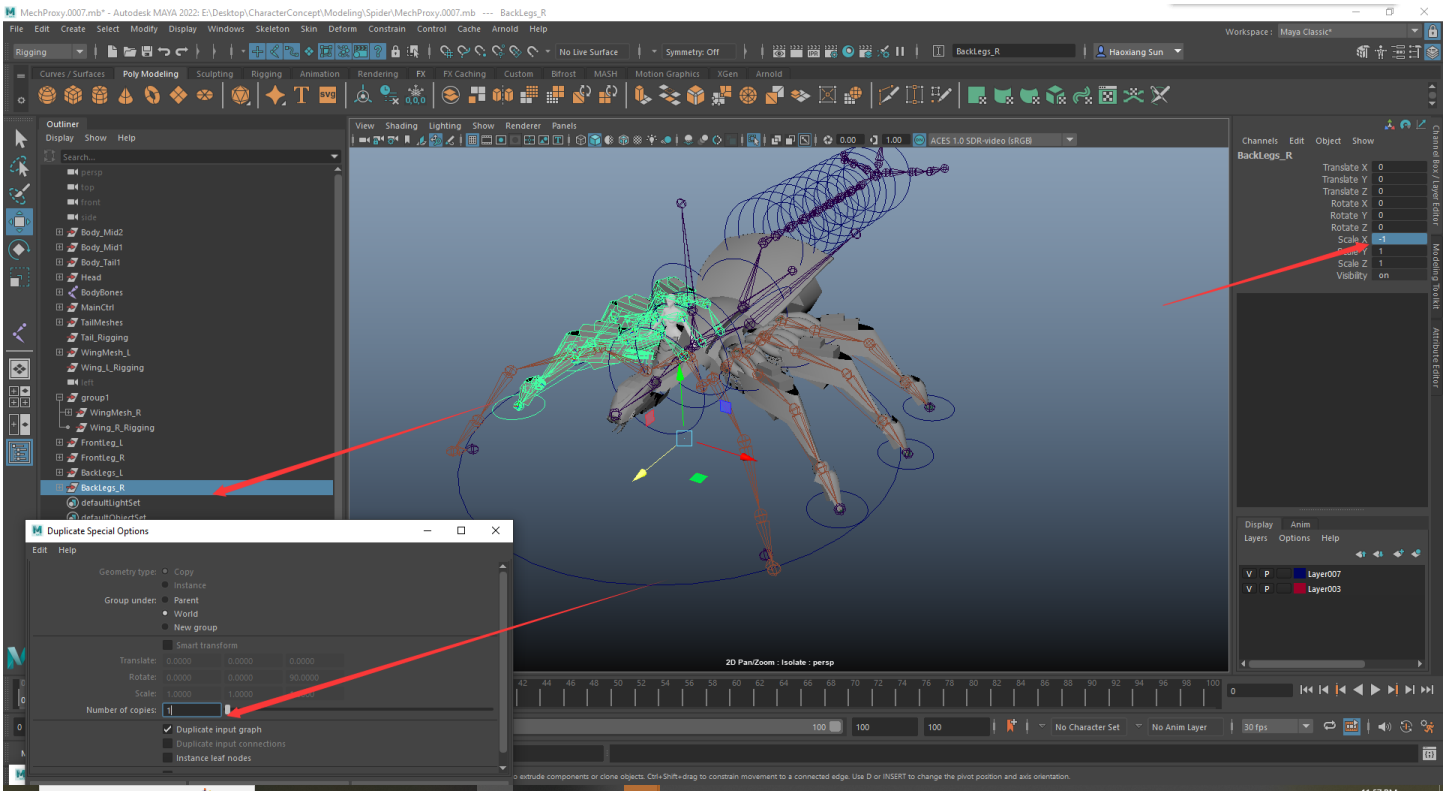
For body part of mech, I used same techniques beside I constrained concollers one by one. And I constrained those controllers to correct bones.



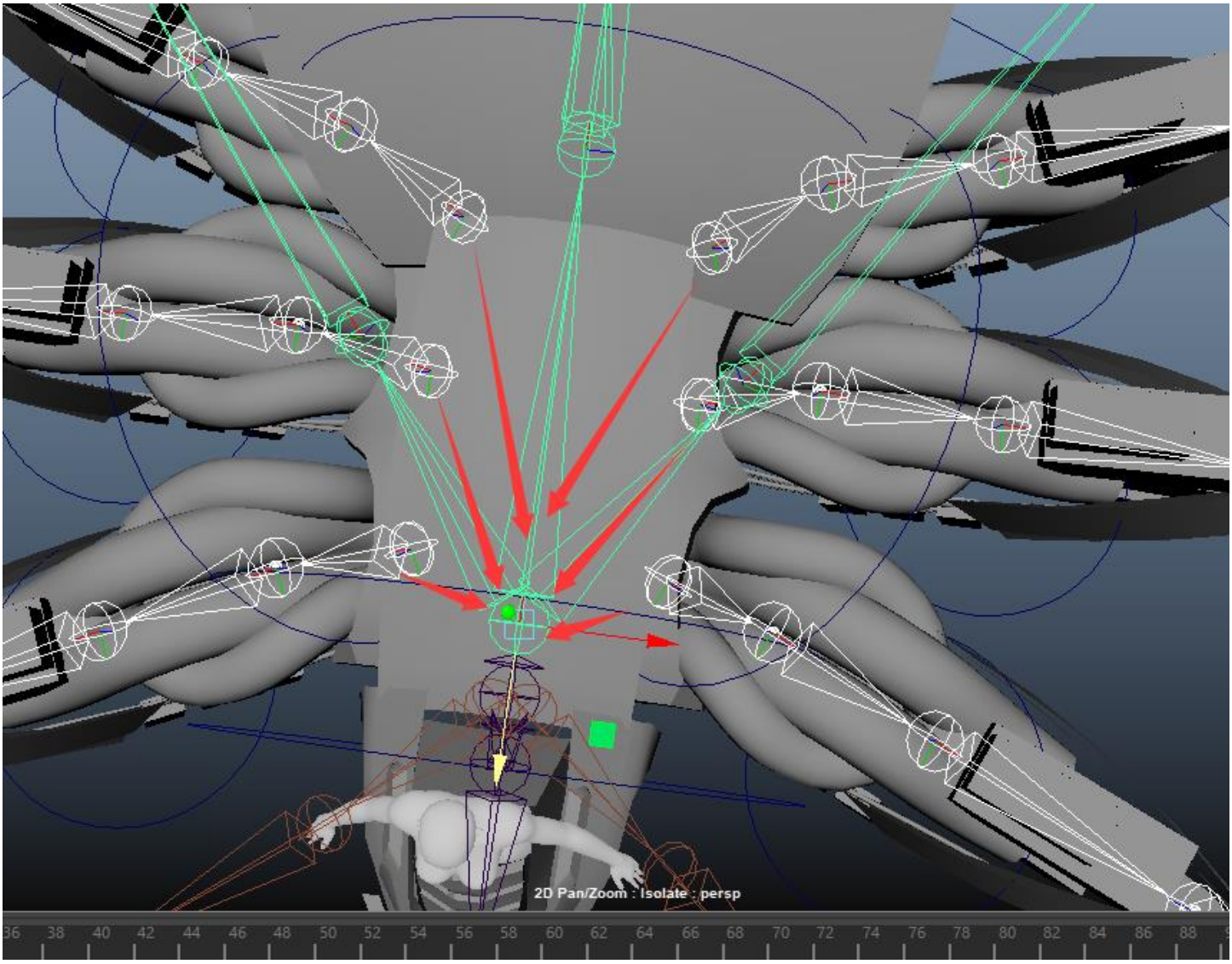
Once I finished one leg rigging system. I can just use special duplicate to make 8 copies. In oder to keep rigging imformation, I need to check the duplicate input graph in special duplicate options.



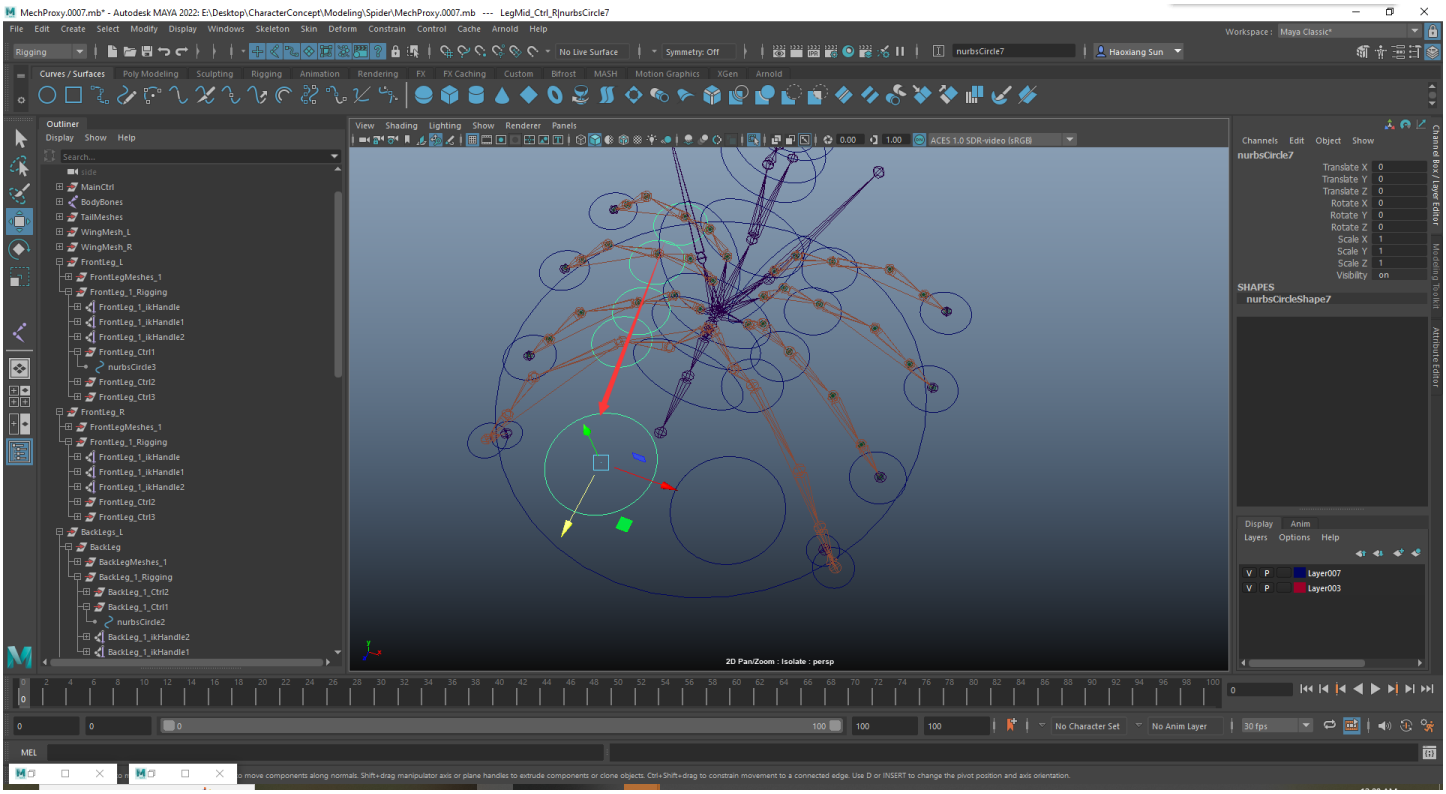
Once copied left side, I can group the left side and special duplicate again. And symmetry them by change the X axis scale to -1.

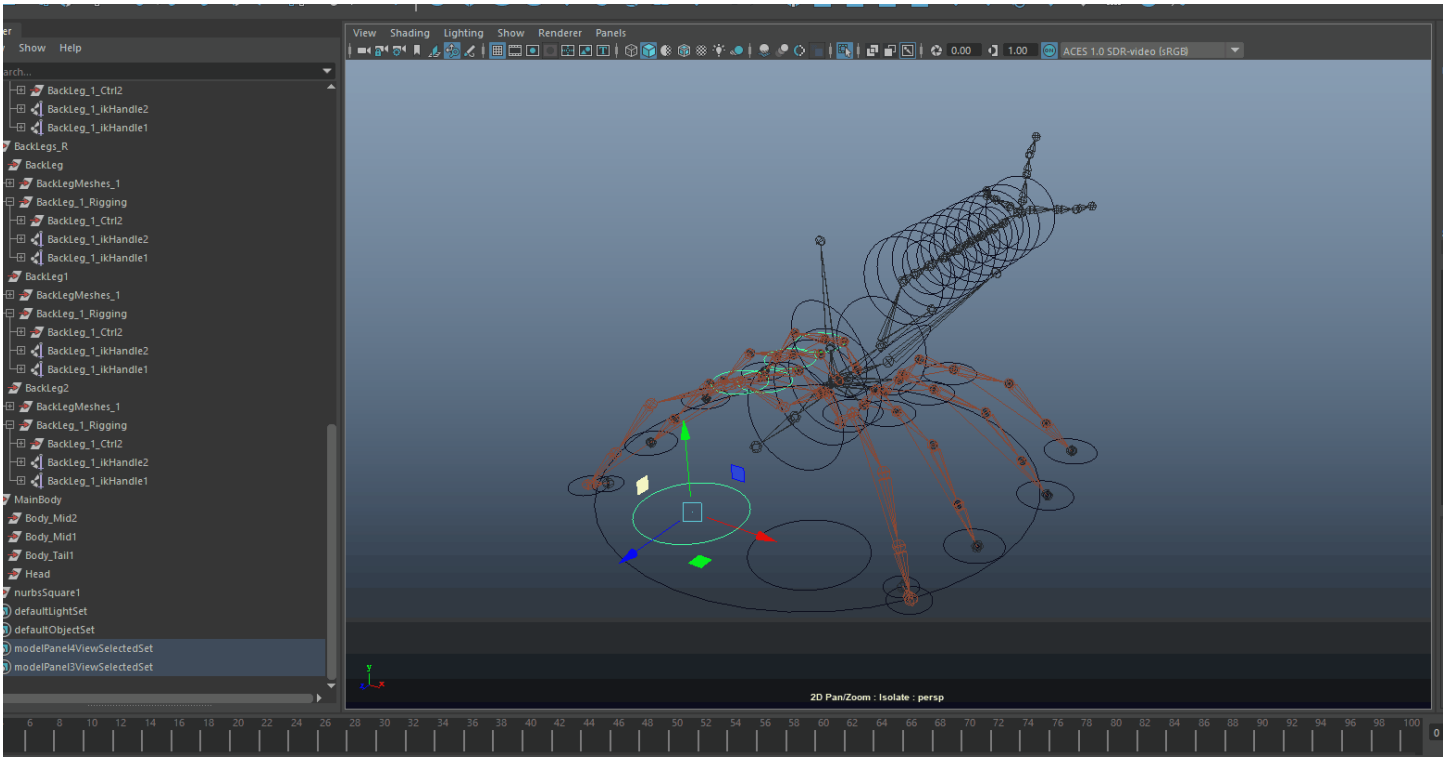


Inorder to connect all those saperate bone to main body, what I need to do is select all of those root bones od part andthem slect the main body bone, using P to parent them.

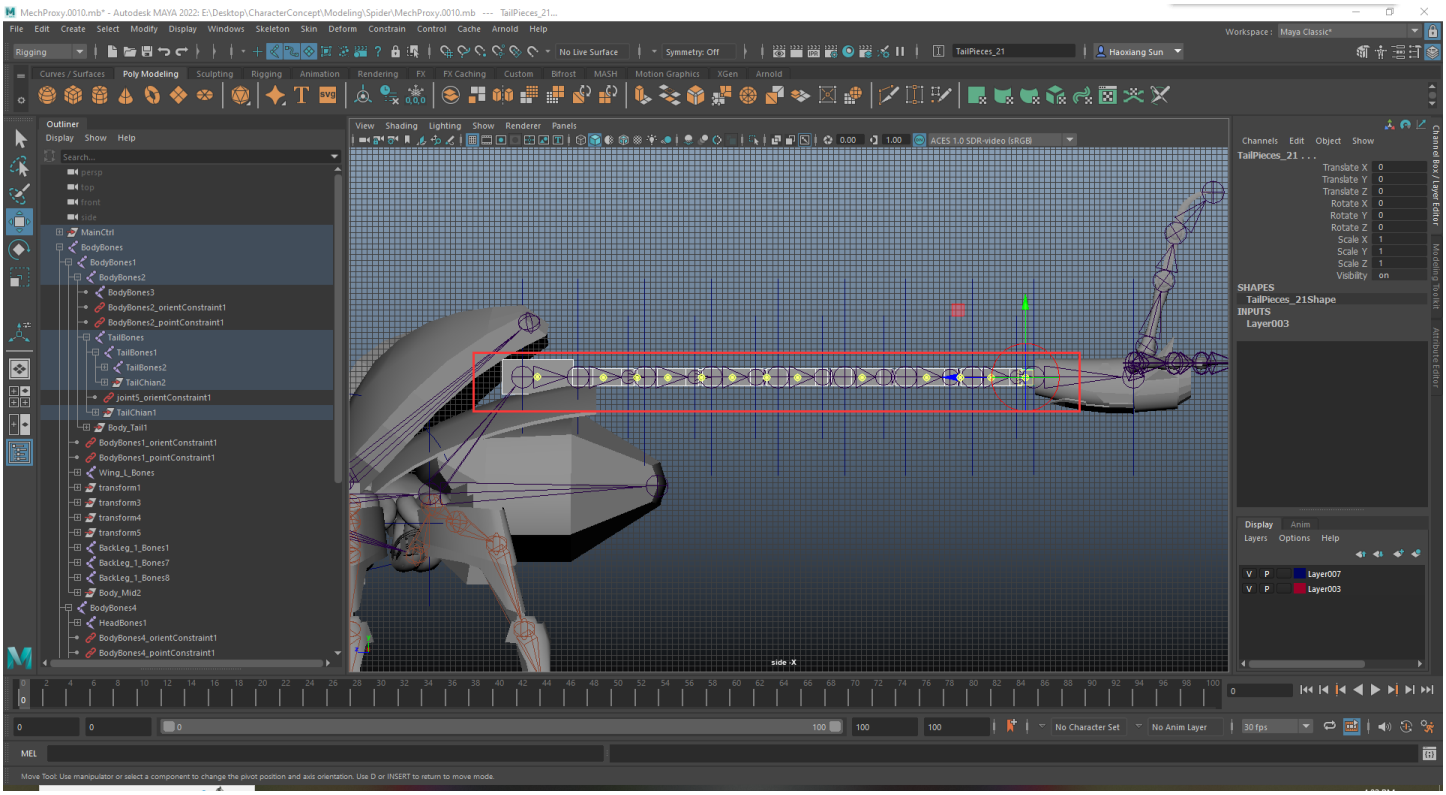


In orther to make it easier to have various leg movement, I parented all of those one side controllers to another main conctroller.

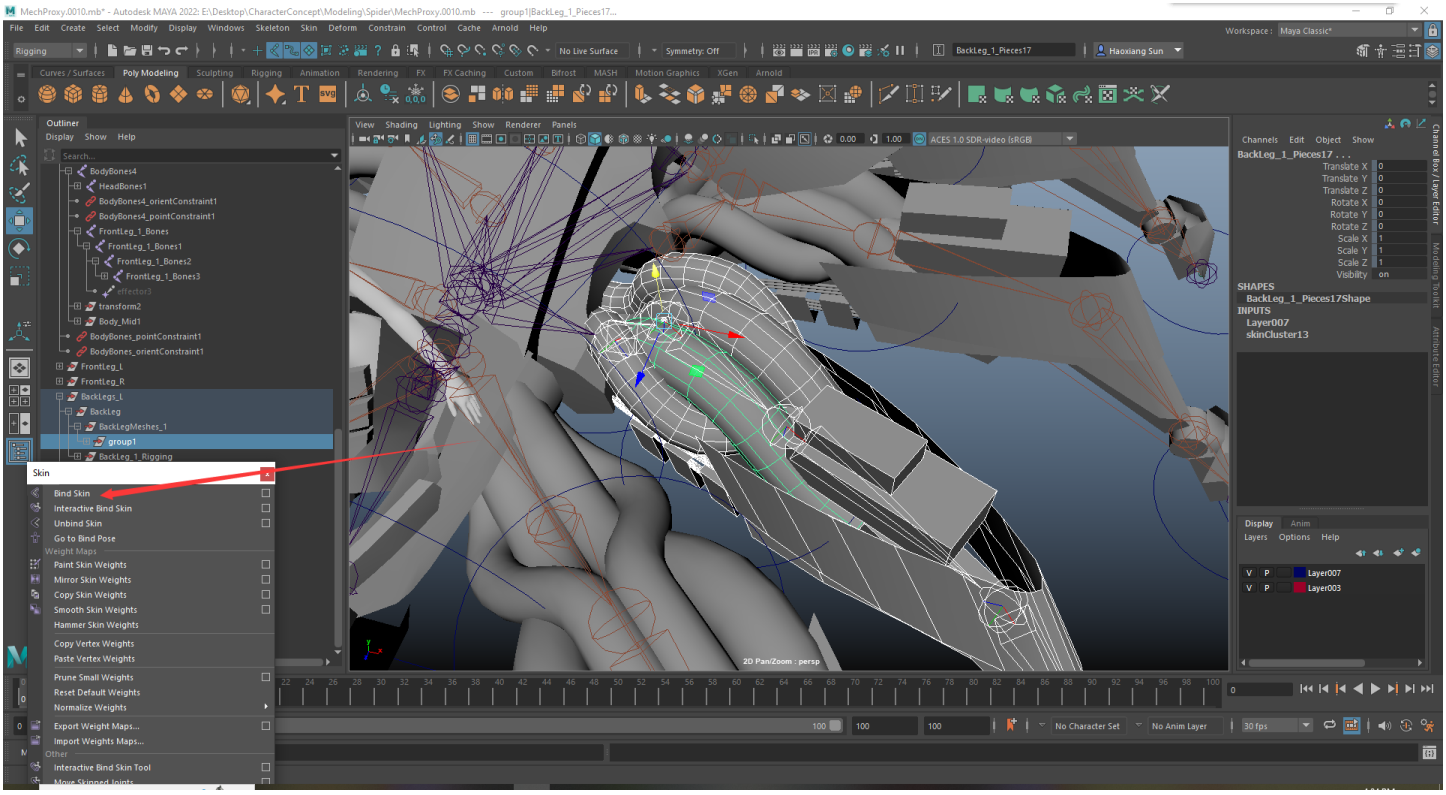

MechProxy.0007.mb* - Autodesk MAYA 2022: E:\Desktop\CharacterConcept\Modeling\Spider\MechProxy.0007.mb --- LegMid_Ctrl_R|nurbsCircle7
File Edit Create Select Modify Display Windows Skeleton Skin Deform Constrain Control Cache Arnold Help
Outliner
Display Show Help
MainCtrl
BodyBones
TailMeshes
WingMesh_L
WingMesh_R
FrontLeg_L
FrontLegMeshes_1
FrontLeg_1_Rigging
FrontLeg_1_ikHandle
FrontLeg_1_ikHandle1
FrontLeg_1_ikHandle2
FrontLeg_Ctrl1
nurbsCircle3
FrontLeg_Ctrl2
FrontLeg_Ctrl3
FrontLeg_R
FrontLegMeshes_1
FrontLeg_1_Rigging
FrontLeg_1_ikHandle
FrontLeg_1_ikHandle1
FrontLeg_1_ikHandle2
FrontLeg_Ctrl2
FrontLeg_Ctrl3
BackLegs_L
BackLeg
BackLegMeshes_1
BackLeg_1_Rigging
BackLeg_1_Ctrl2
BackLeg_1_Ctrl1
nurbsCircle2
BackLeg_1_ikHandle2
BackLeg_1_ikHandle1
View Shading Lighting Show Renderer Panels
ACES 1.0 SDR-video (sRGB)
2D Pan/Zoom : Isolate : persp
Channels Edit Object Show
nurbsCircle7
Translate X
Translate Y
Translate Z
Rotate X
Rotate Y
Rotate Z
Scale X
Scale Y
Scale Z
Visibility
SHAPES
nurbsCircleShape7
Display Anim
Layers Options Help
Layer007
Layer003
No Character Set
No Anim Layer
30 fps
MEL

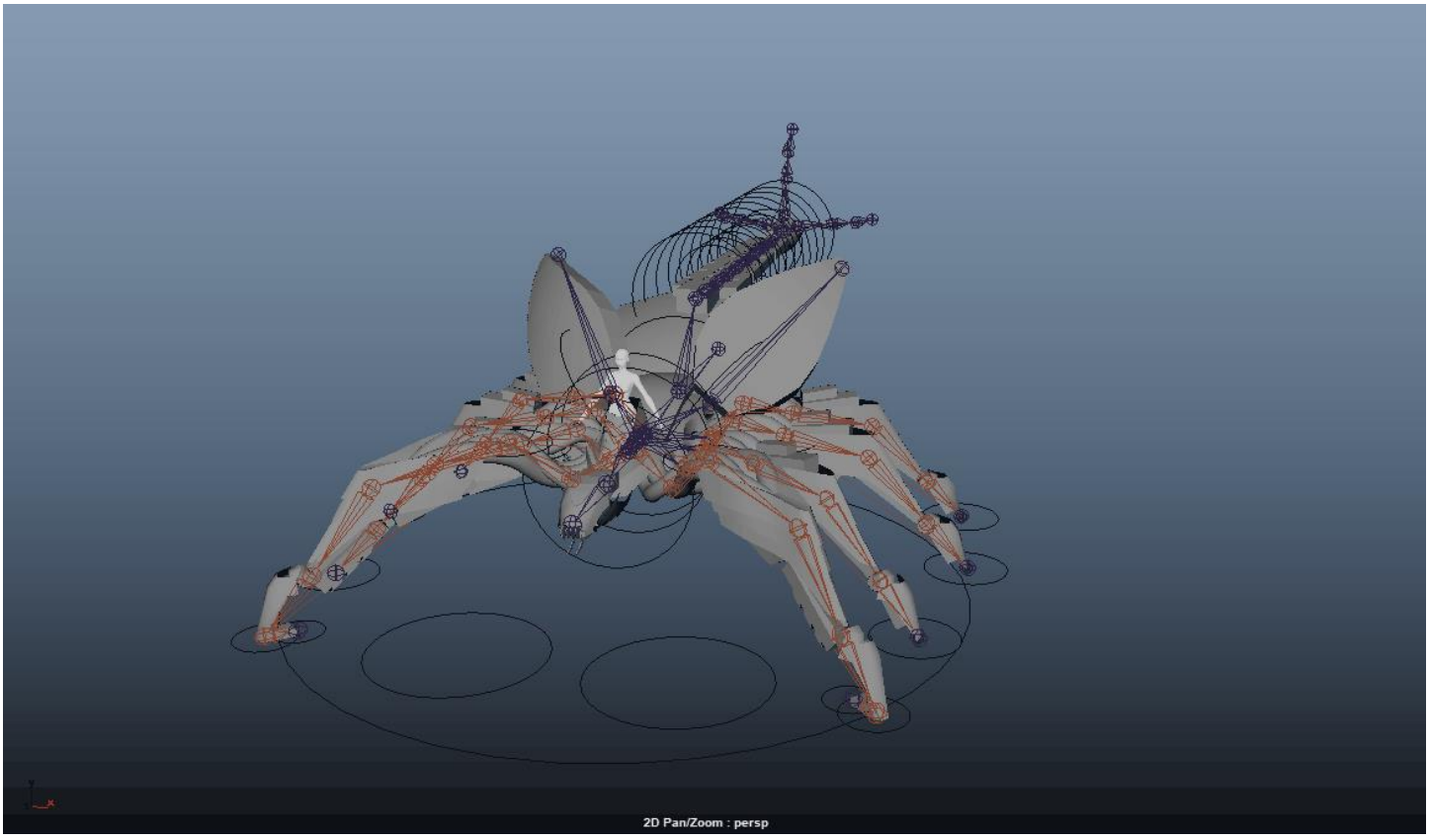

Show Help
BackLeg_1_Ctrl2
BackLeg_1_ikHandle2
BackLeg_1_ikHandle1
BackLegs_R
BackLeg
BackLegMeshes_1
BackLeg_1_Rigging
BackLeg_1_Ctrl2
BackLeg_1_ikHandle2
BackLeg_1_ikHandle1
BackLeg1
BackLegMeshes_1
BackLeg_1_Rigging
BackLeg_1_Ctrl2
BackLeg_1_ikHandle2
BackLeg_1_ikHandle1
BackLeg2
BackLegMeshes_1
BackLeg_1_Rigging
BackLeg_1_Ctrl2
BackLeg_1_ikHandle2
BackLeg_1_ikHandle1
MainBody
Body_Mid2
Body_Mid1
Body_Tail1
Head
nurbsSquare1
defaultLightSet
defaultObjectSet
modelPanel4ViewSelectedSet
modelPanel3ViewSelectedSet
View Shading Lighting Show Renderer Panels
ACES 1.0 SDR-video (sRGB)
2D Pan/Zoom : Isolate : persp

Due to most of parts of this mech are hard surface pieces, what I need to to ia adjust all of those rigging groups' pivot are in those pisitions that I want to bend, Then using P to parent them.

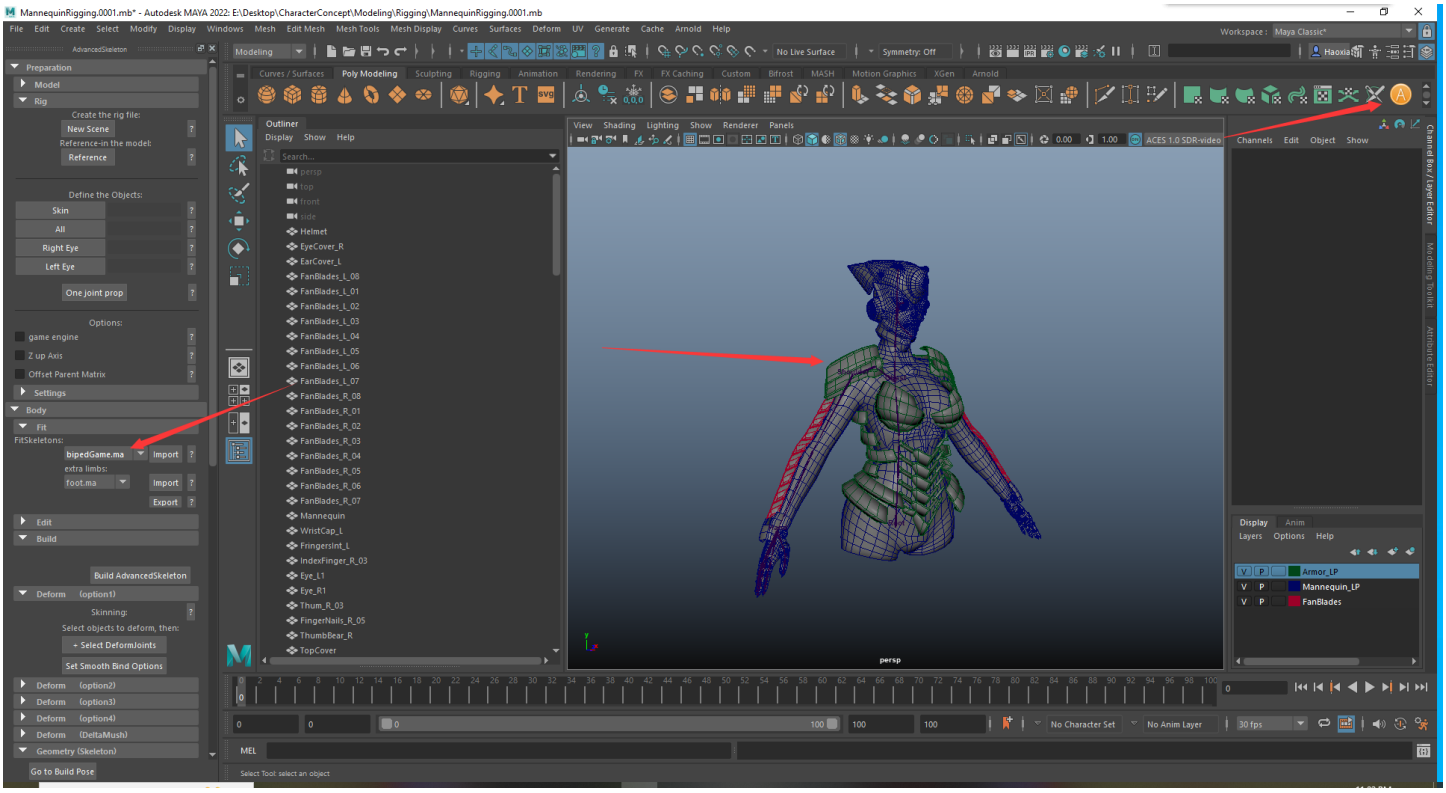


But the connection part of legs are soft material, therefor I need to use bend skin.

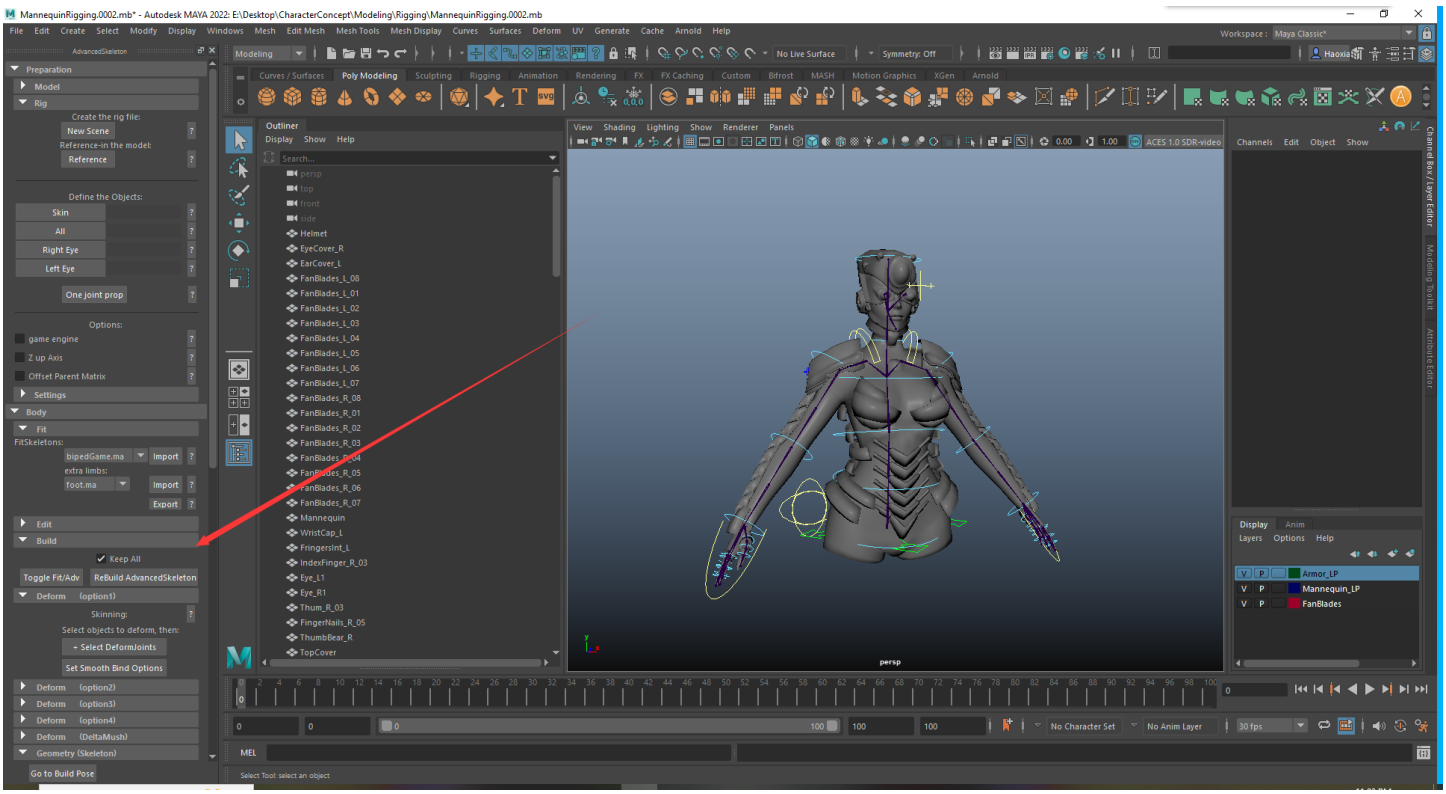




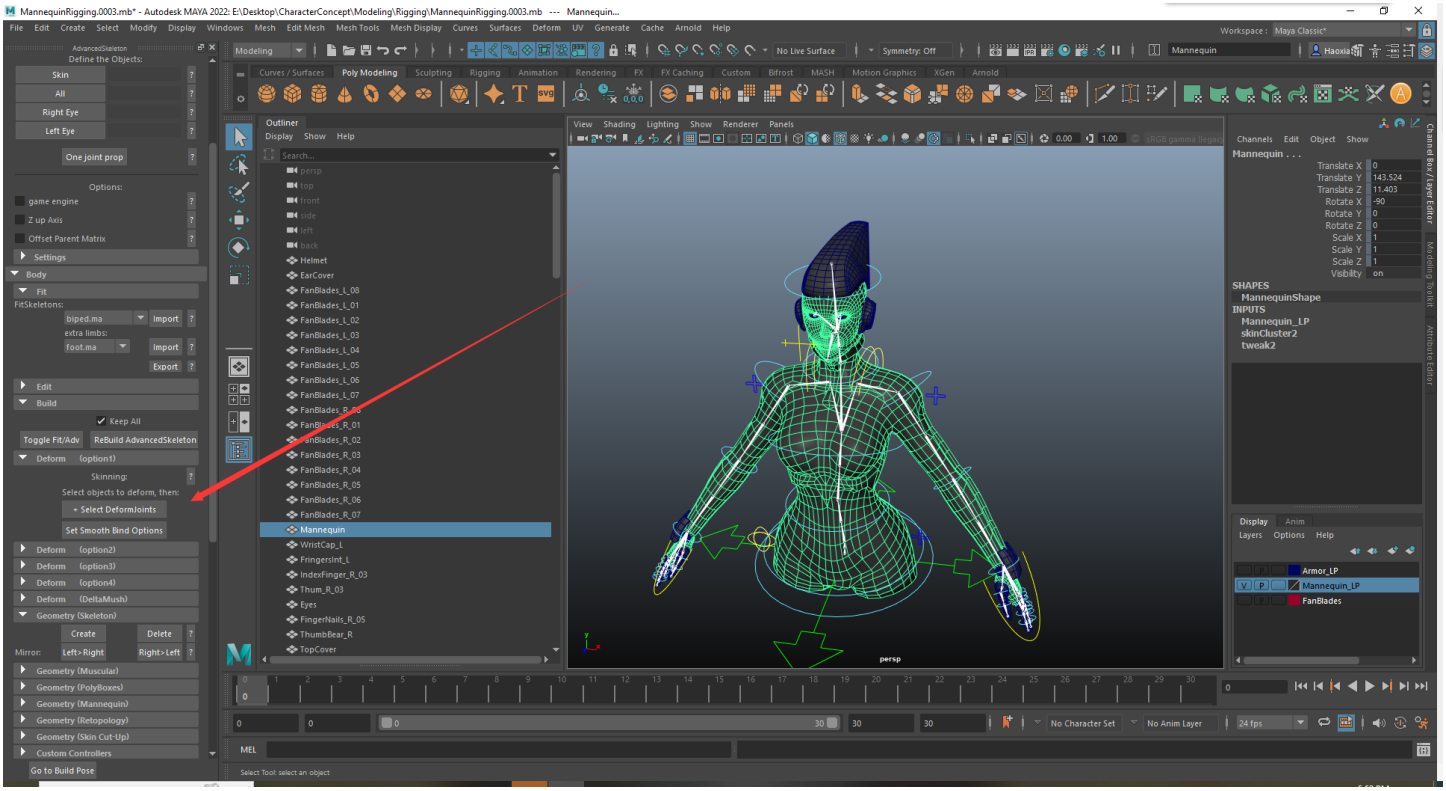
In order to rig the mannequin, I used a plugin called Advanced Skeleton. This plugin can generate mannequin skeleton swiftly. In my case, I selected biped Game skeleton. I deleted legs and adjusting sholder, head and fingers to the mesh.



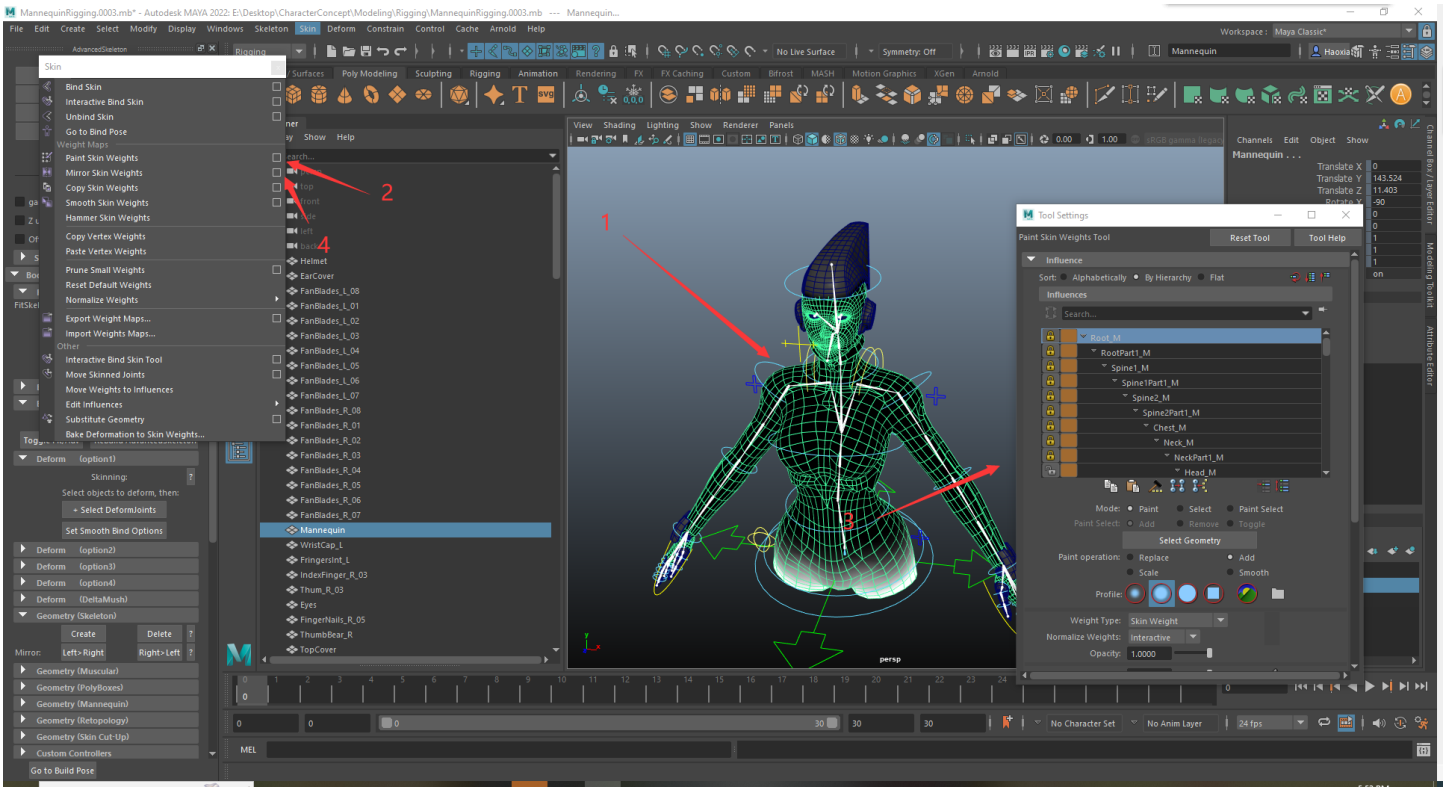
And then hit Build AdvancedSkelton, it can genderate whole skeleton and controllers at once.



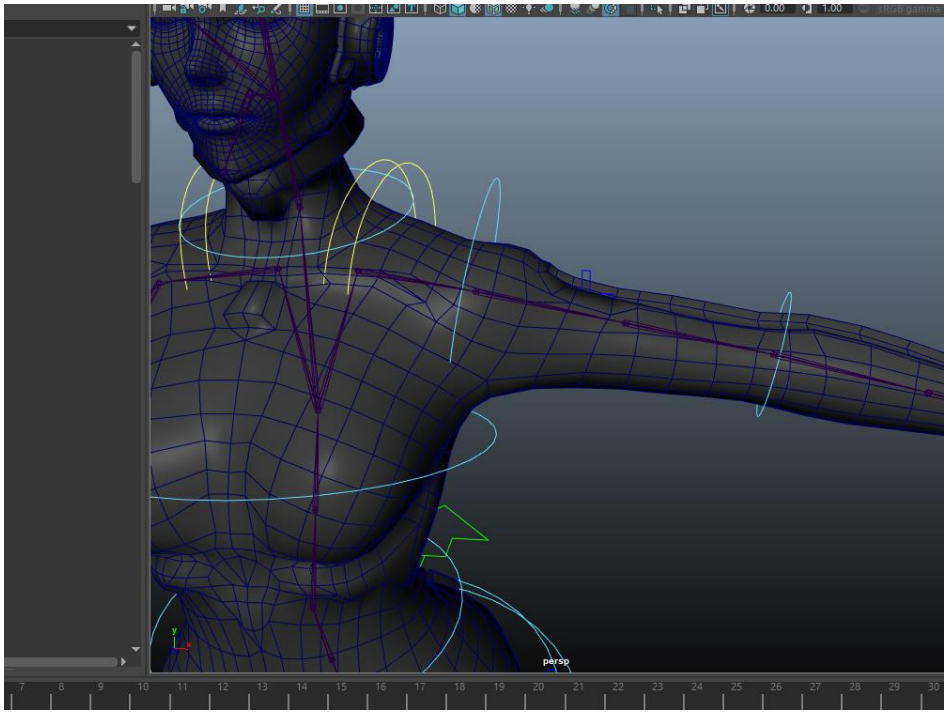
And then, select the mesh first, hitting the + Select Deformations. And then hit skin. Then the skeleton is skined to the mesh.



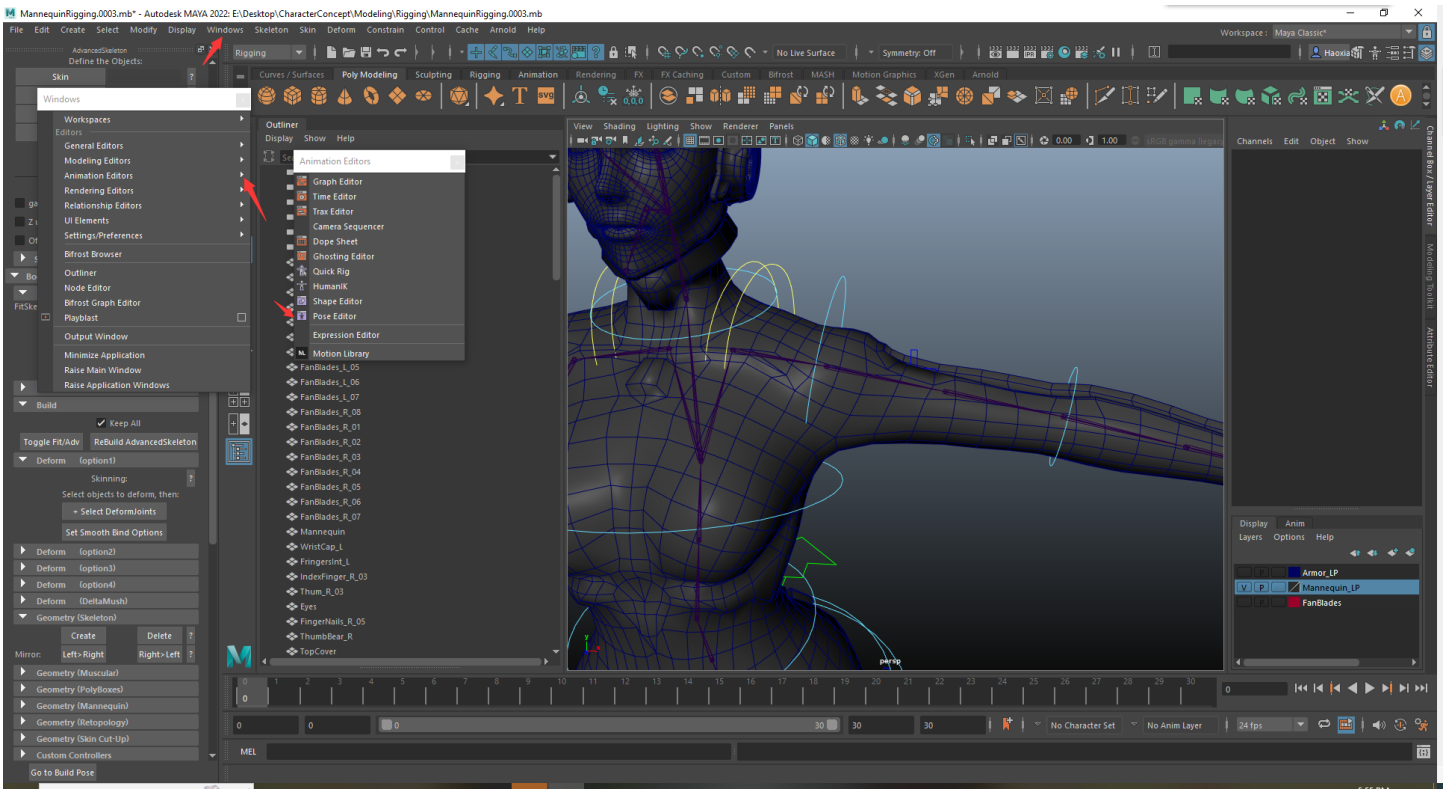
But there will be lots of issues of weight. I selected the mesh, using paint skin weight, blending weights to correct places.



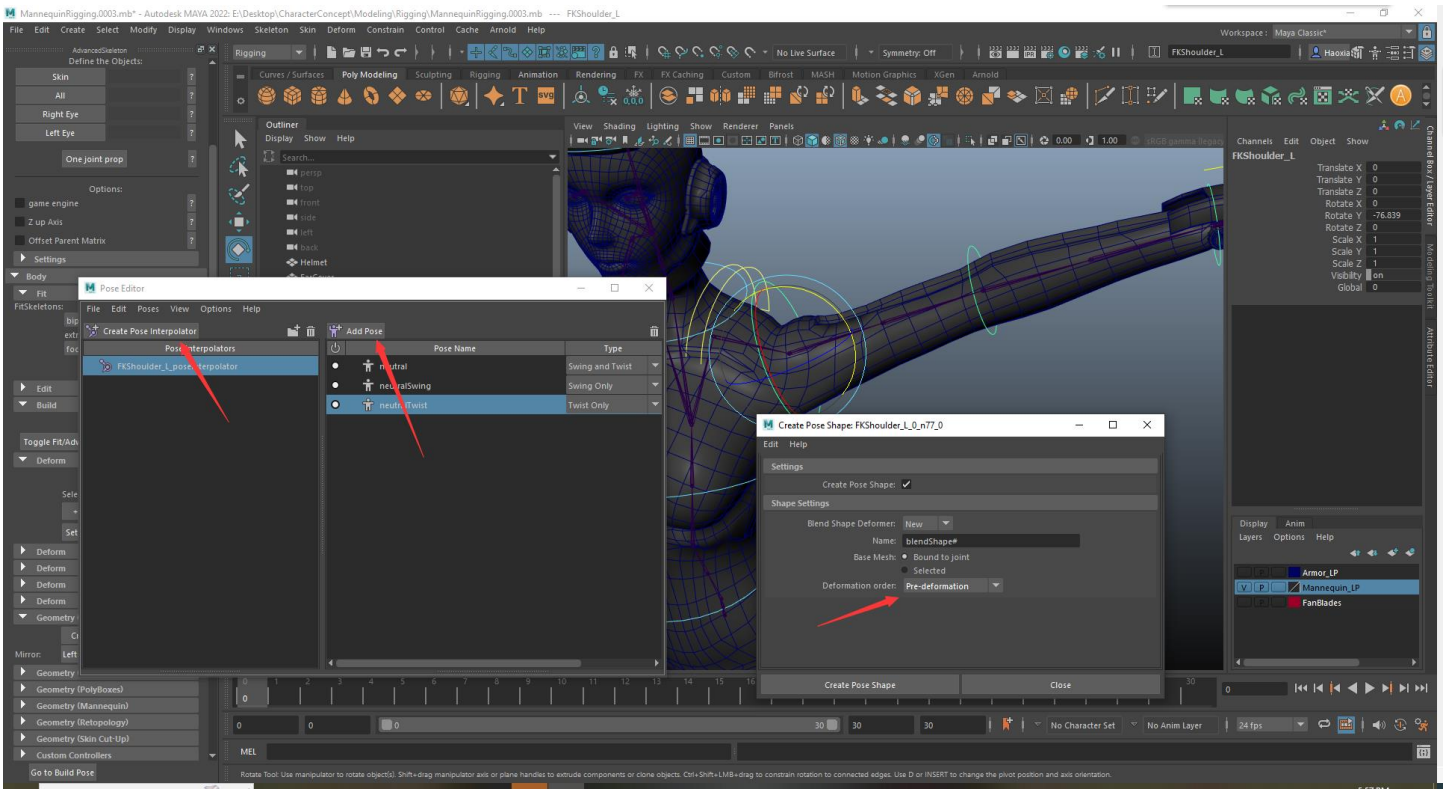
In some cases, weight deformation can't finish their job perfectly.



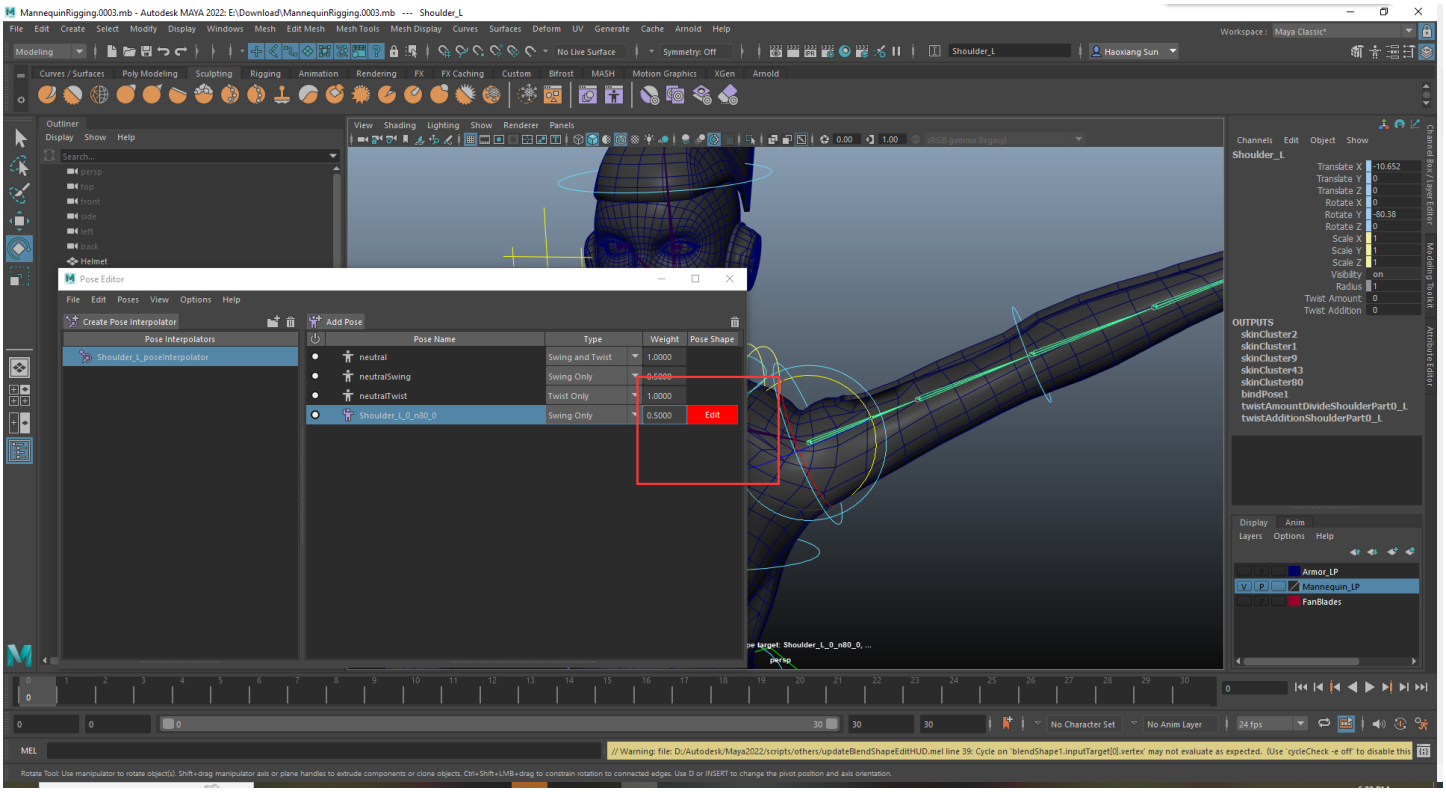
So I used a function called pose editor. It can record some sculpting information in maya to corresponding model motions.



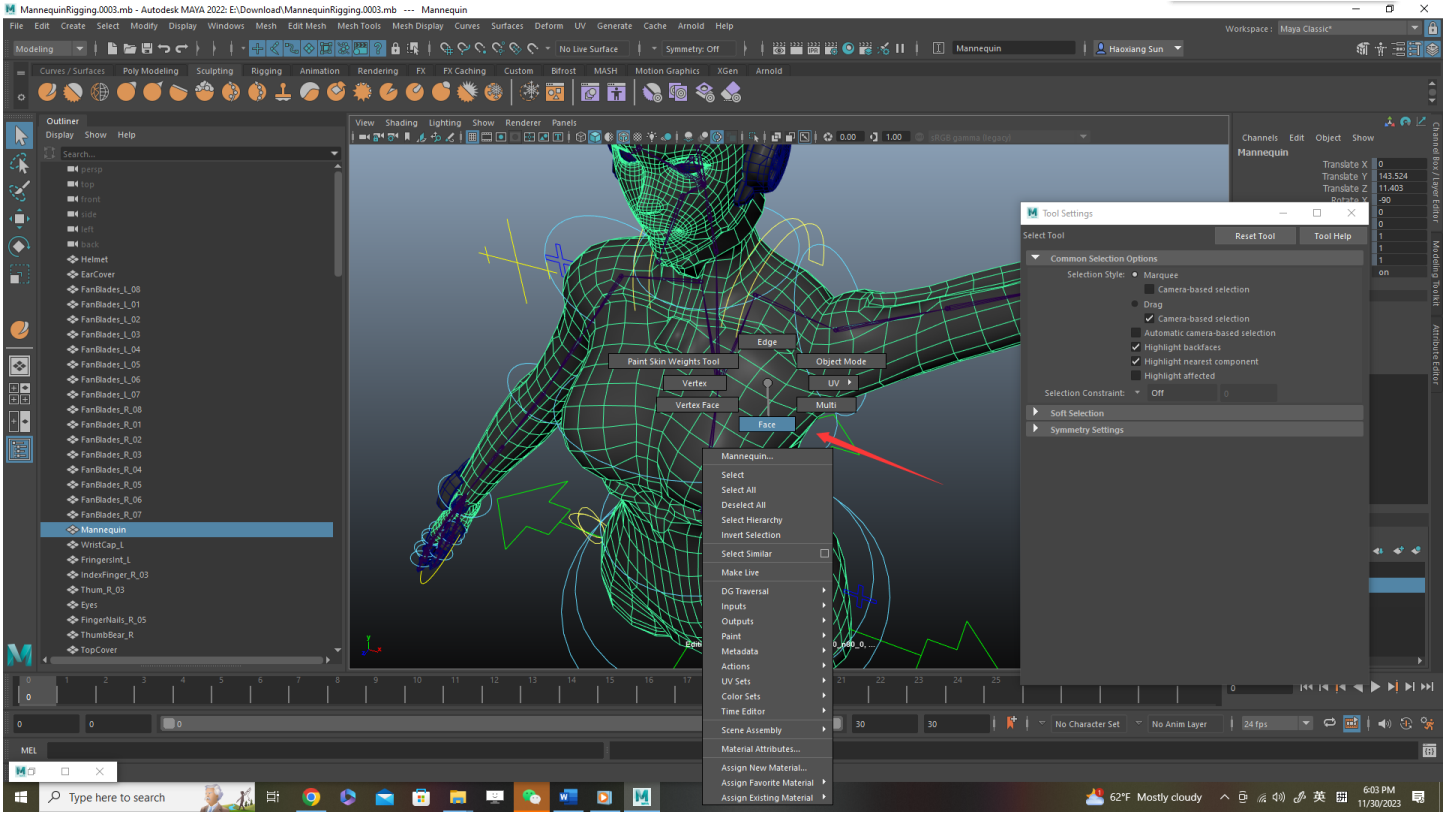
In my case, I posed the arm to t pose and setting it as pre-deformation.



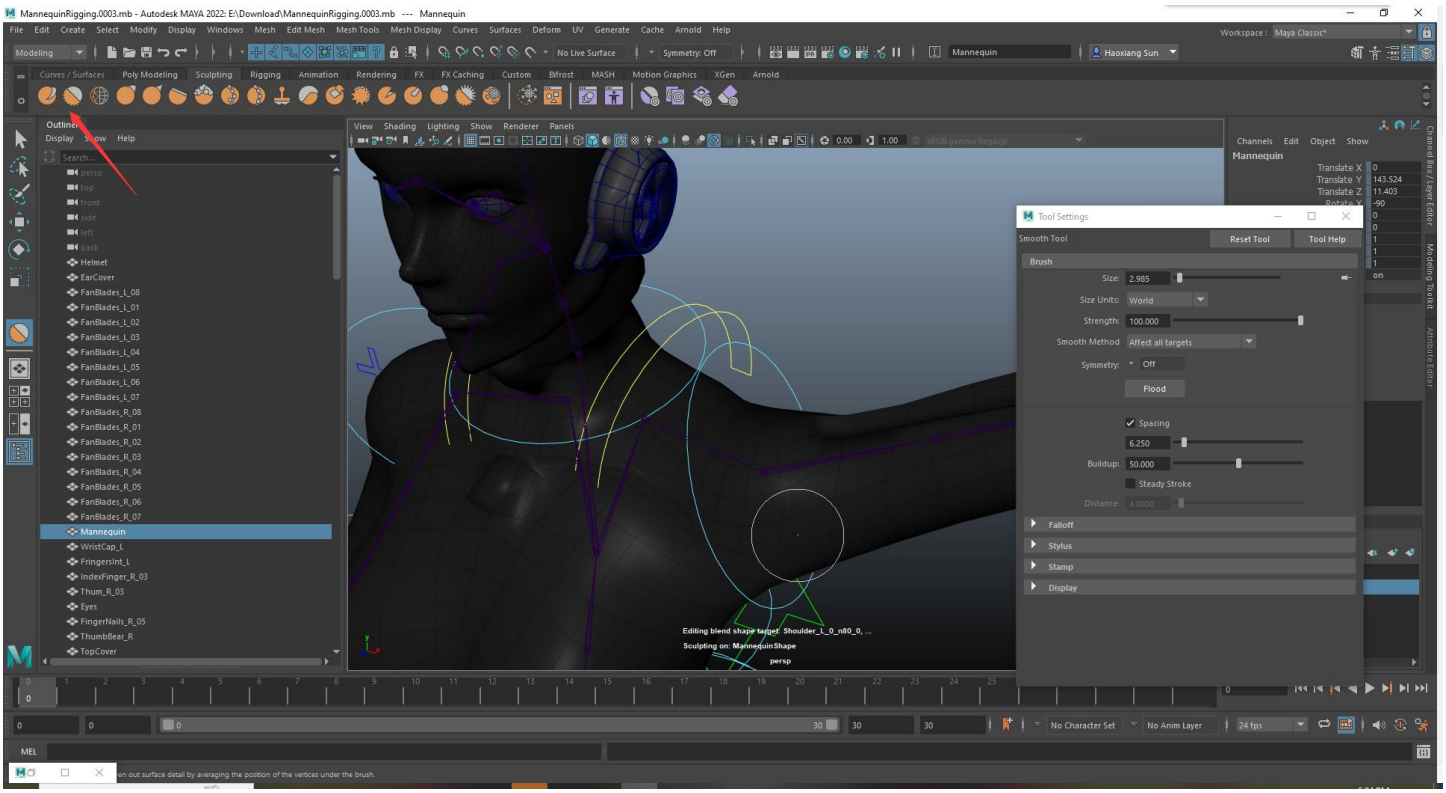
When the red bottom appeared, I moved the arm to a higher angle.



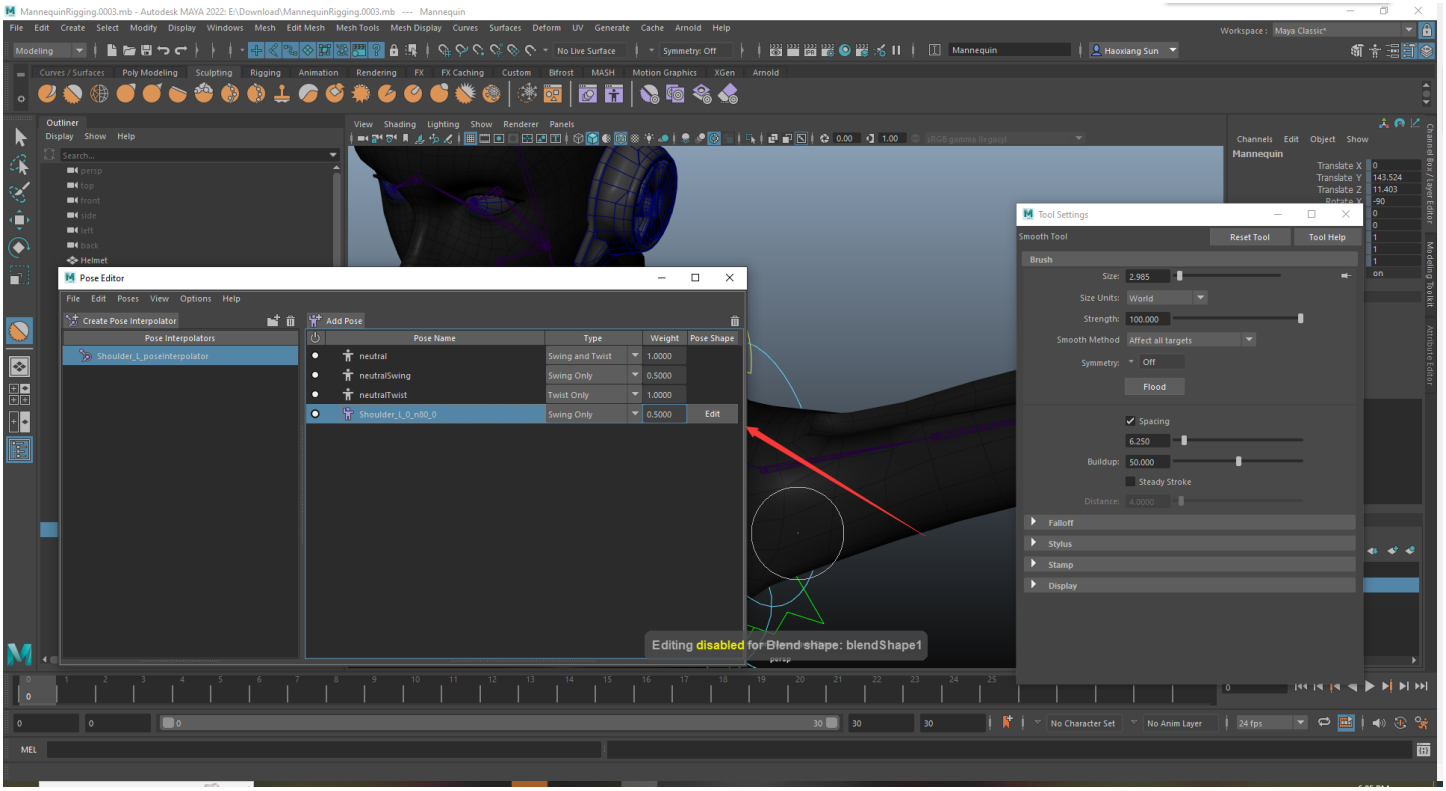
And then, go to the sculpting mode in face selection.



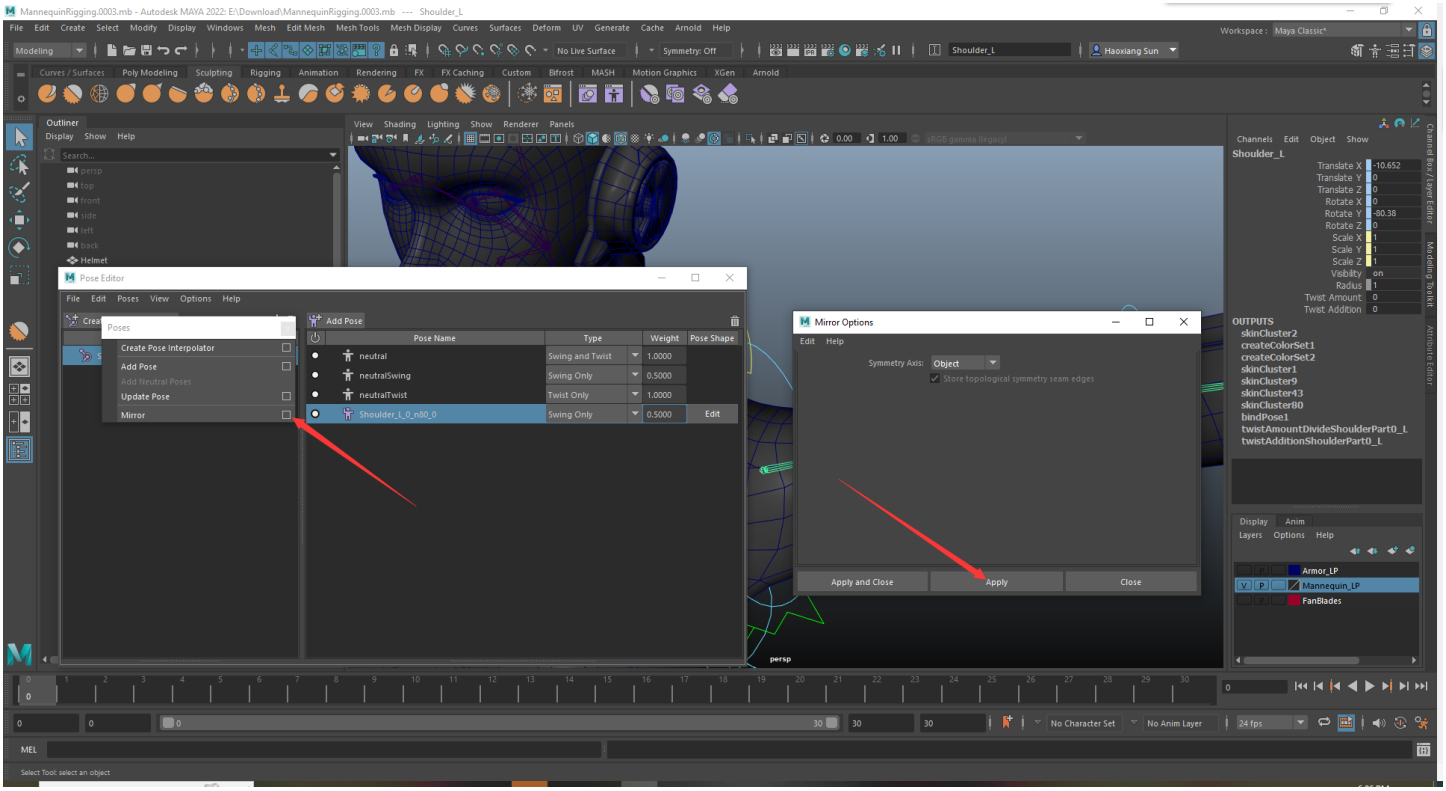
Recording this deformation information.

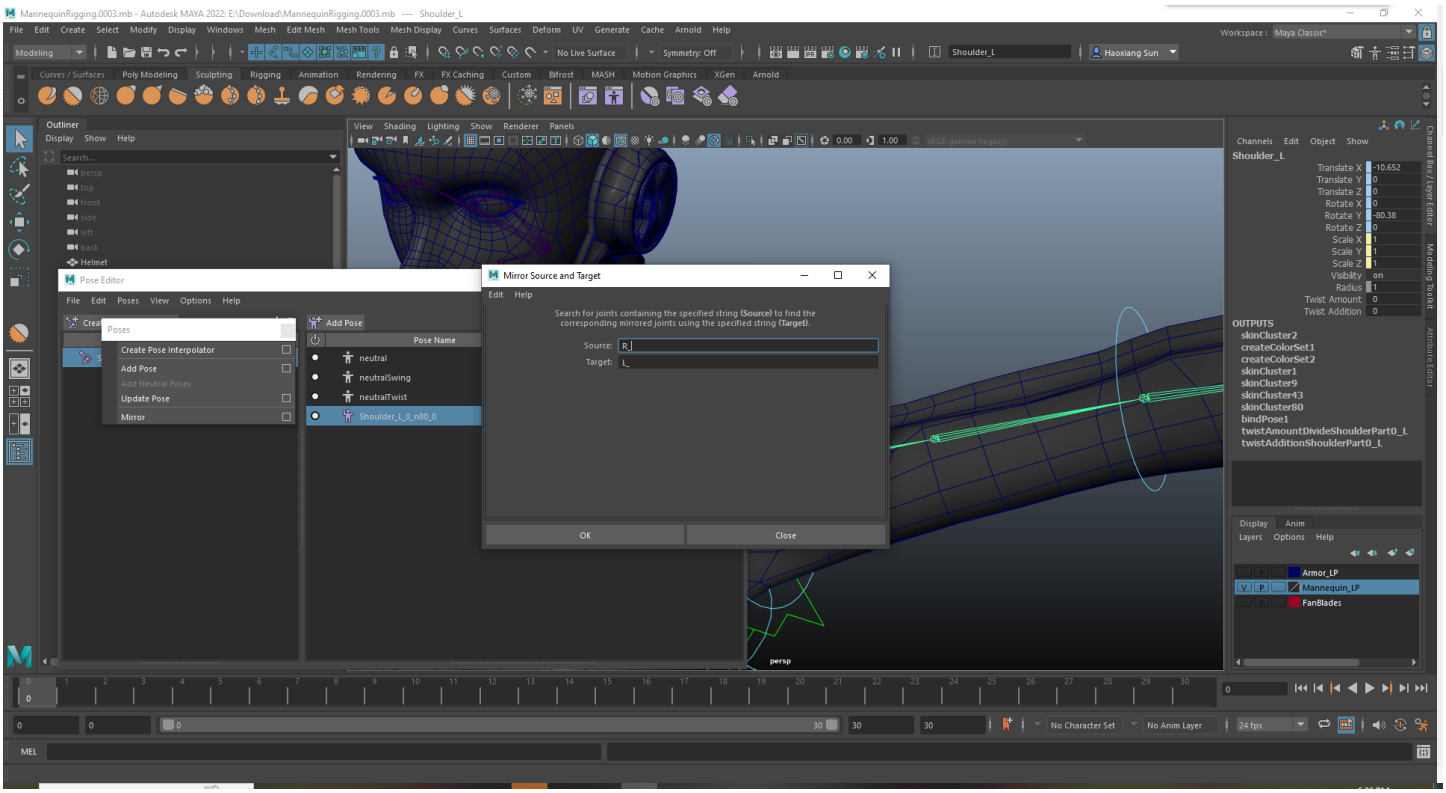


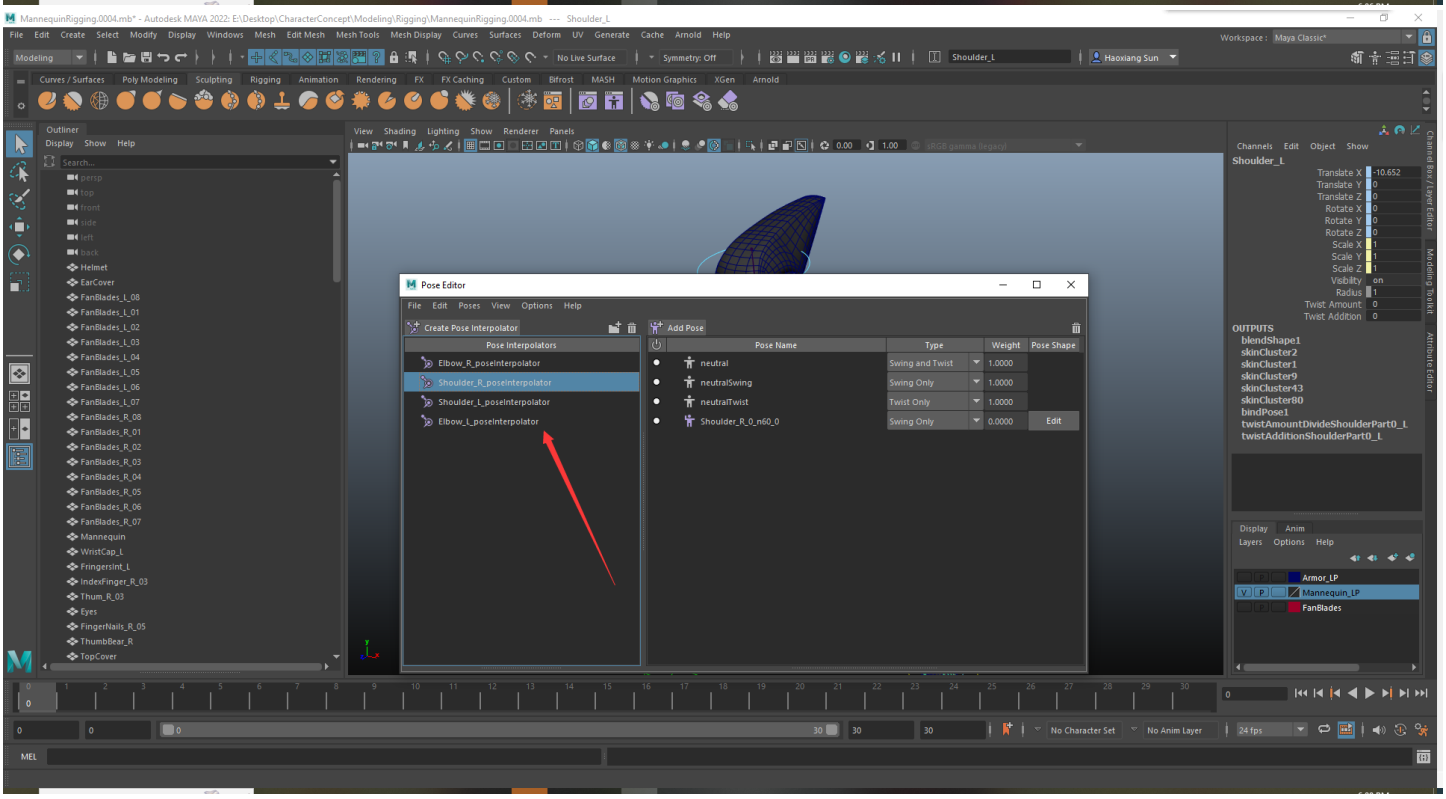
And then, click off the edit bottom. Now the deformation information has been recorded to the shoulder.



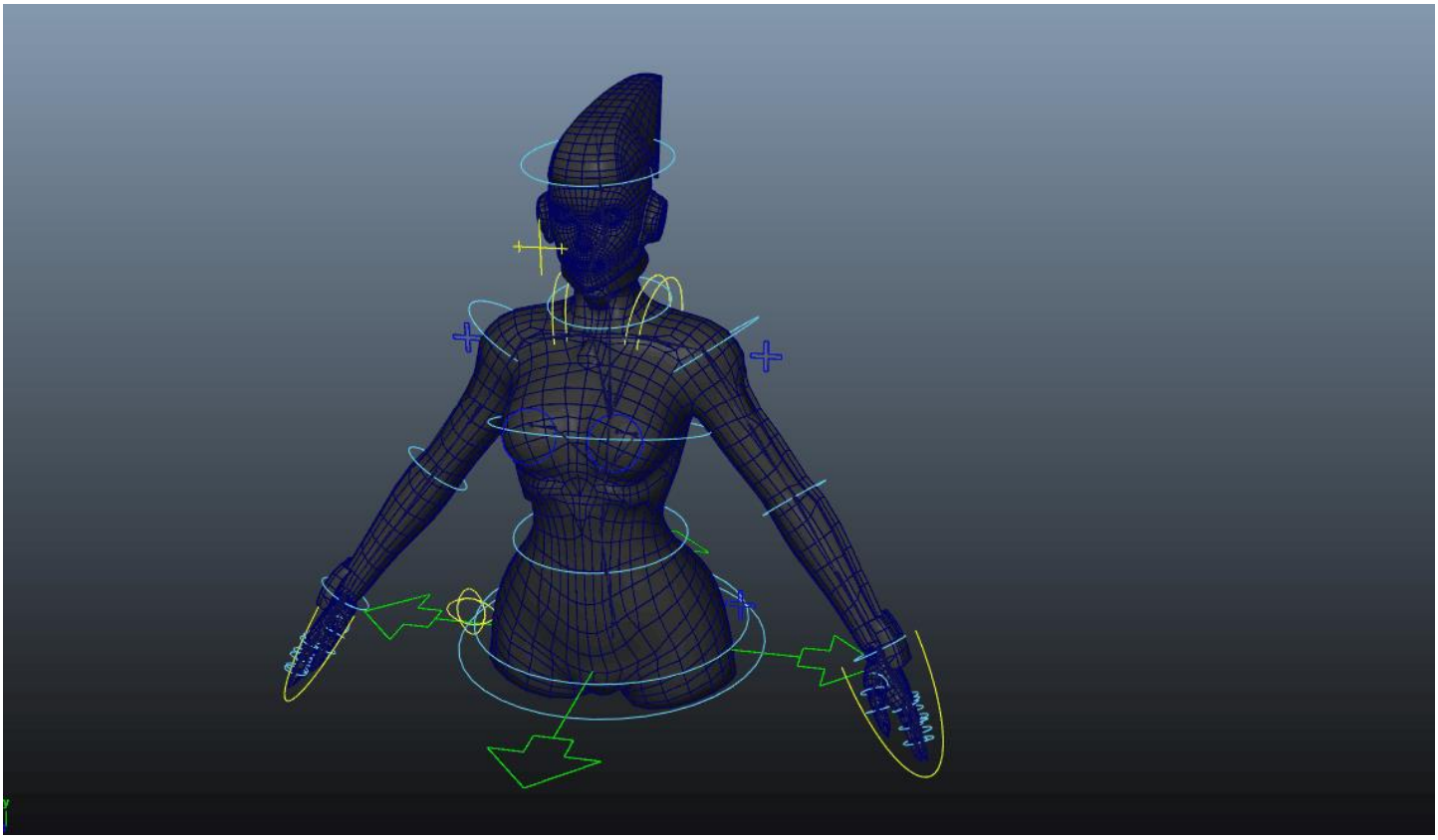
In the left top corther , I can mirror it to another shoulder.



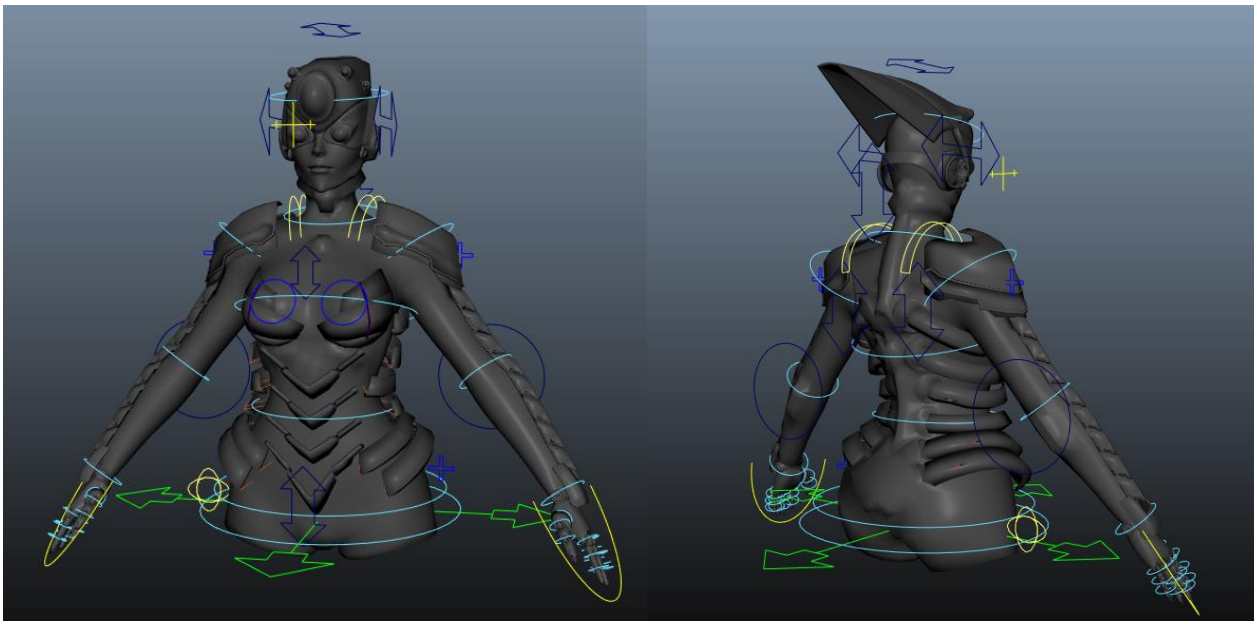




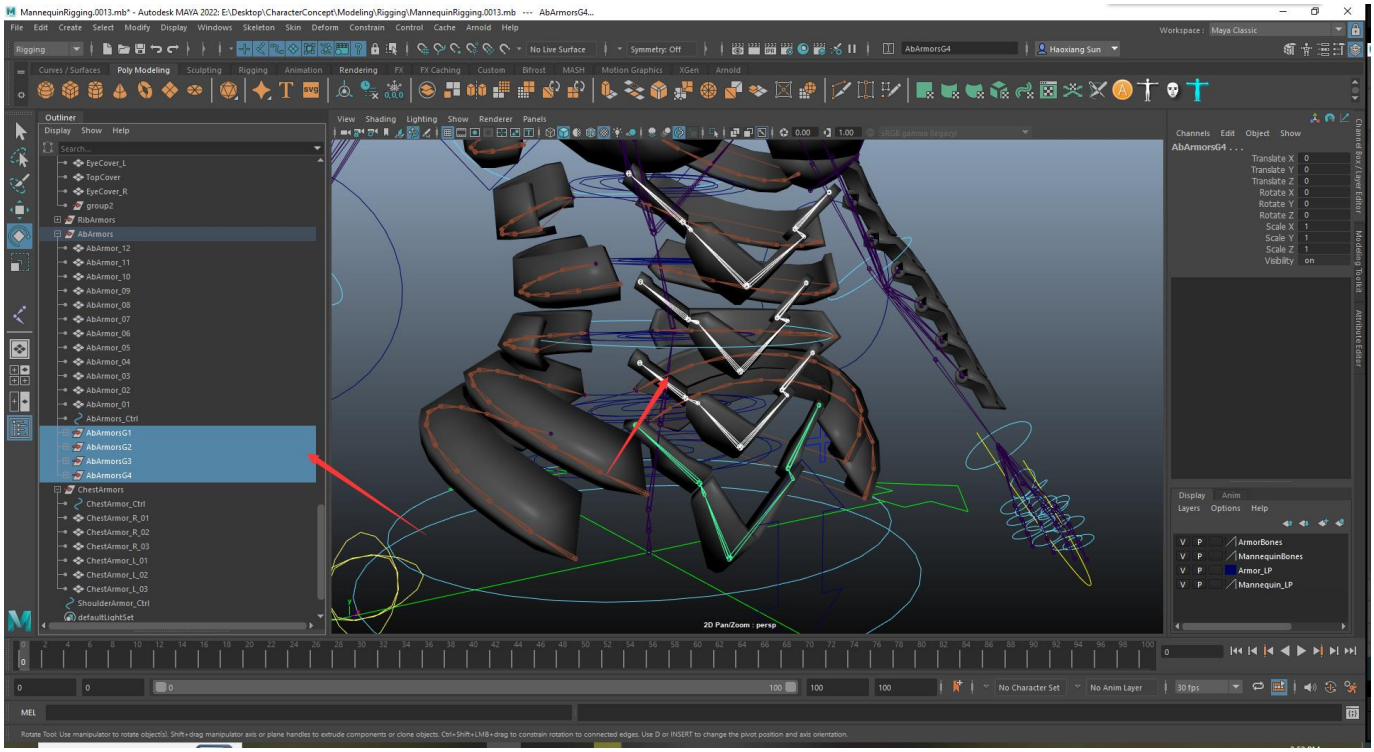
And now my mannequin rigging is bassicly done.



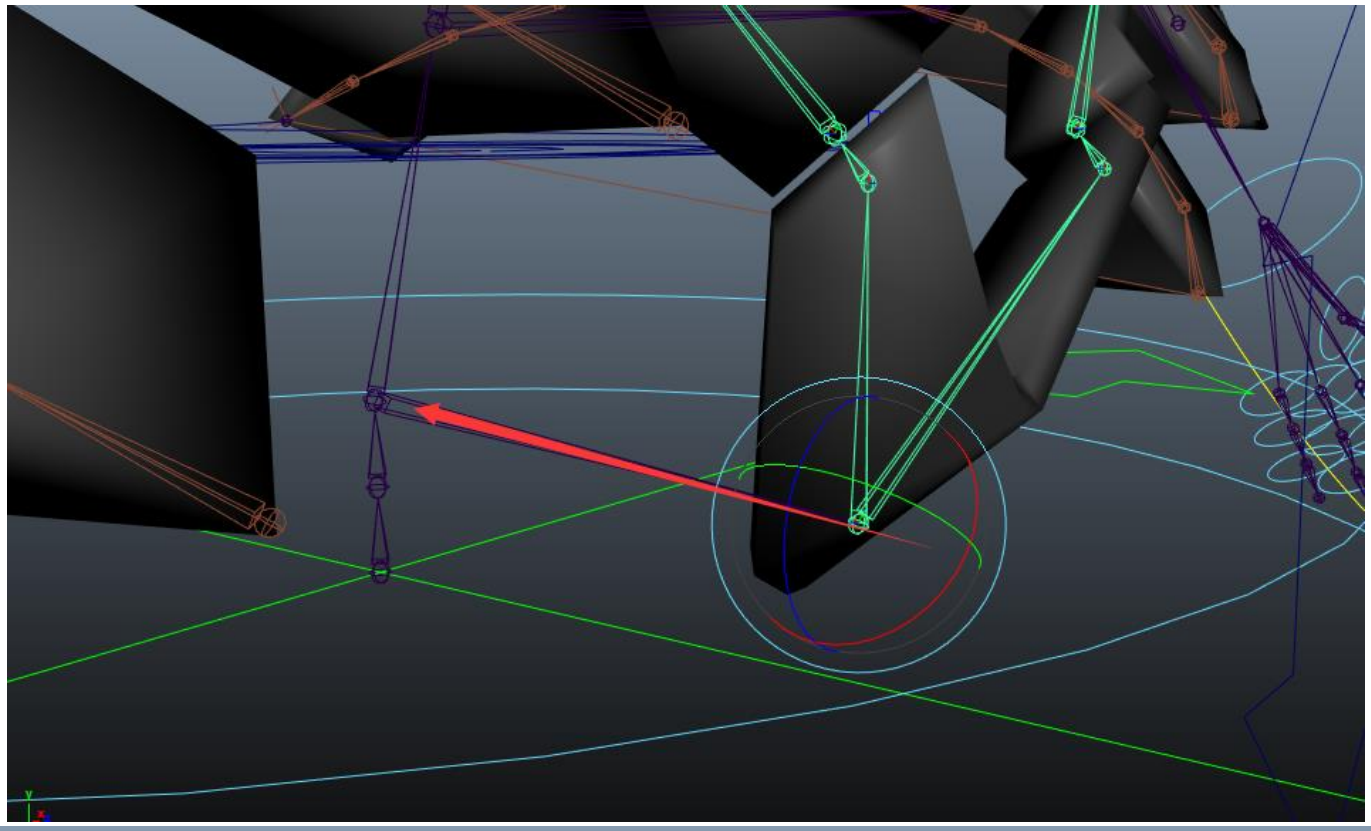
Then, I imported skeletons I created in prototype phase. And adjusted some nodes to correct places.

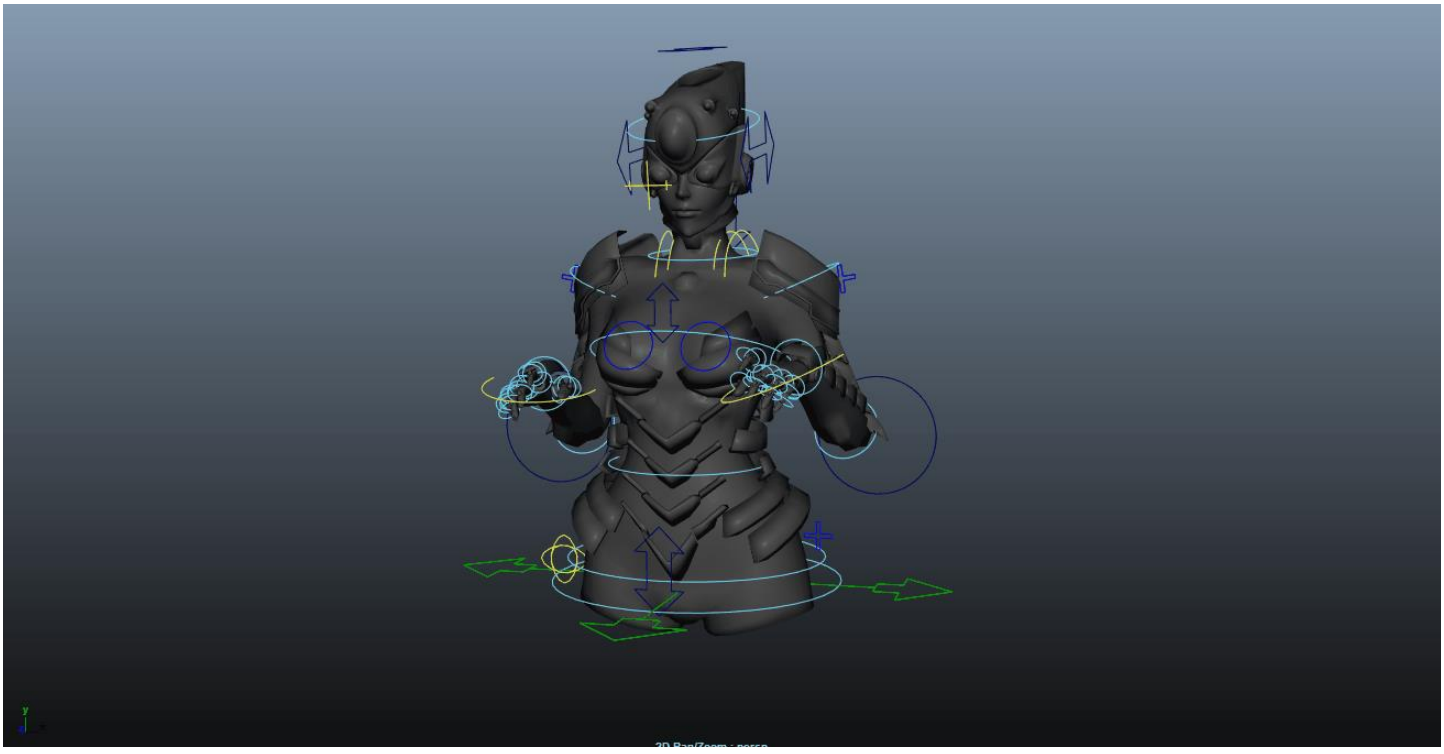


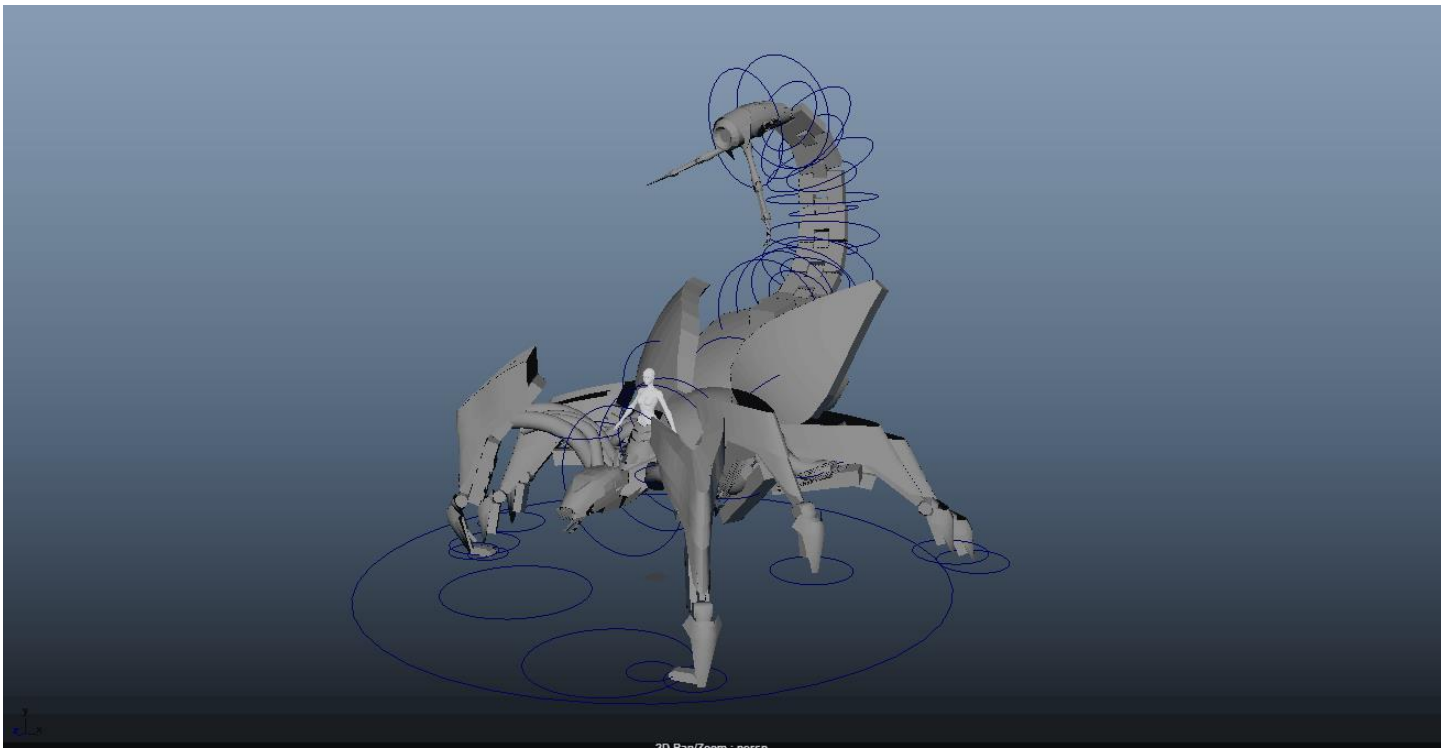
In order to combine two sets of bones together, I grouped the individual bones separately. The reason I did this is if I parent those armors bones to the mannequin bones directly, those Set Key Drive animations to those armors will drift apart.



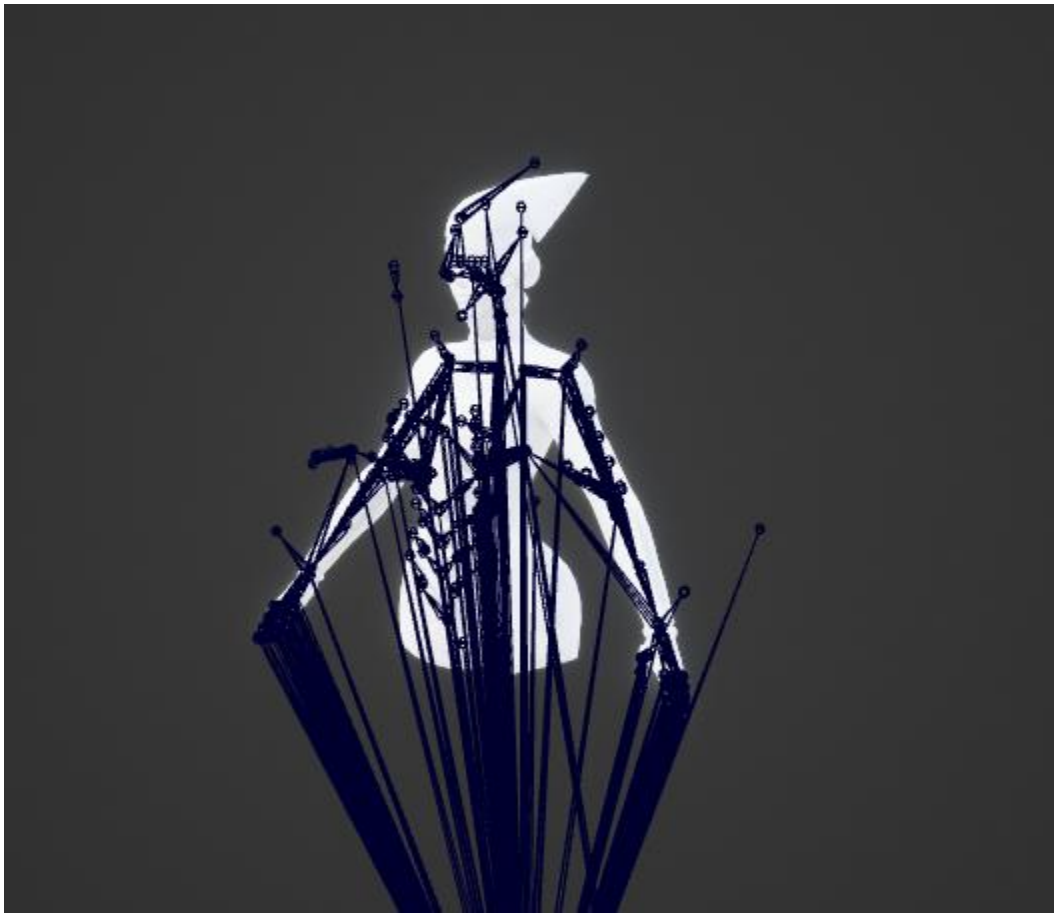
I used p key to parent those bone groups to their clothest bone nodes on the mannequin skeleton.



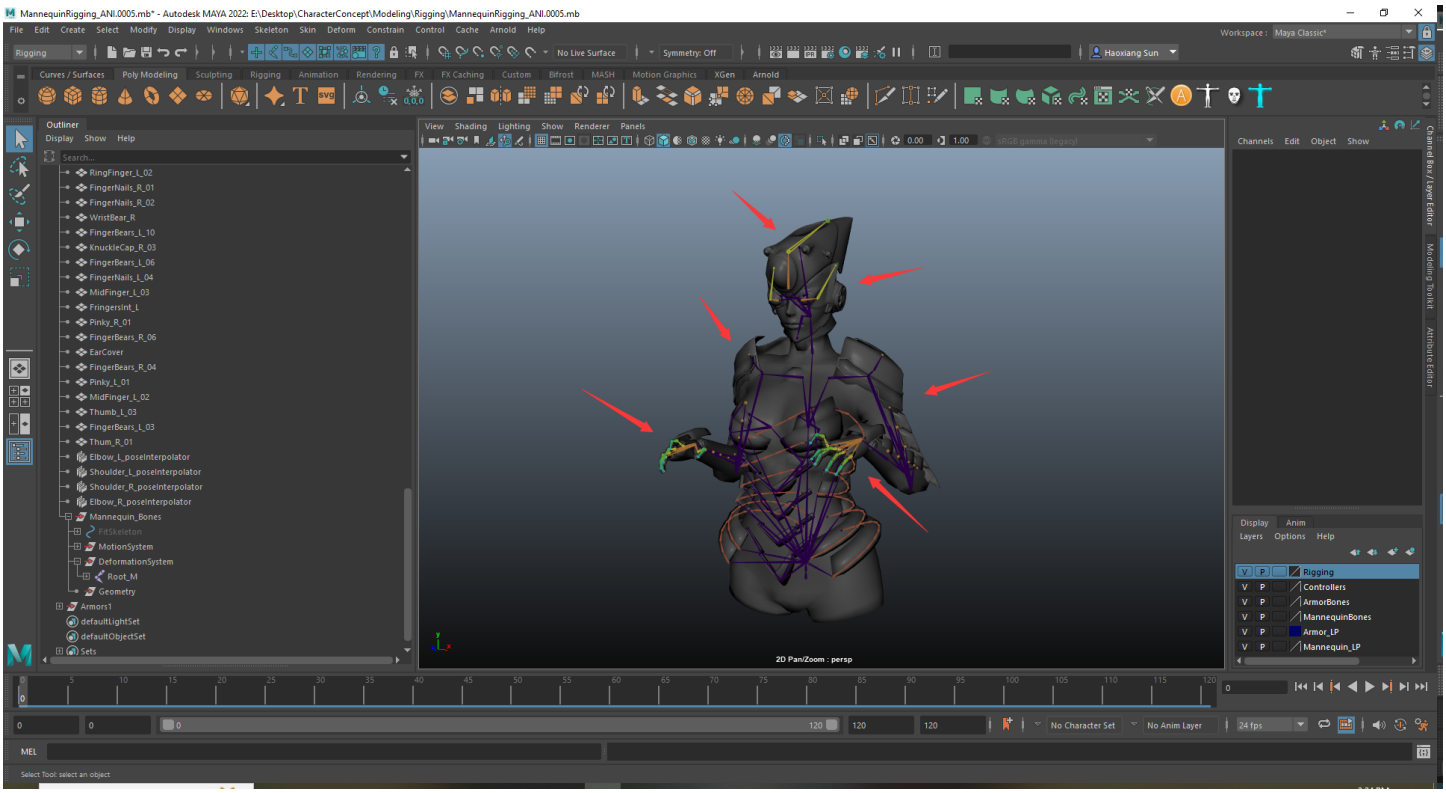




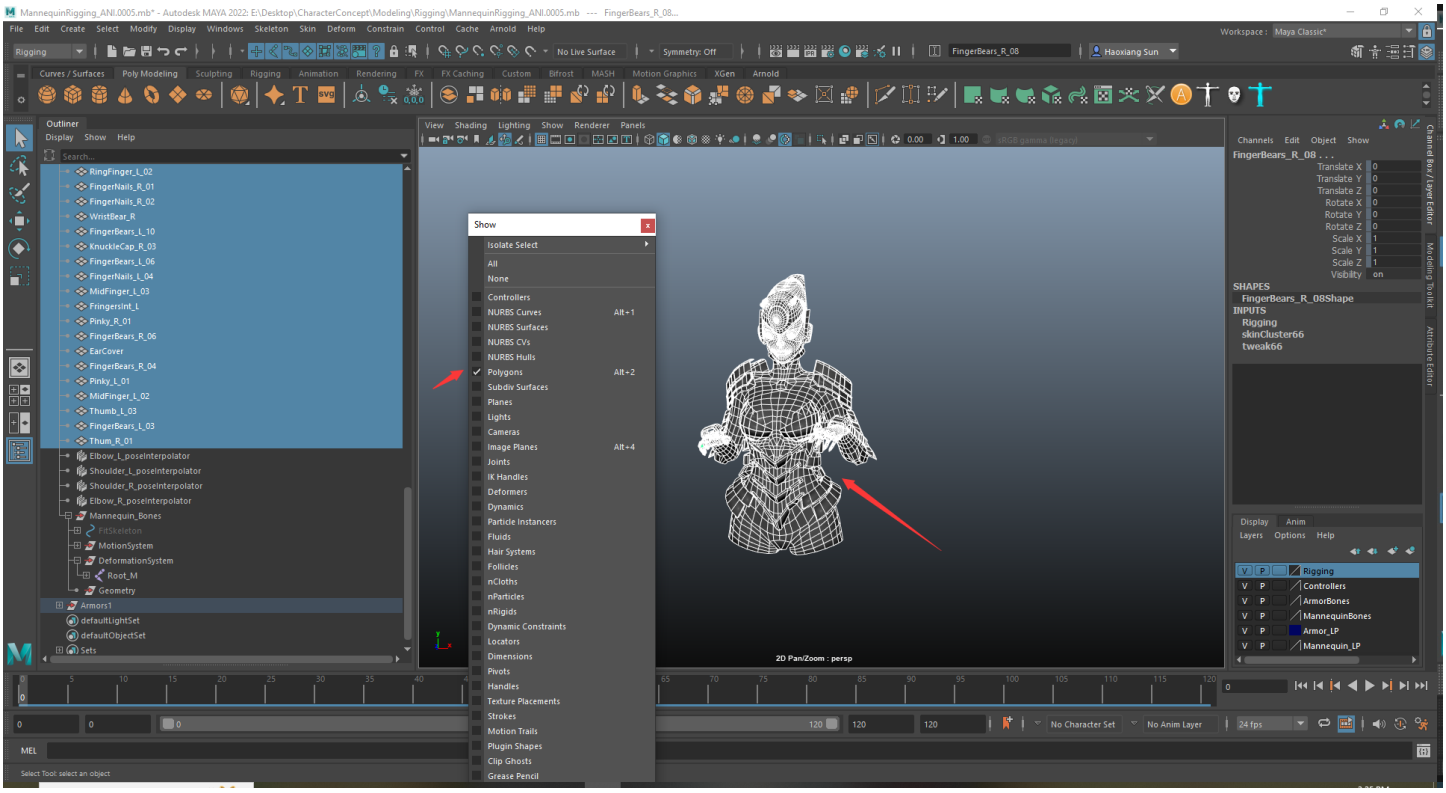
But then I meet a issue with set key drive animation. Those meshes won't show correct if I export those meshes directly.



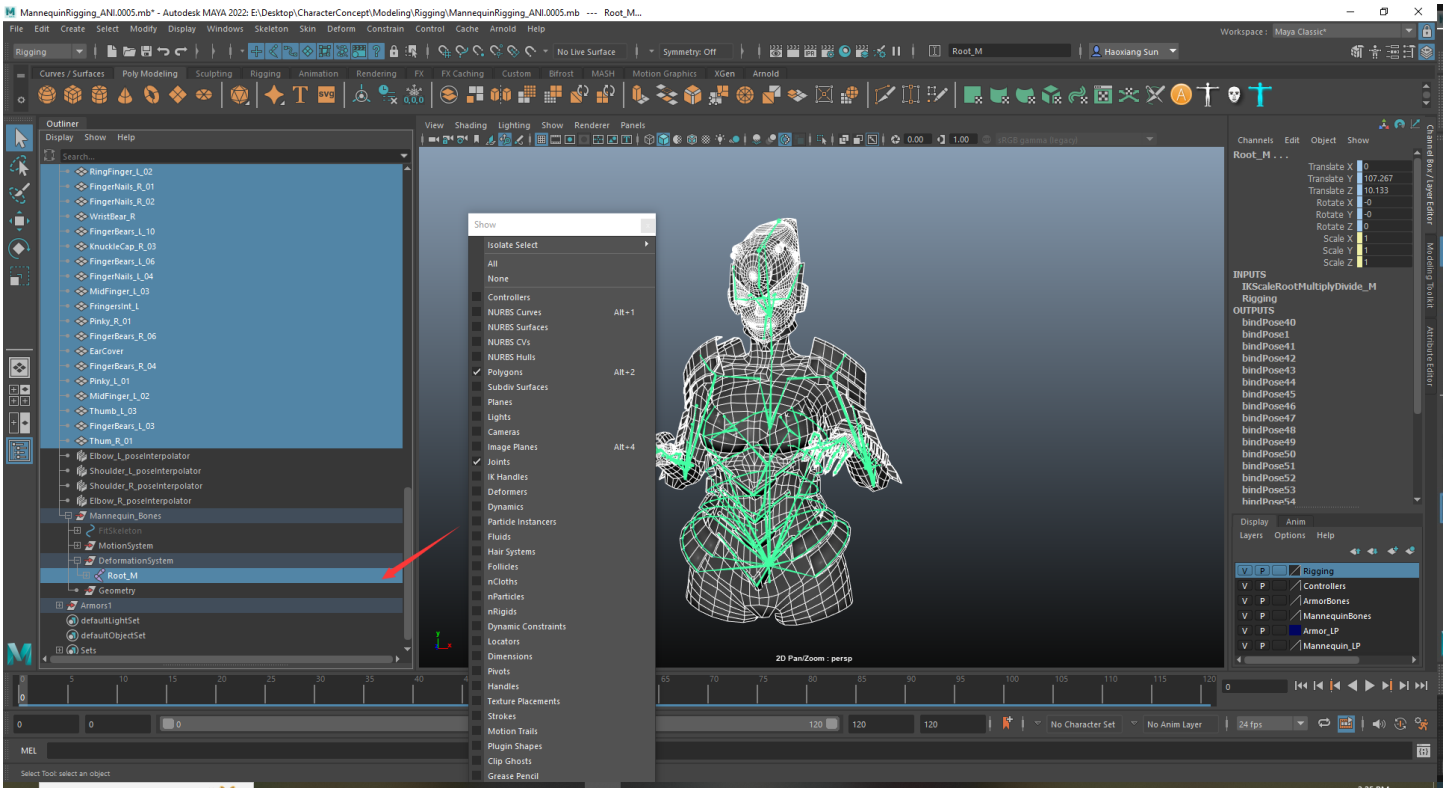
Then, I found the solution. Due to Unreal's limitation, Set Key Drive animations can't recognize constrained meshed. So I changed the way of rigging those armor piece from constrain to skin.

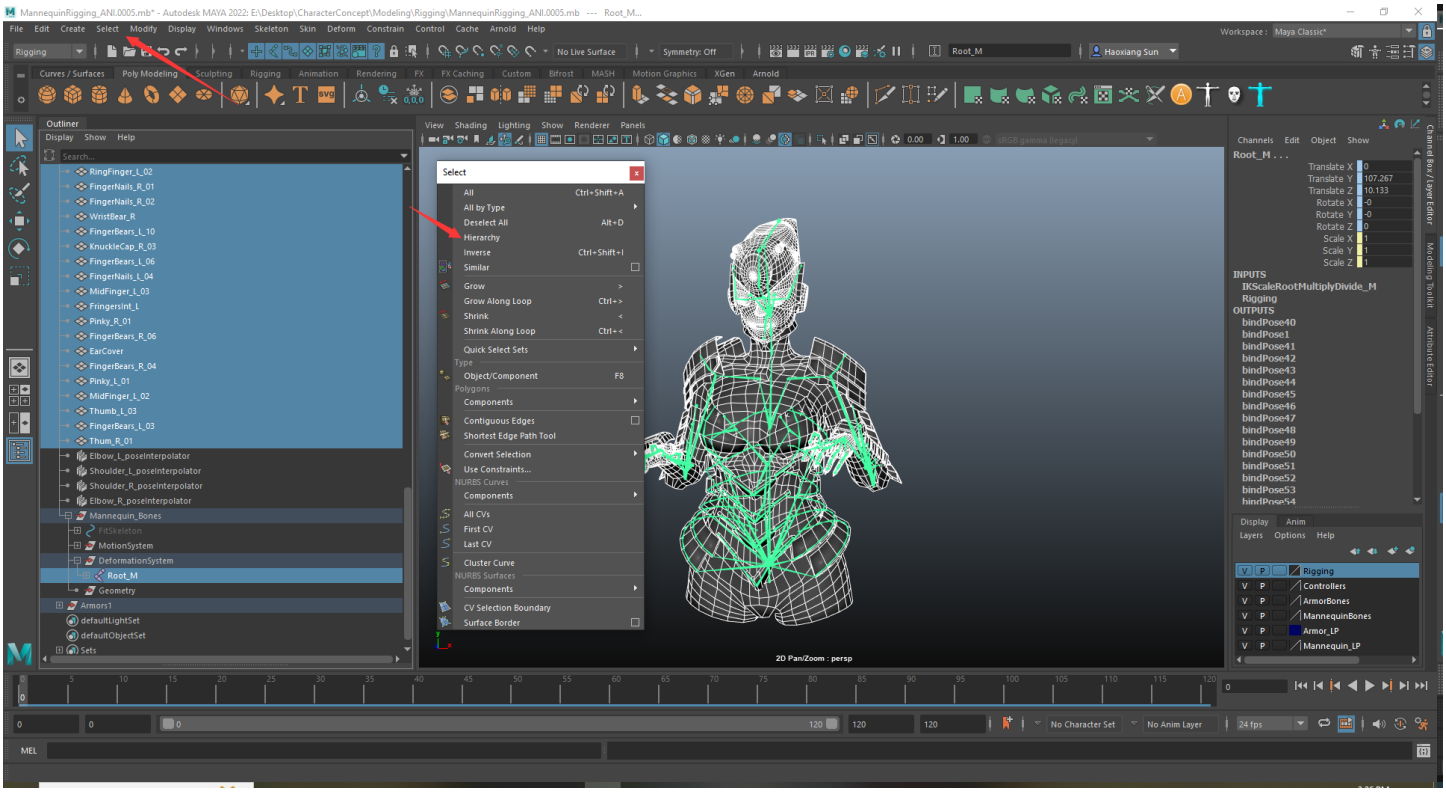


What I need to do is next is bake those animations to bones. Selecting all meshes first.

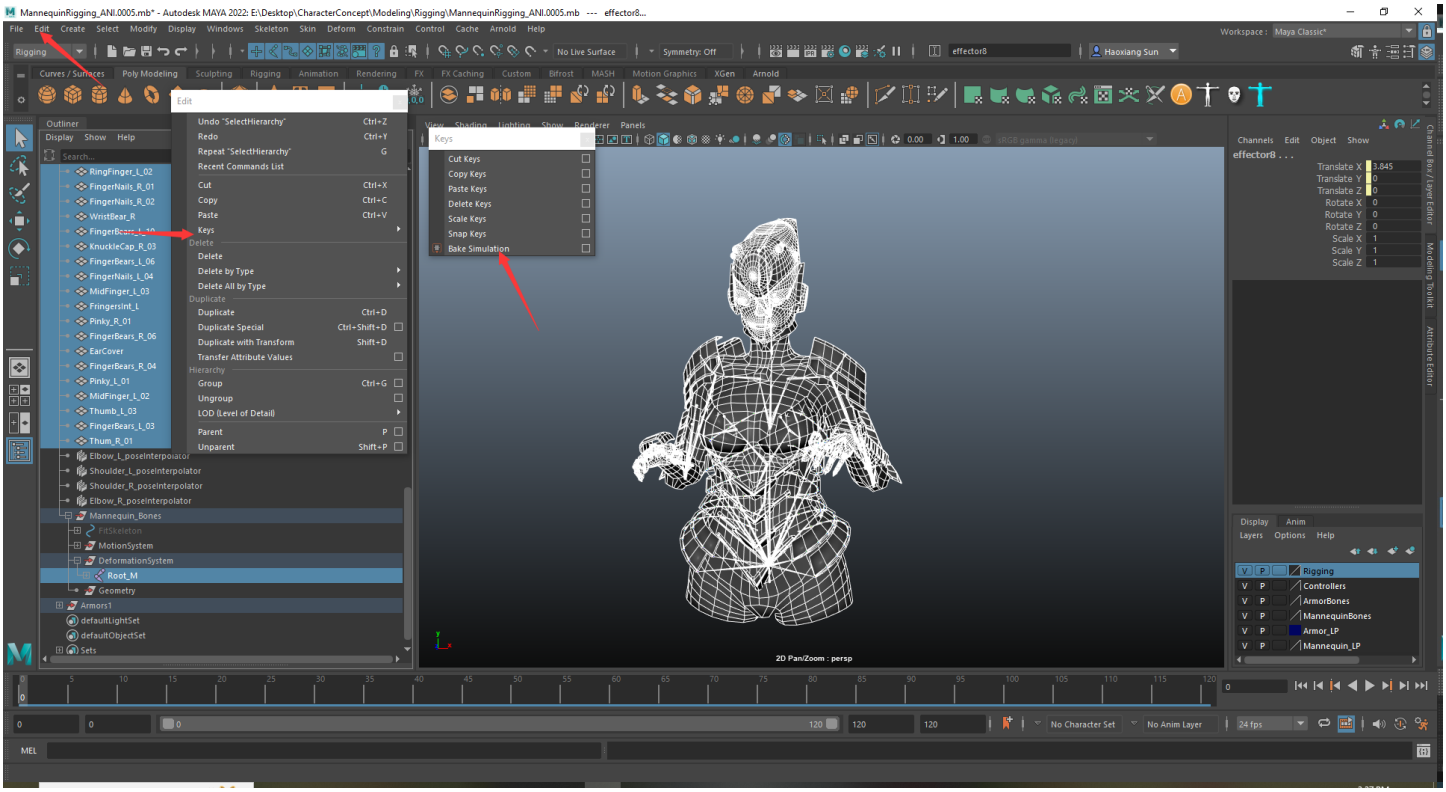


Then, select the root bone, using select- hierarchy slect all bone joints.

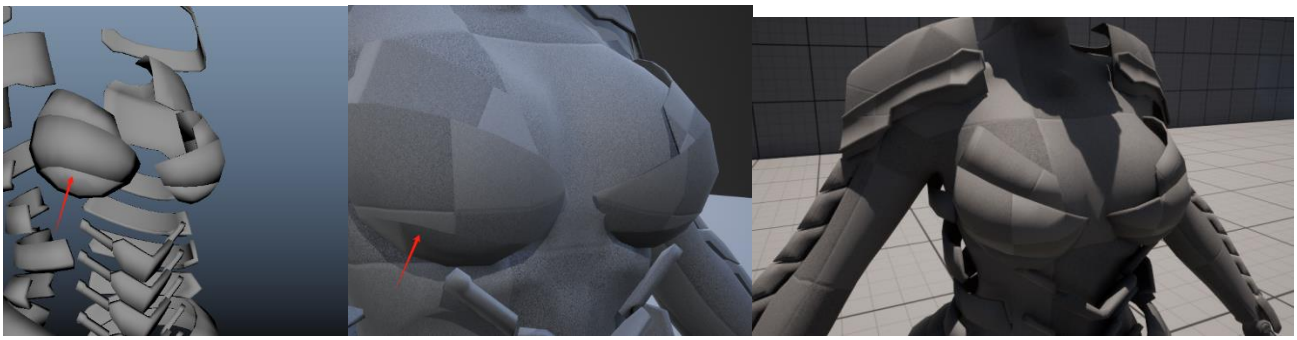




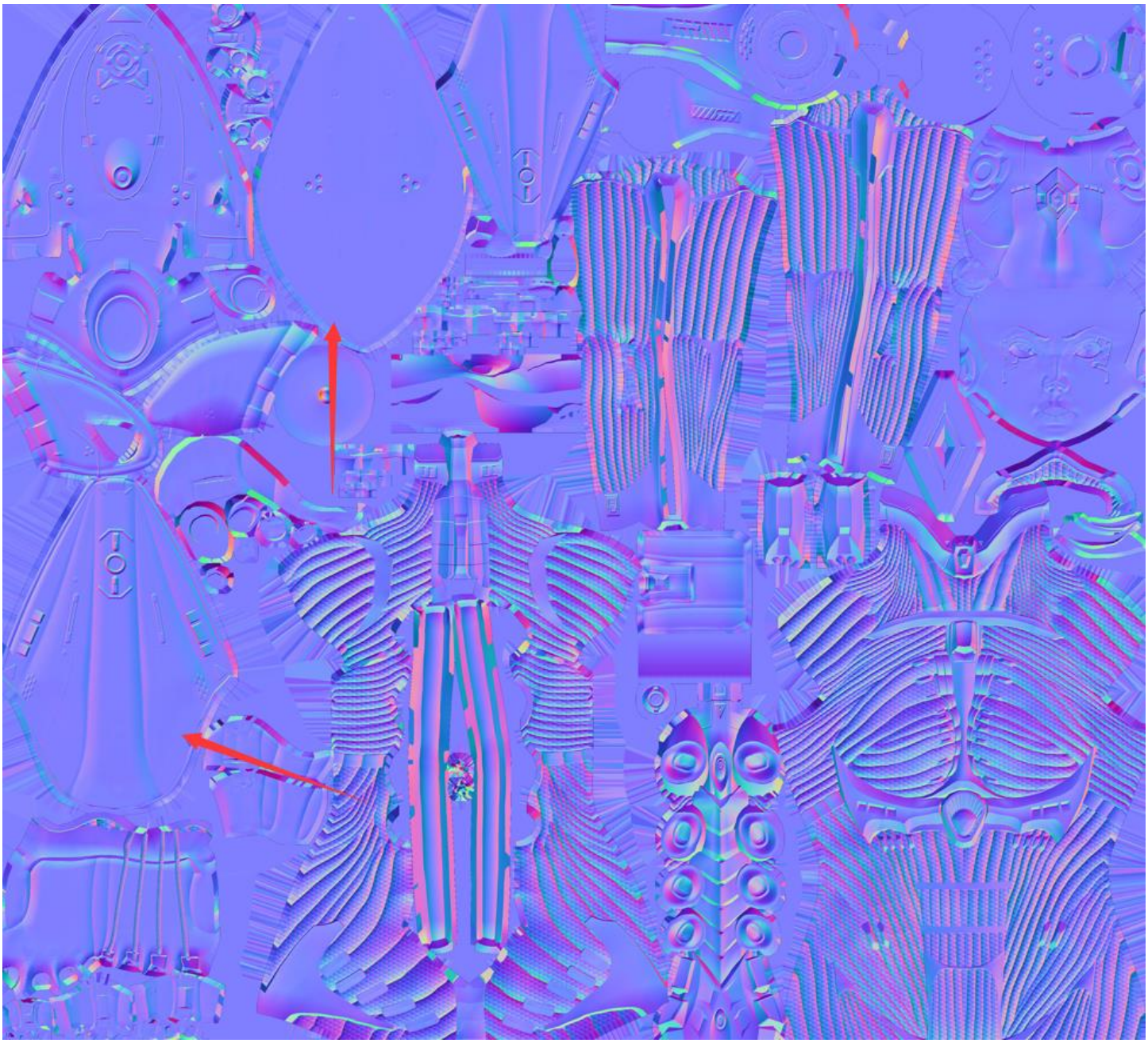
And then, I used Edit-Keys-Bake Simulation. Then those animations will be baked on bones. Select meshes and root joint hierarchy again. Now I can export selection as FBX file now.



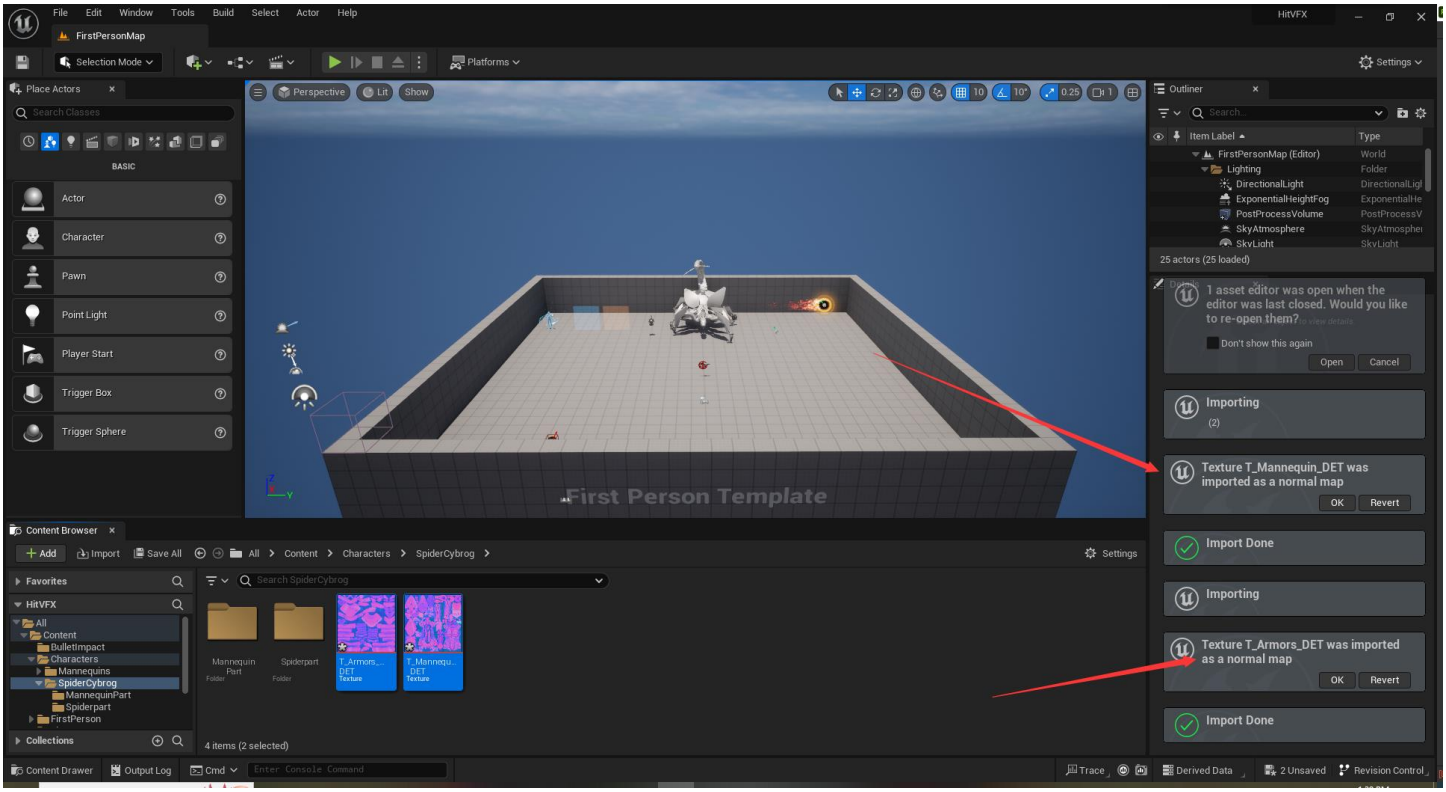
But then, I met another troblesome problem. I setted only one smoothing group to all meshes. But when I import the whole character with bones. Those smoothing groups will be changed. This is been proved by import then without bones.



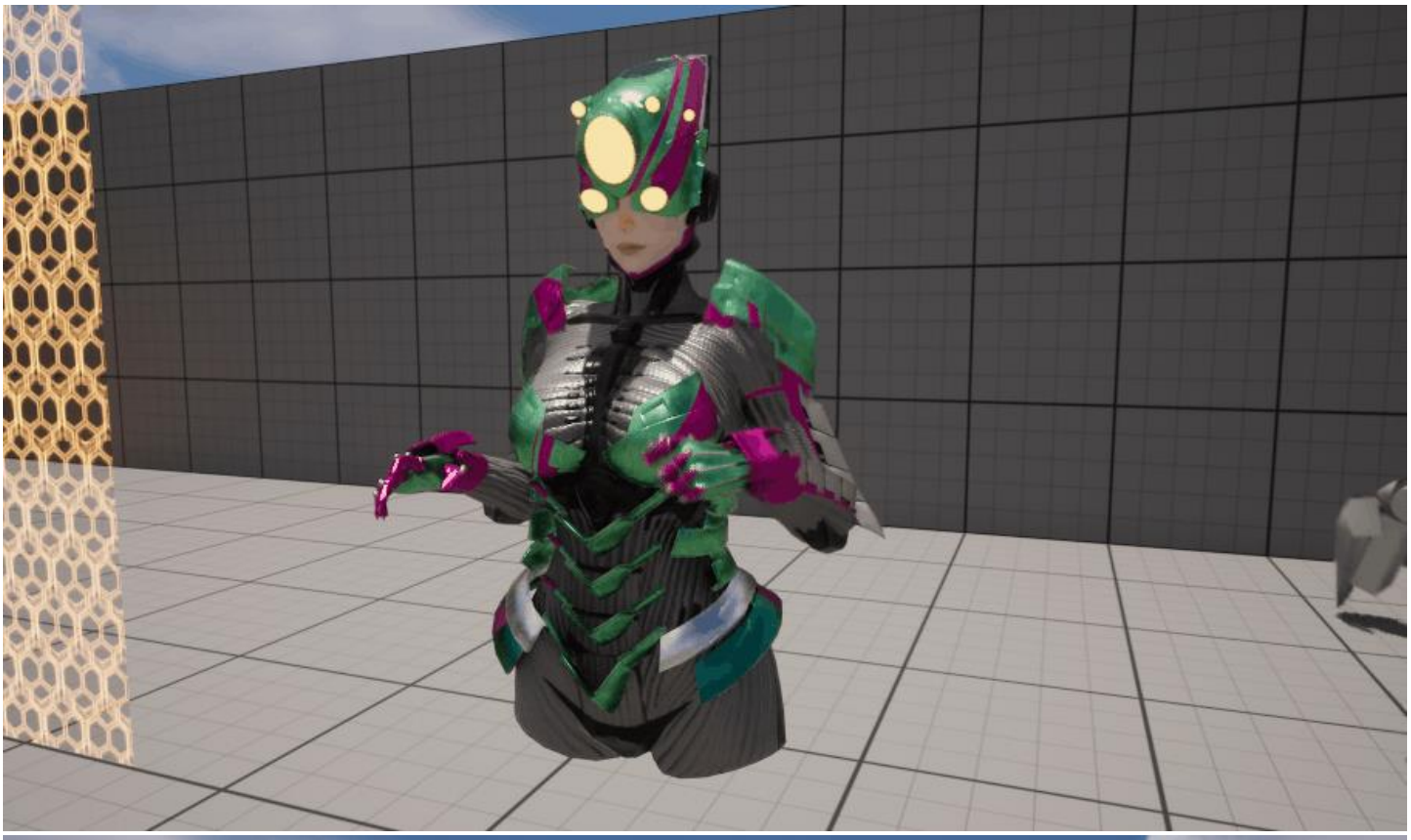
So I auto smoothed the whole mesh and baked again.

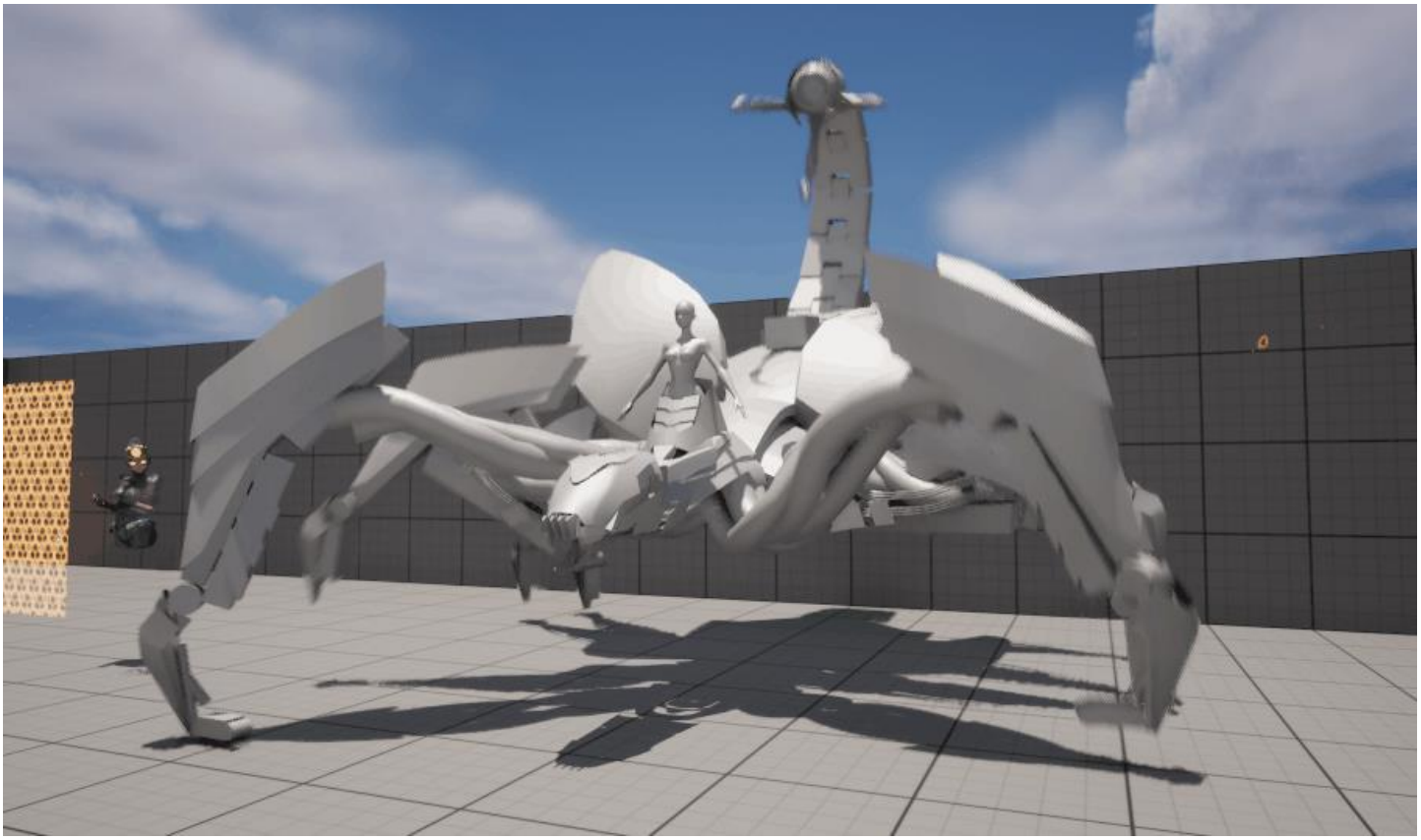


Also, there are some thing borthered me a while. Basiclly, in my DET maps, blue dominates these textures. That caused Unreal defined those DET maps as Normal maps. I need to revert it when I import them.



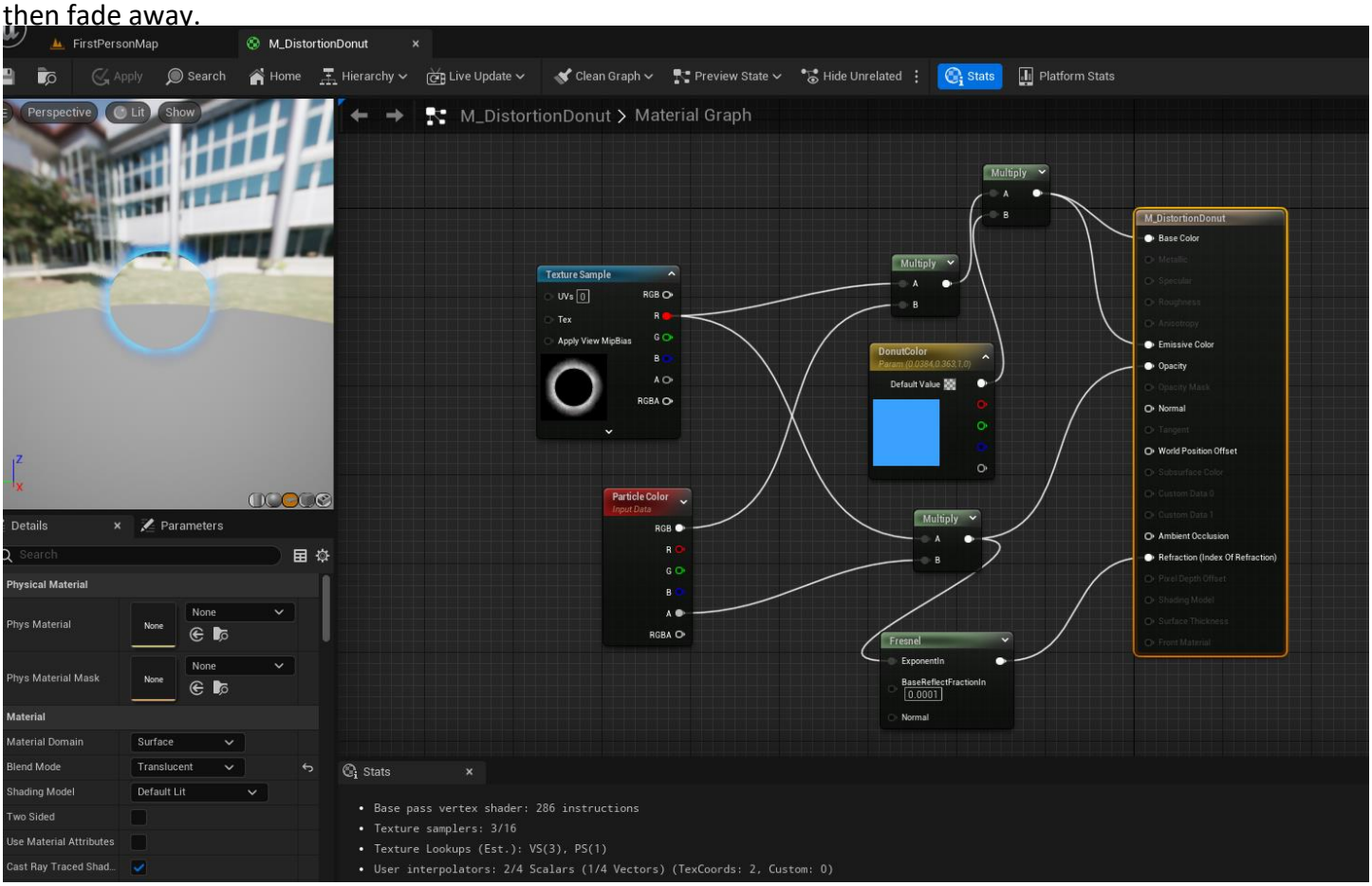
These Gifs are how my meshes look in Unreal.

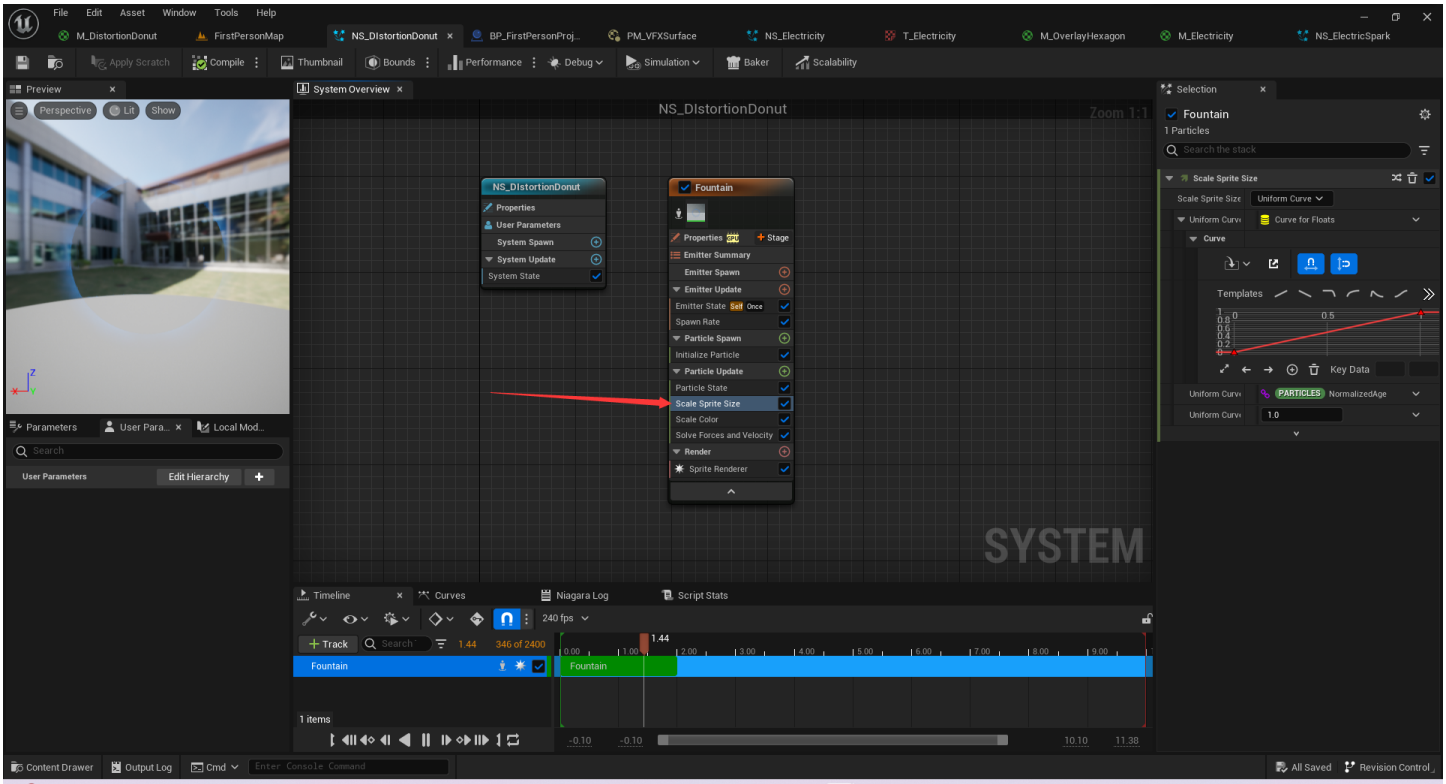




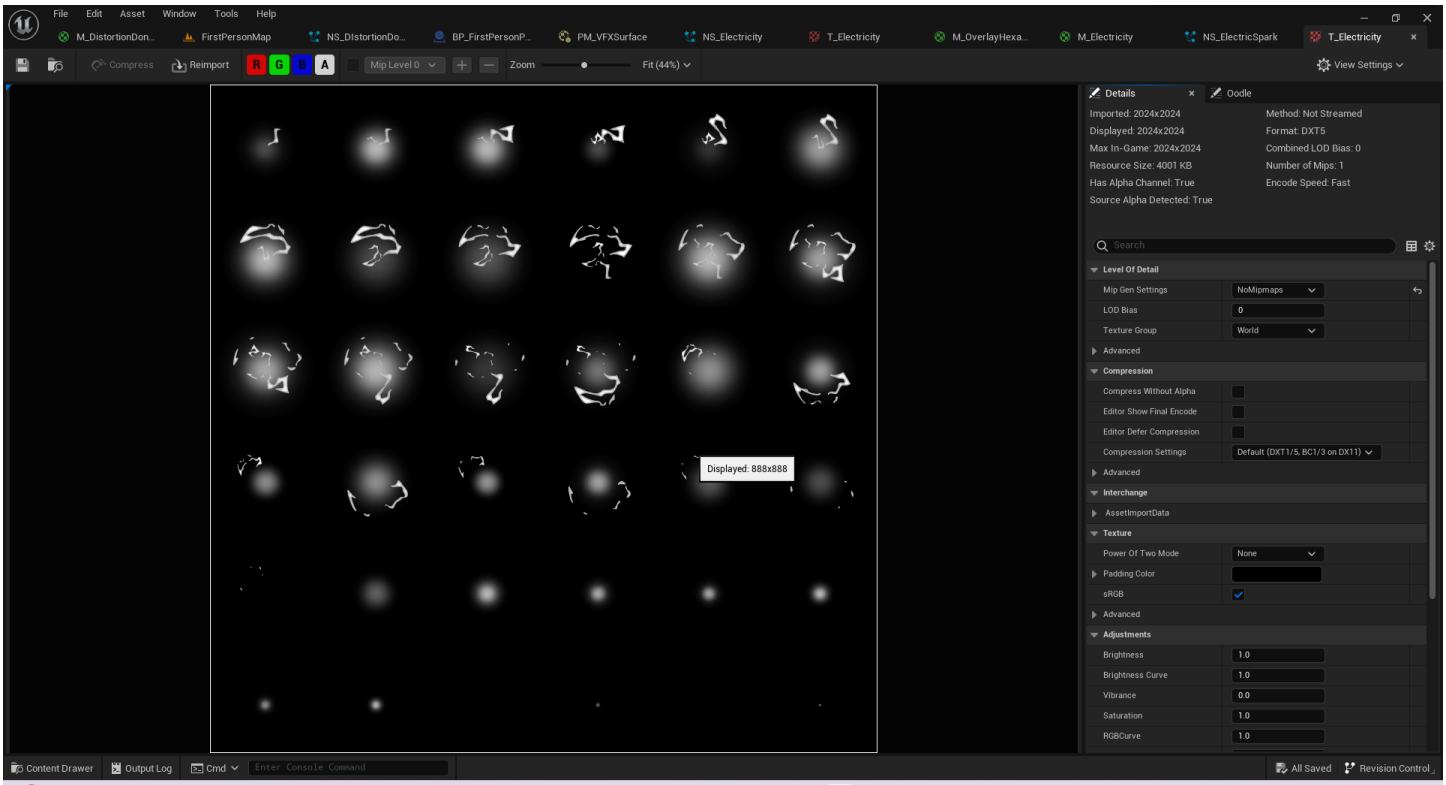
MASTERY TOPIC 3: VFX

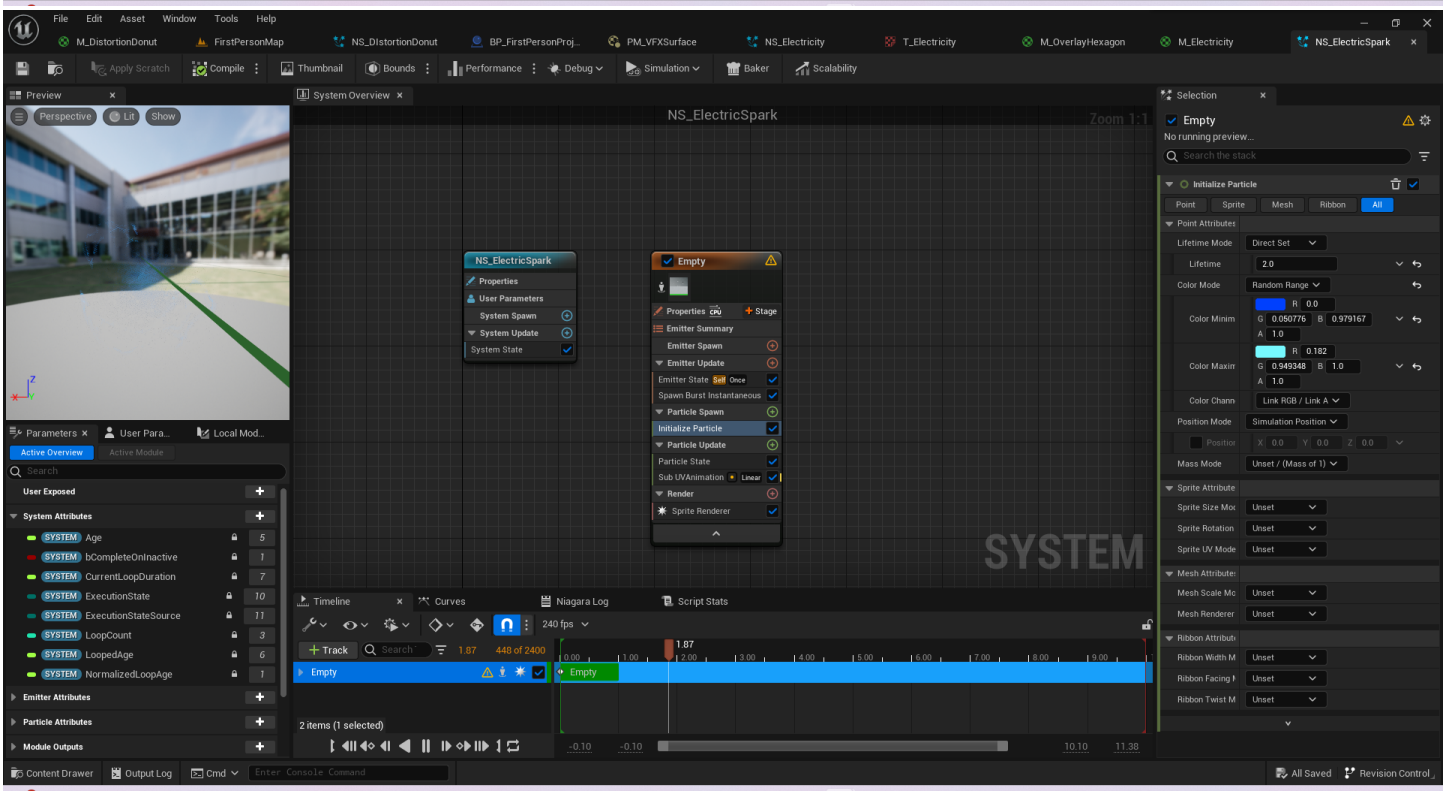
In order to have VFX of hit impact, I made a sound ripple material, bringing it to a fountain Niagara system. I gave it a scale sprite size node which will allow the sound ripple could playback from small size to big size and then fade away.



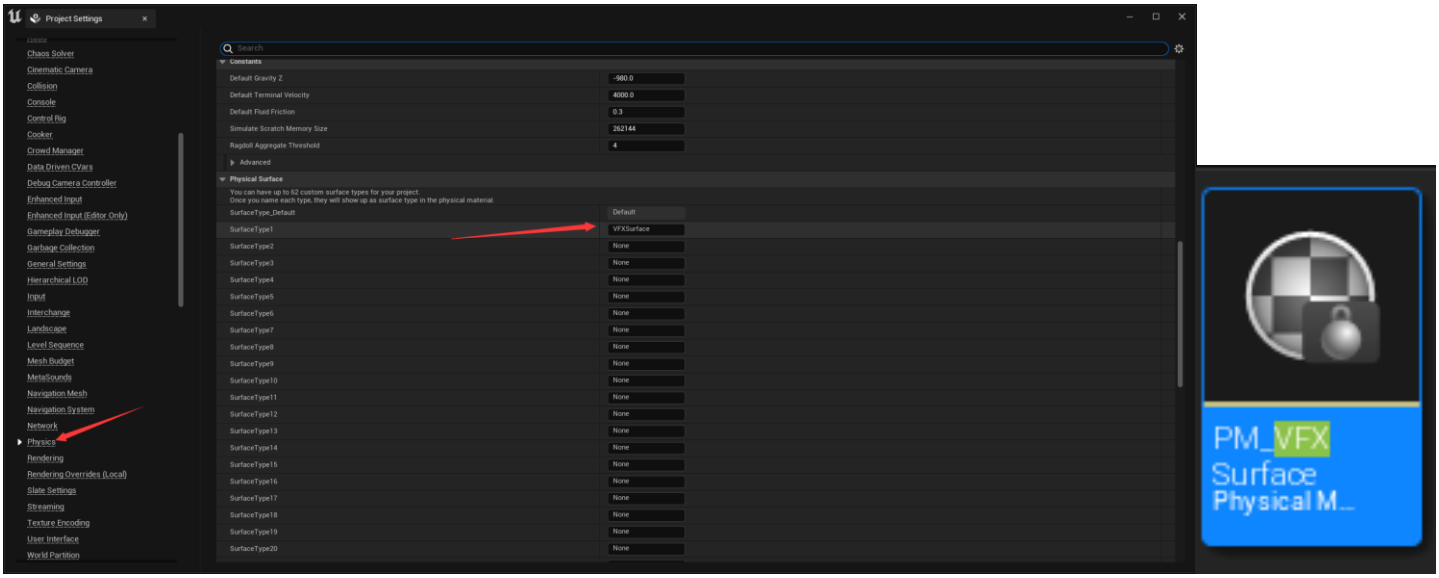


Also, I made a flipbook Niagara system which allowed me to have a single time played electronic VFX.

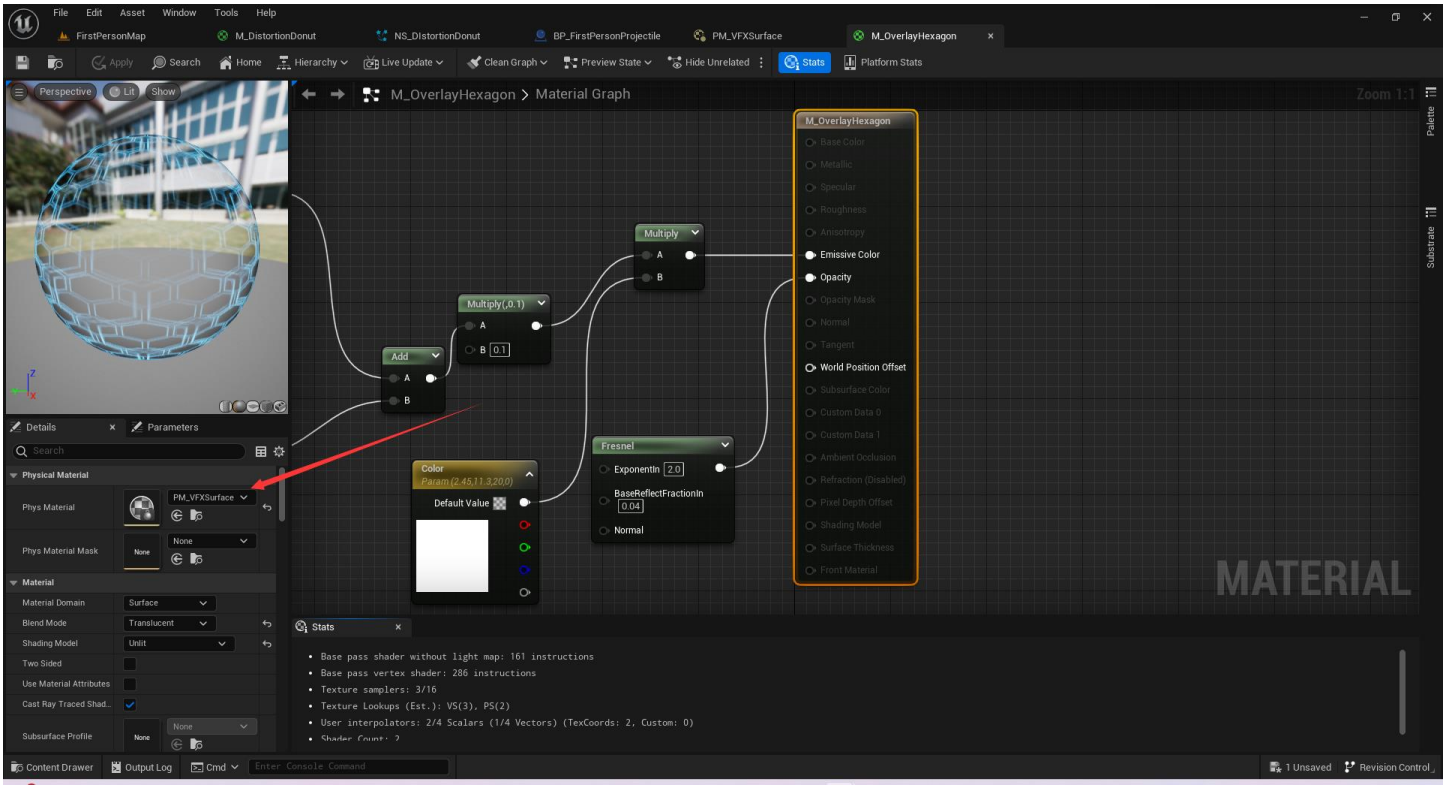




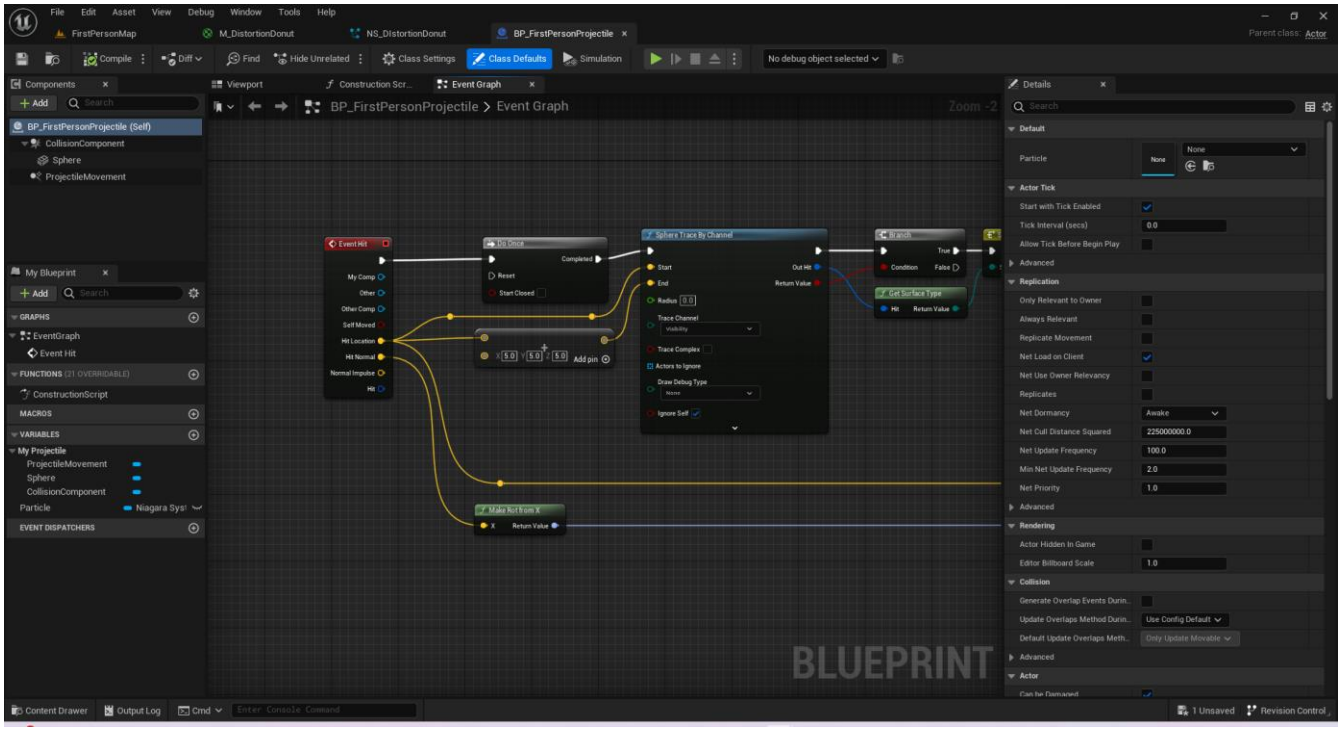
How to make a bullet have a certain reaction when it hits a certain surface was a great task for me. What I found to get that result is gone to project setting-physics and naming certain surfaces that I want to have. And then create physical material that is assigned to certain surfaces.



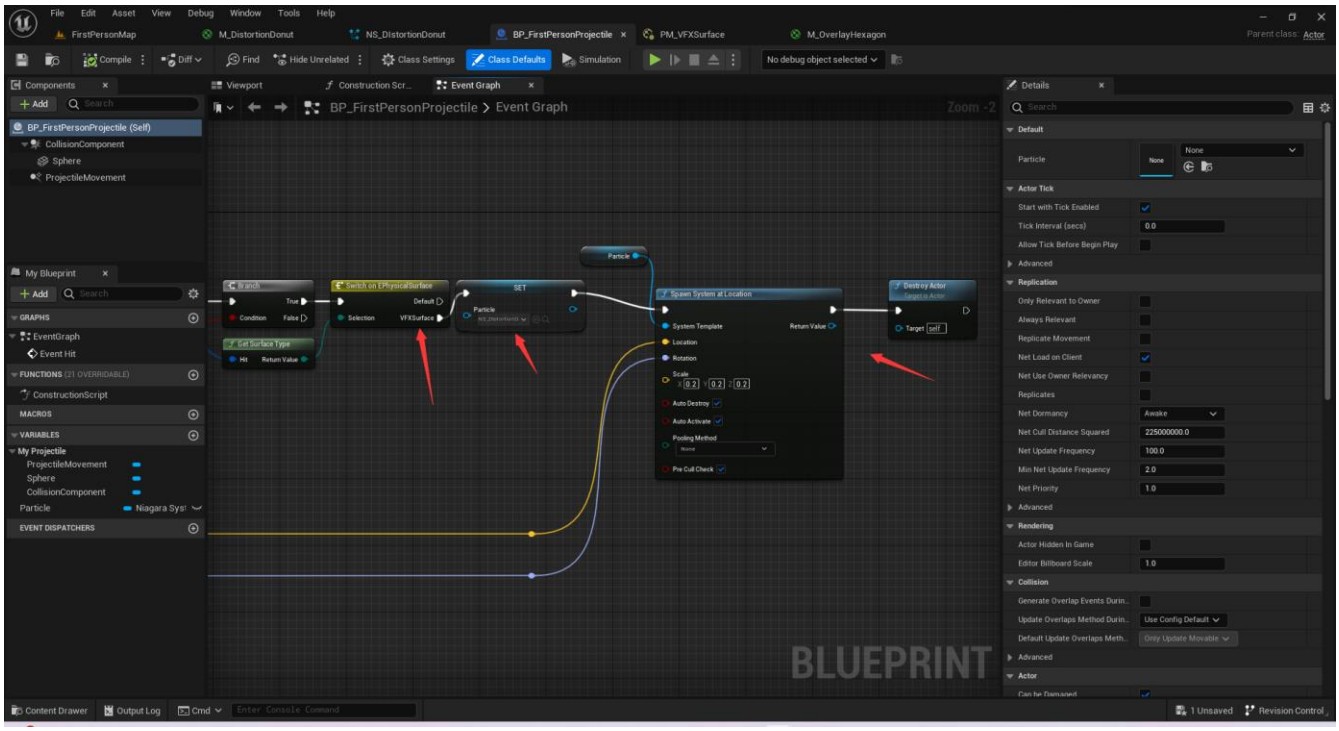
Go to the material that you want to hit, assigning the material with physical materials.

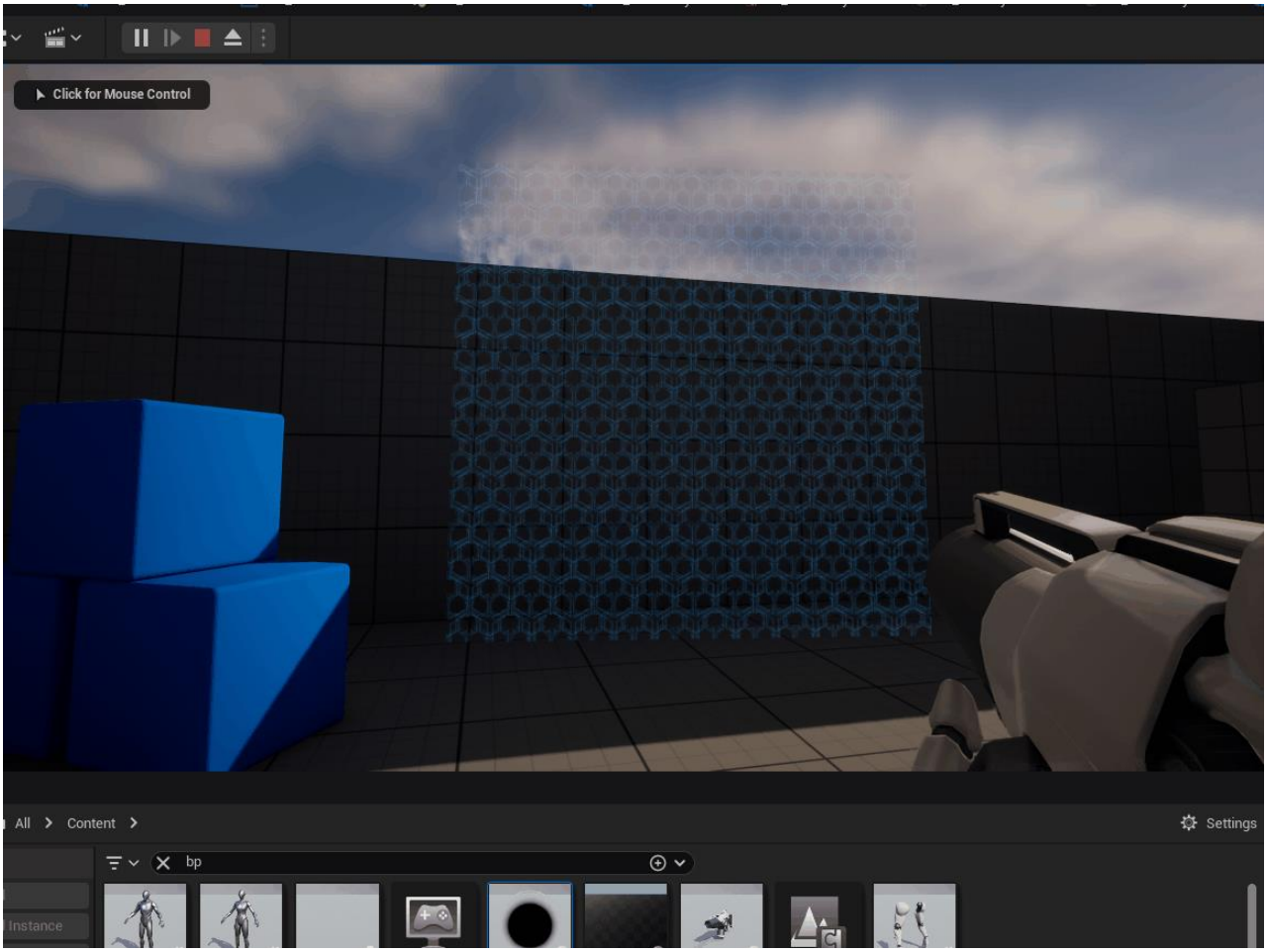


And now I can go to the bullet blueprint, create nodes as follows. Overall, this could let bullets trigger certain VFX when they hit related surfaces.

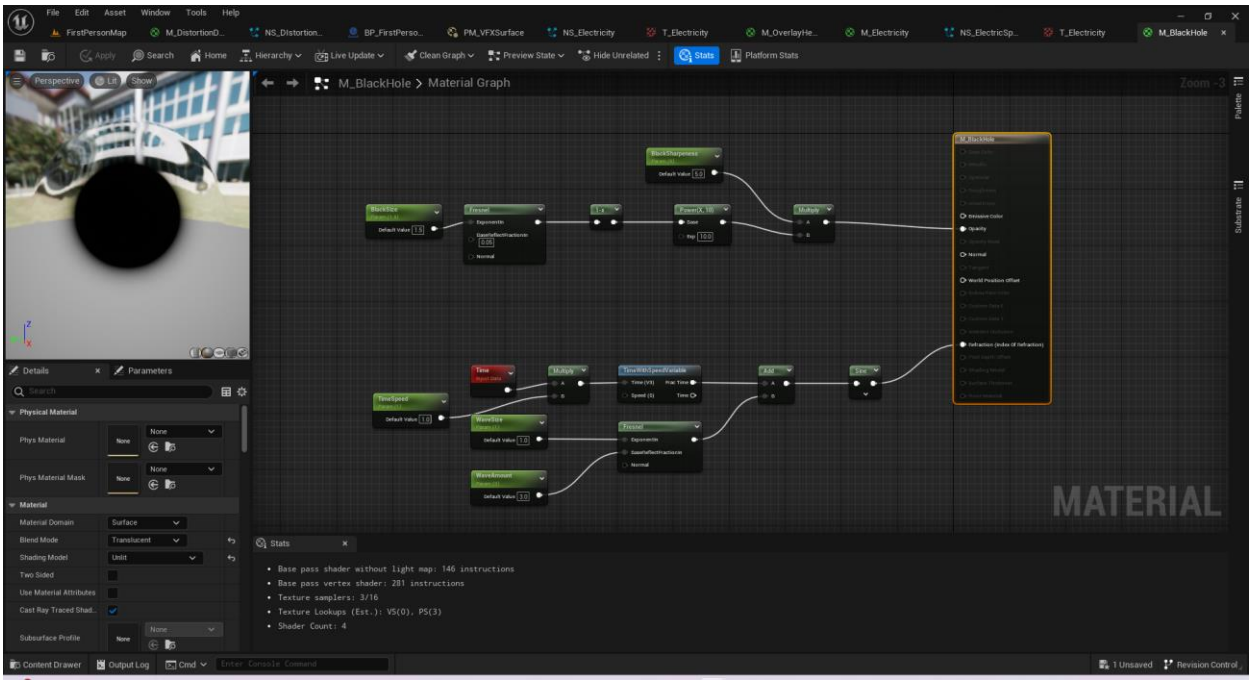


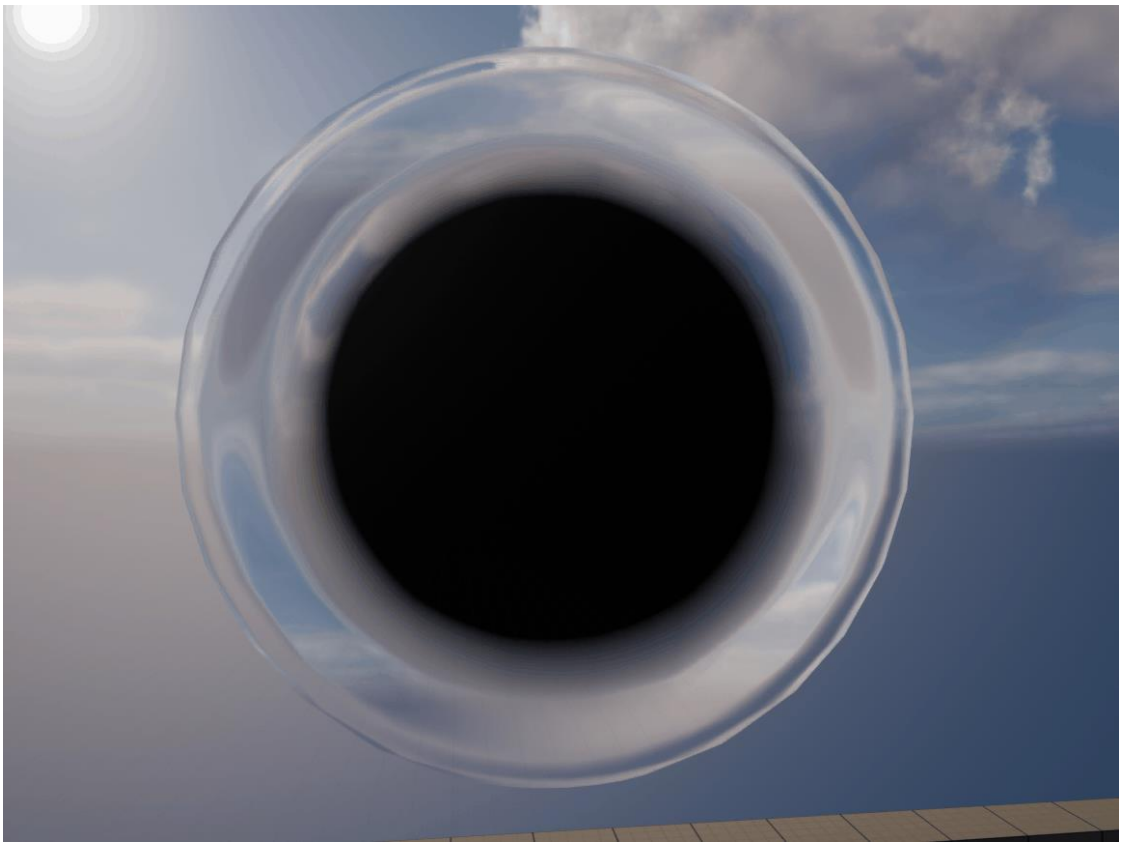
In here I can assign more surfaces and VFX if I needed.



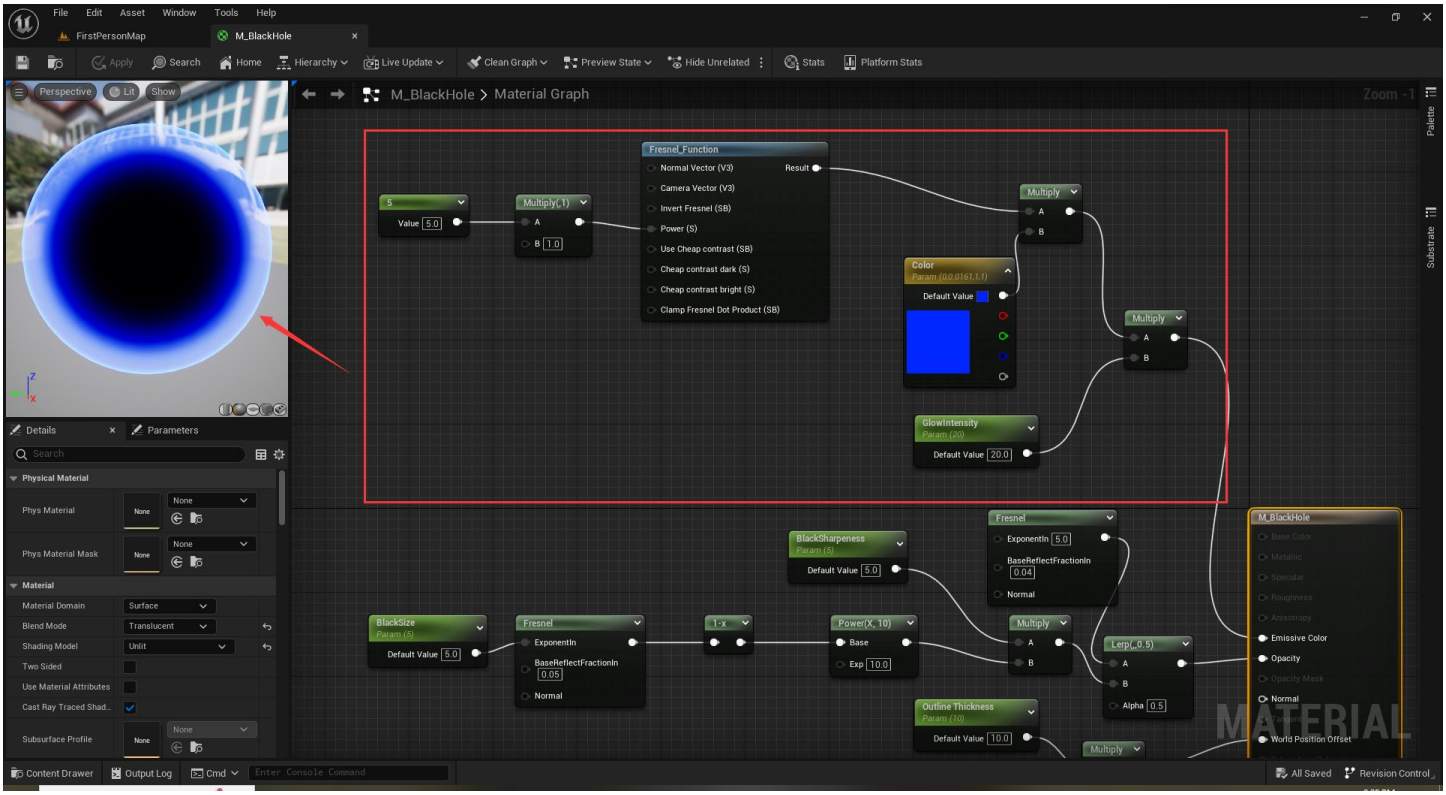


Beyond that I explored VFX that I could apply for ammos of character's scorpion tail. I made a black hole material that I can adjust the size and smoothness of the core. I just need to create an instance then I can adjust the color and size of core easily.

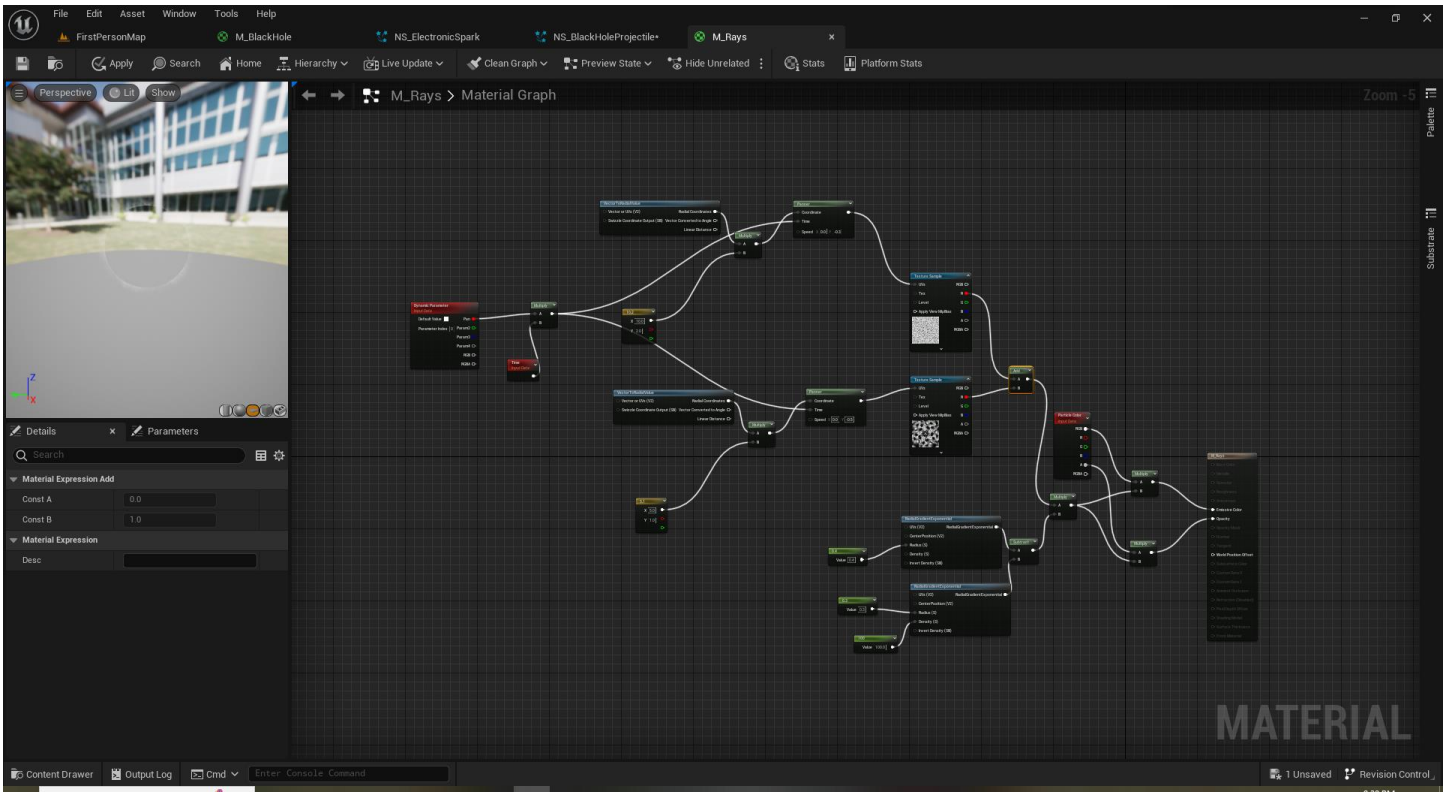


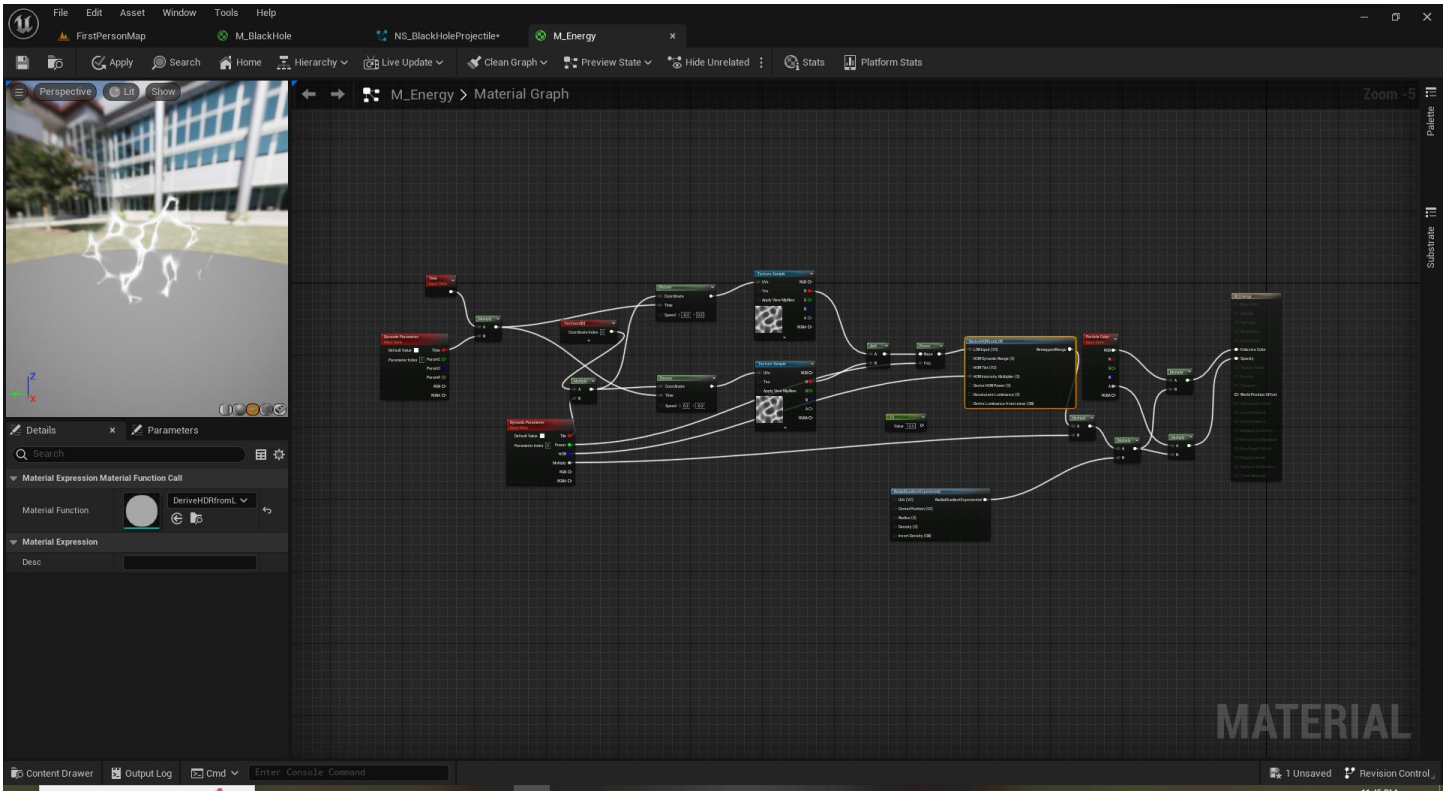


I updated the black hole material, adding Fresnel function node. And now the edge of black hole can be glow now.

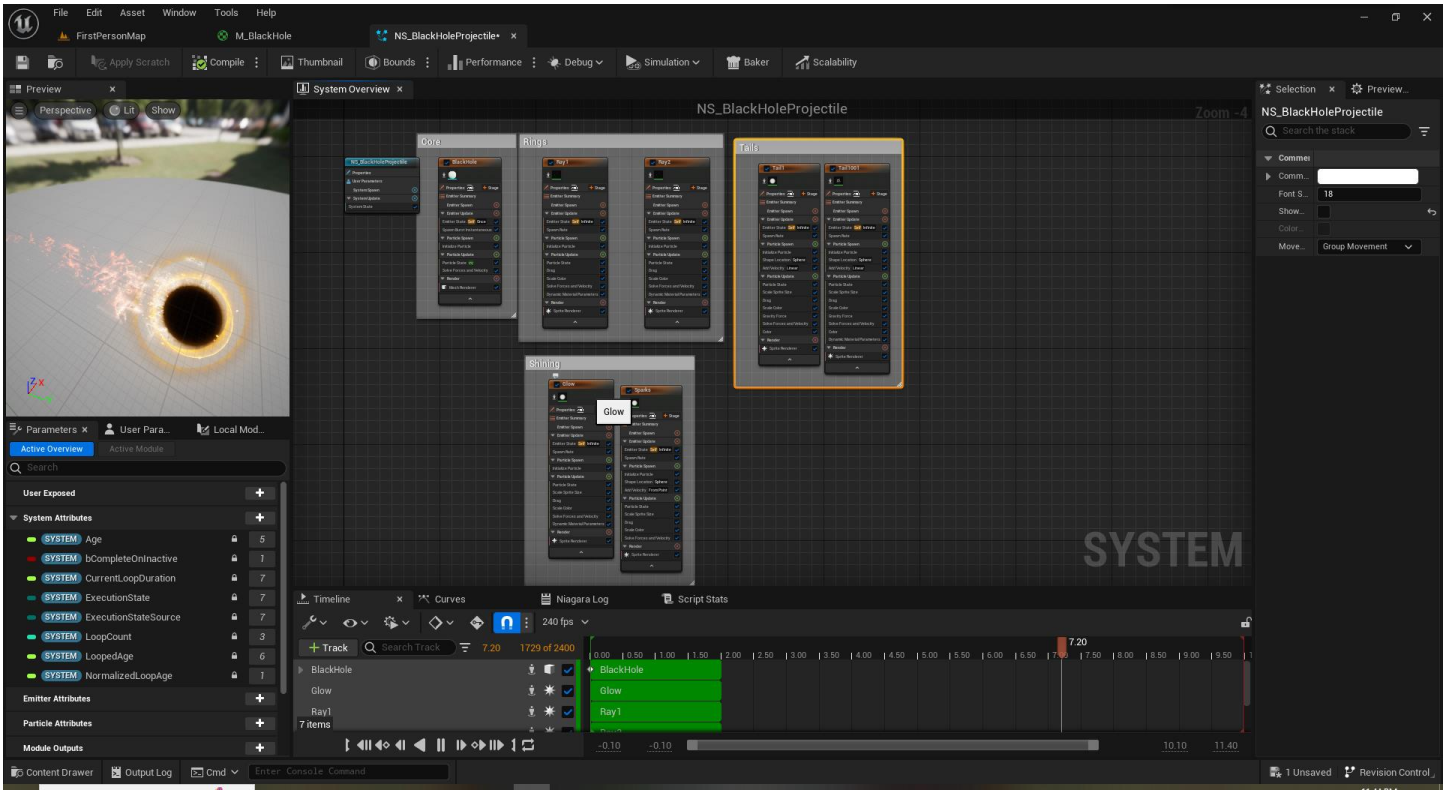


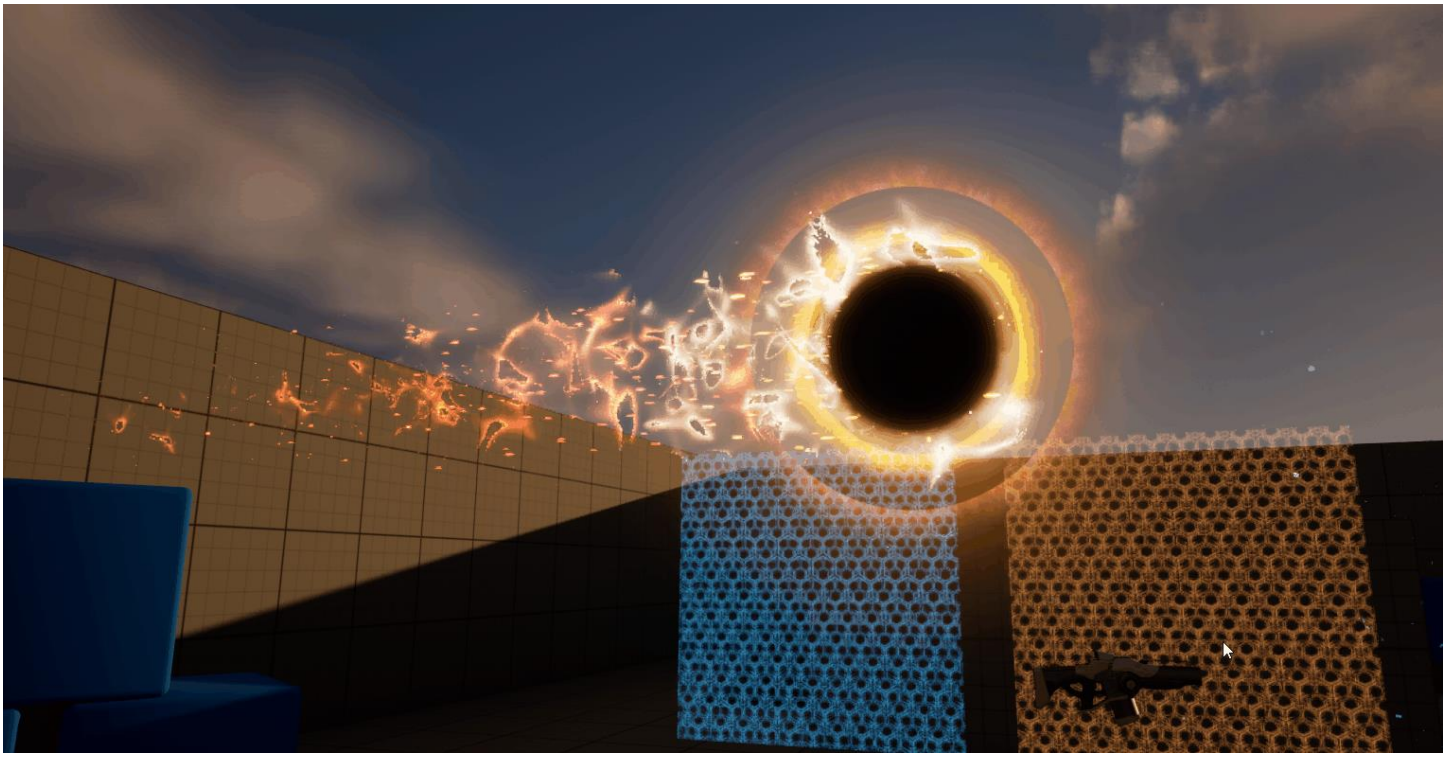
Also, I made two new materials for the beam VFX. First is for outer glow, second is for beam's tail.



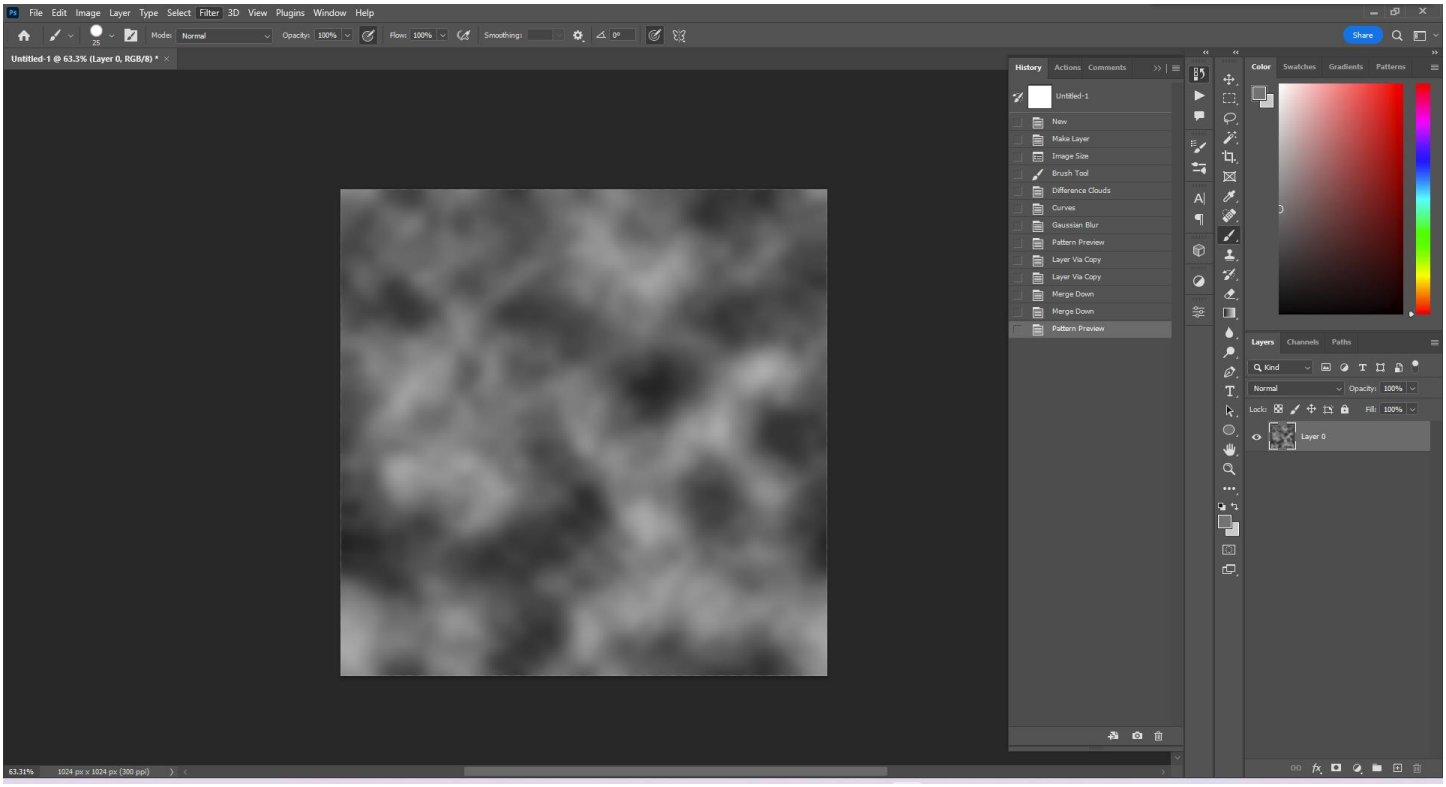


This VFX could be separated to core, outer glow, tails, and wave glow parts.





Now I need another VFX for ground impact. First, I rendered a cloud texture in Photoshop.


File Edit Image Layer Type Select Filter 3D View Plugins Window Help
Untitled-1 @ 63.3% (Layer 0, RGB/8) *
History
Actions
Comments
Untitled-1
New
Make Layer
Image Size
Brush Tool
Difference Clouds
Curves
Gaussian Blur
Pattern Preview
Layer Via Copy
Layer Via Copy
Merge Down
Merge Down
Pattern Preview
Color
Swatches
Gradients
Patterns
Layers
Channels
Paths
Layer 0
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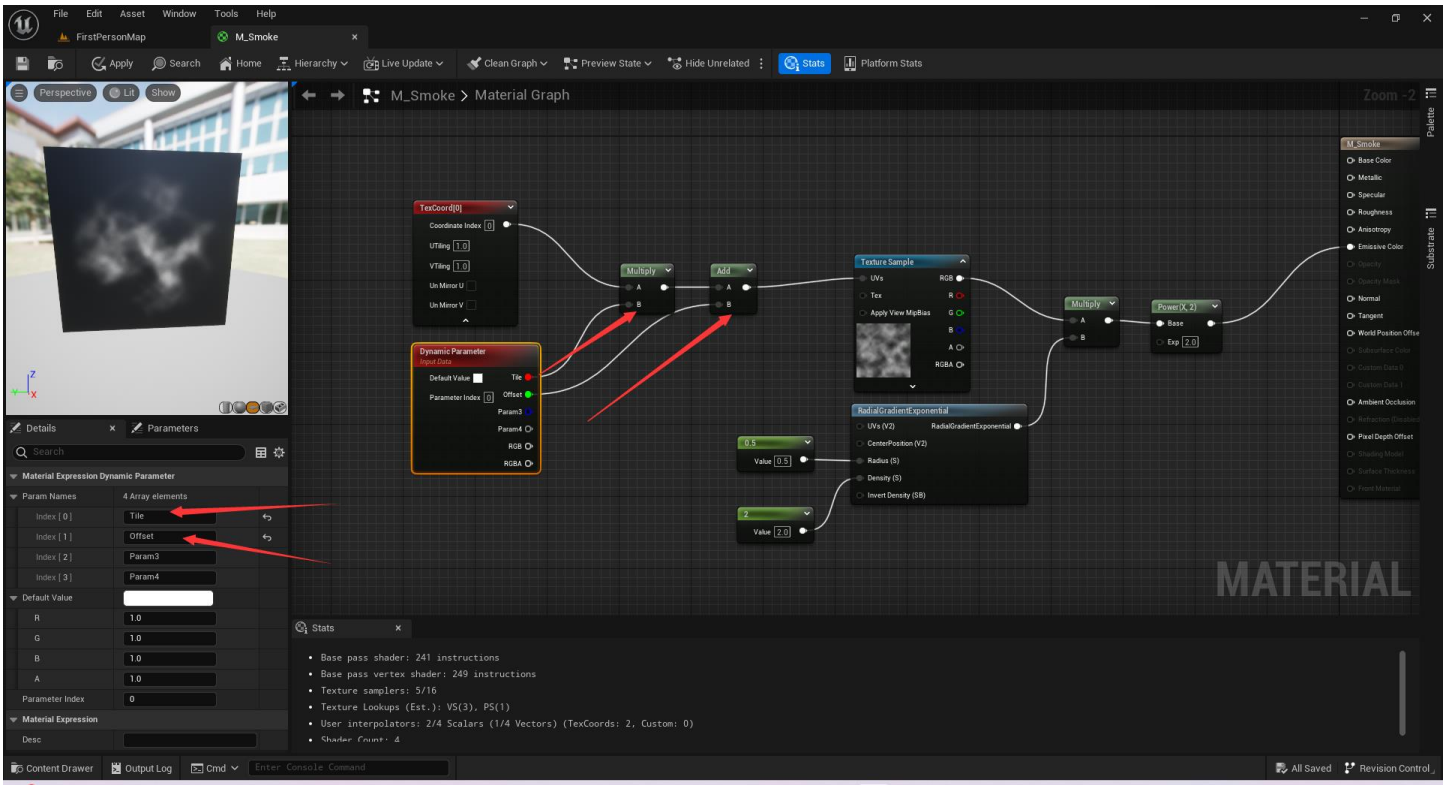
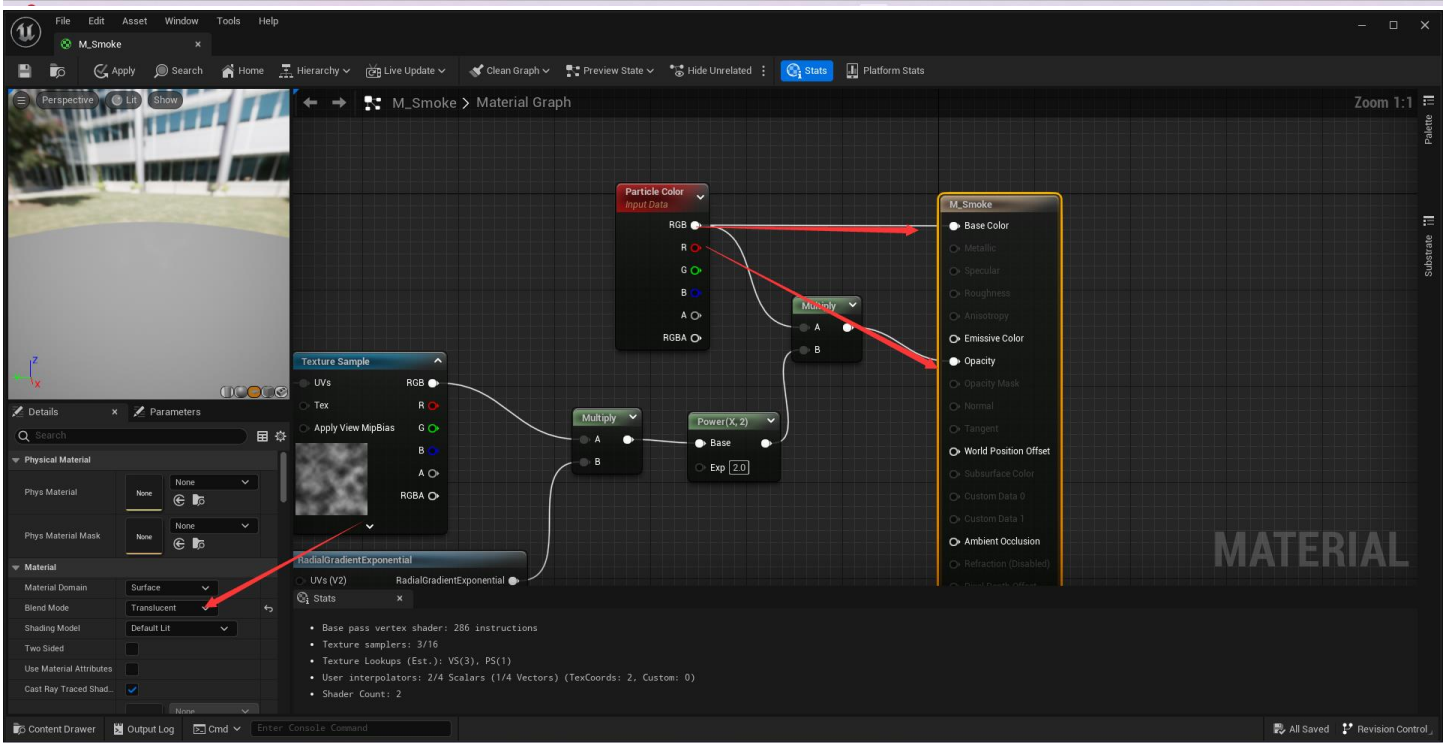
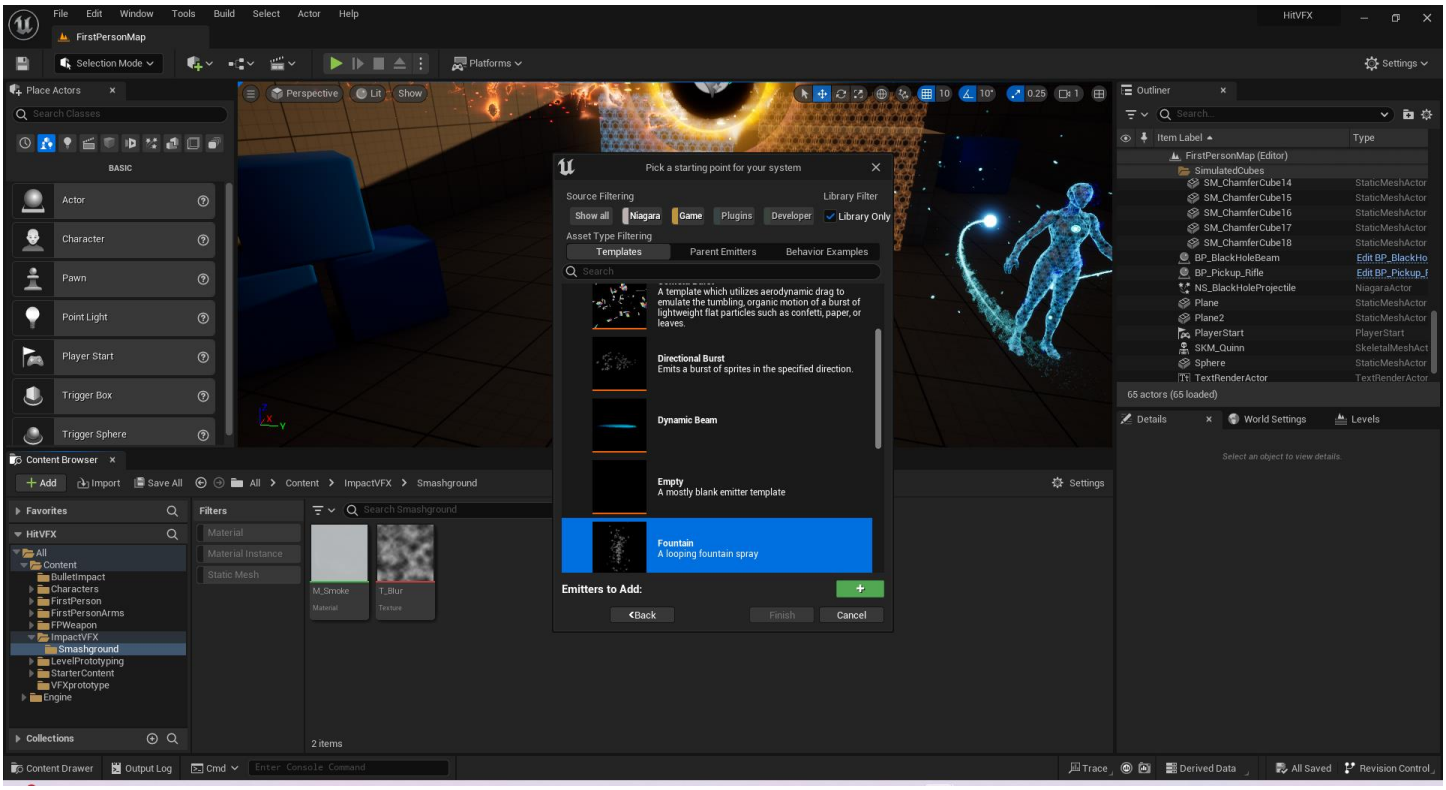
1024 px x 1024 px (300 ppi)

Based on that, I created a transparent cloud material which can control density and tile.

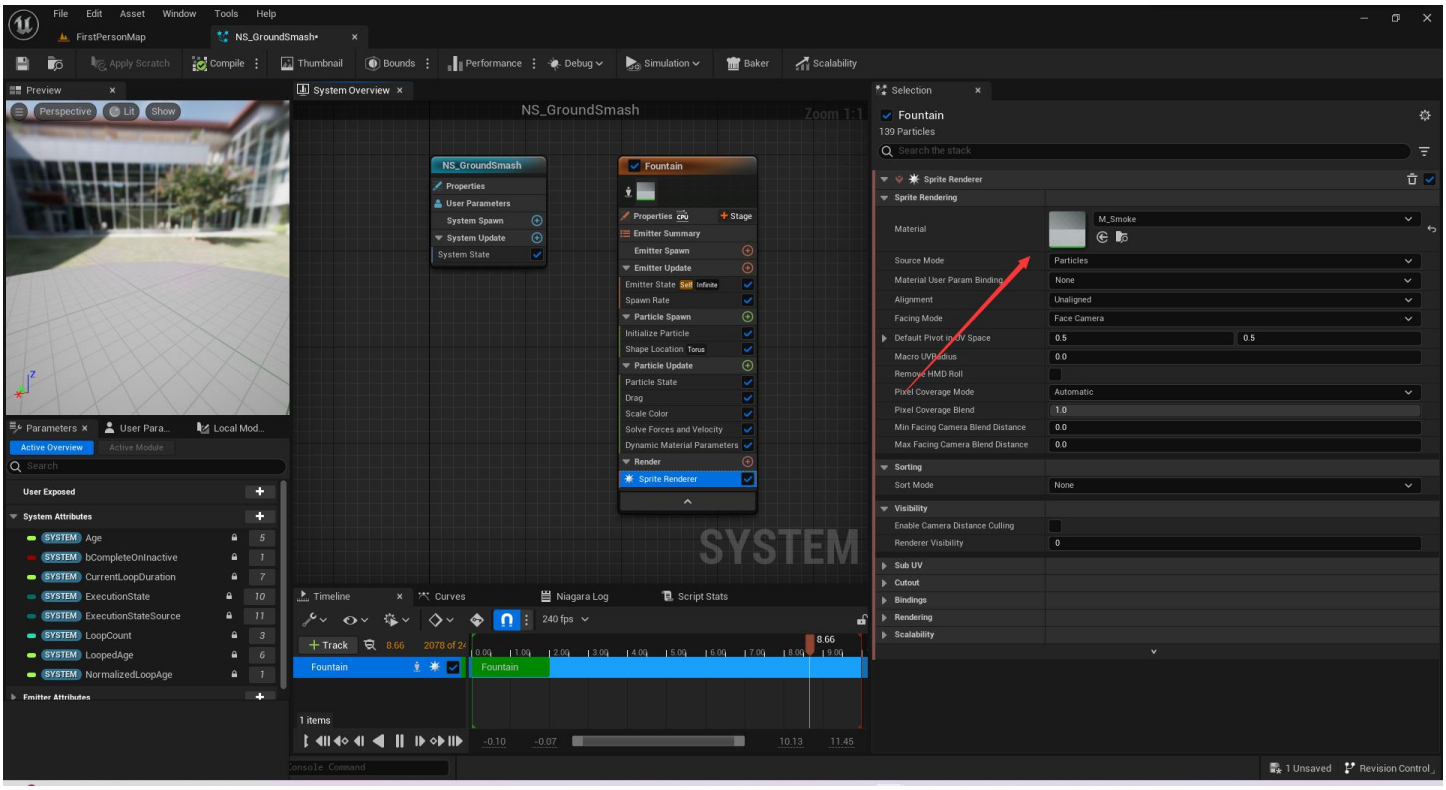




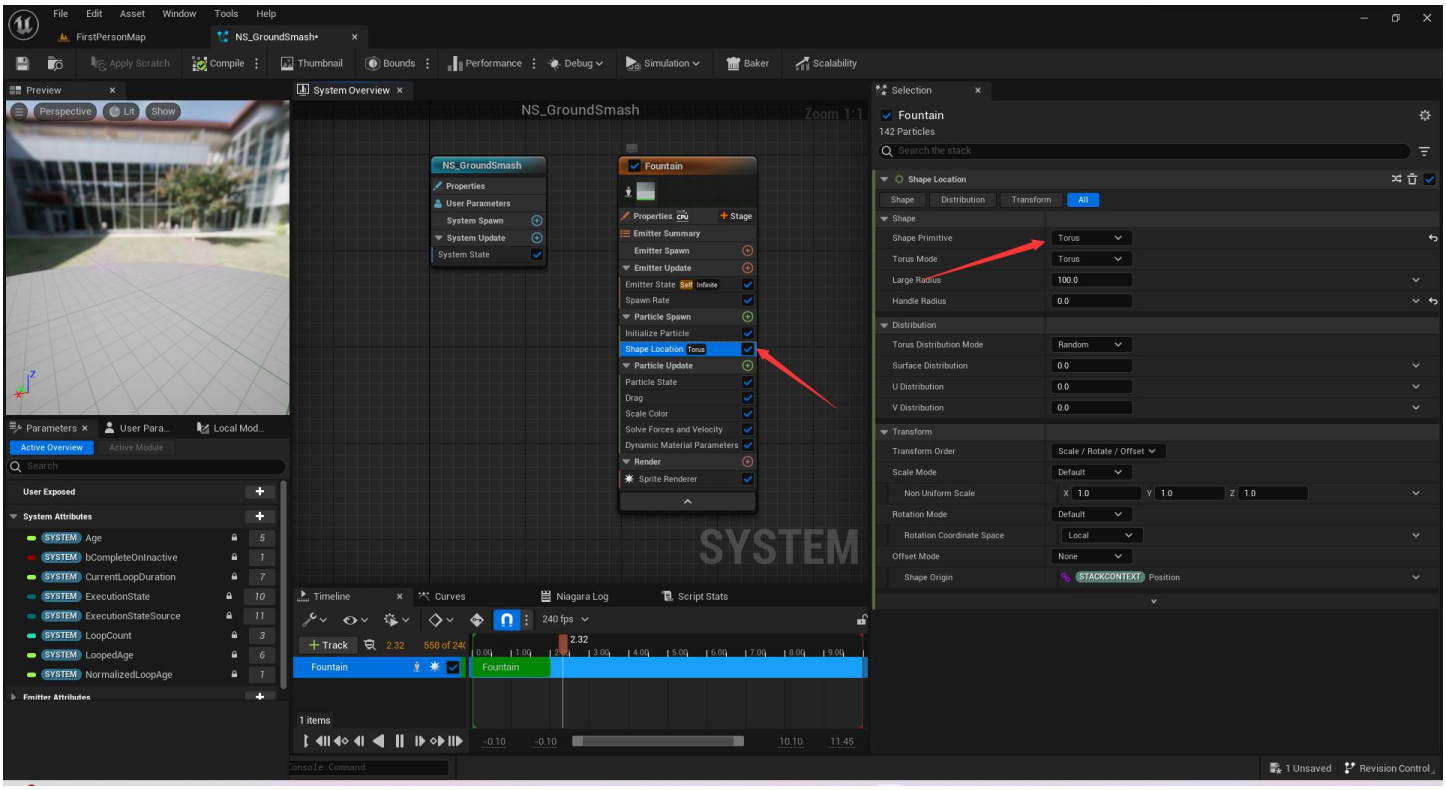
Still start with fountain Niagara system.



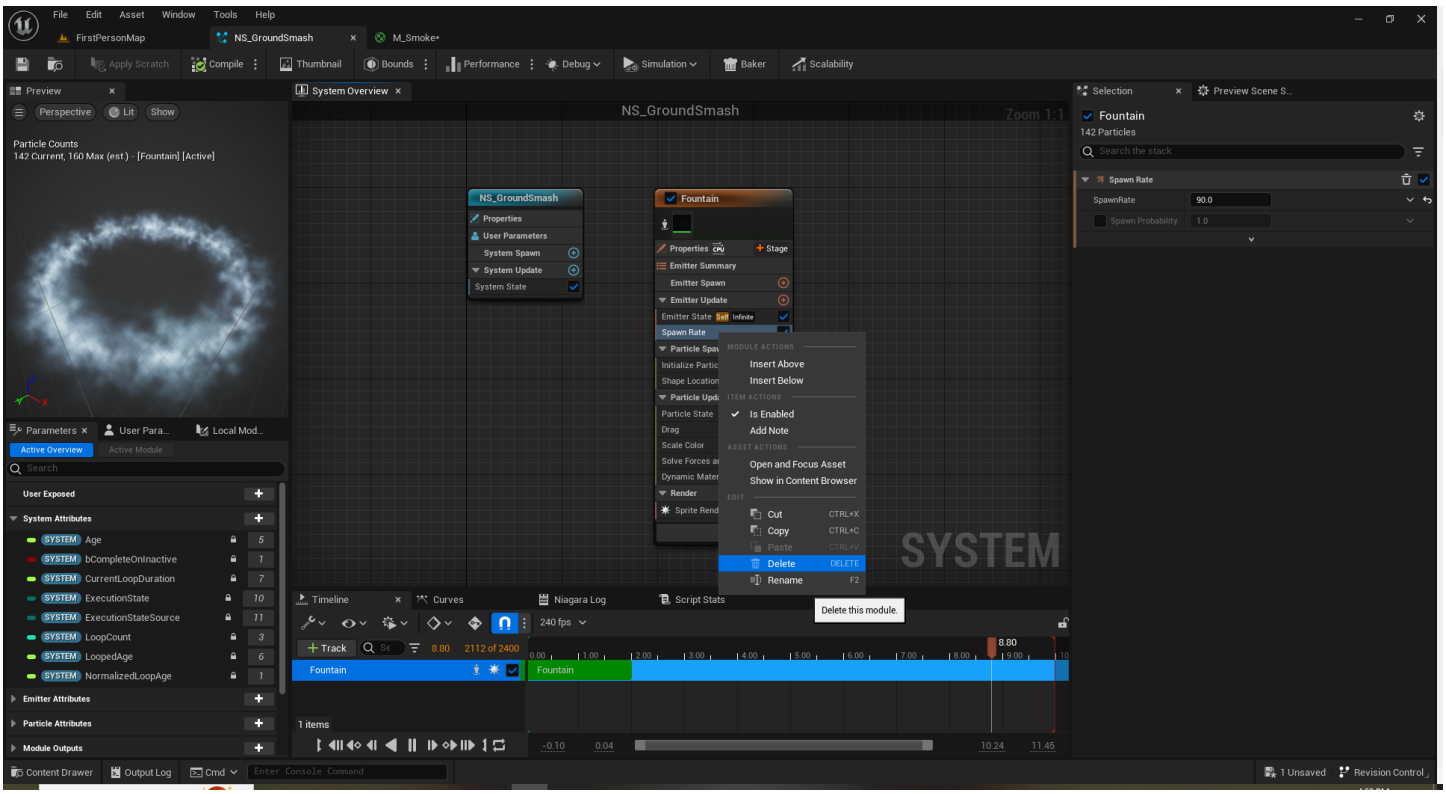
Apply the material to first part of NFX.



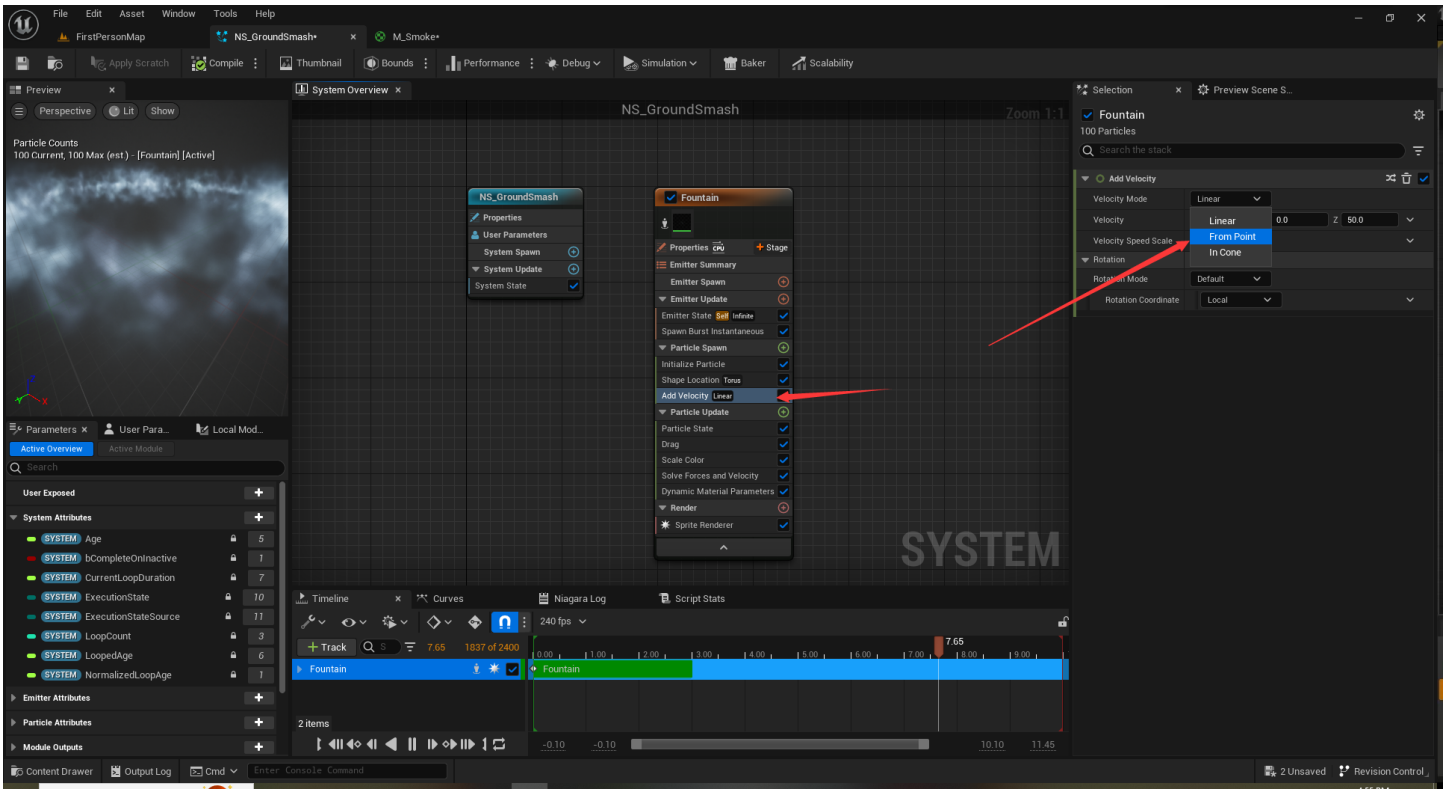
Making the VFX generated surrounded by torus.



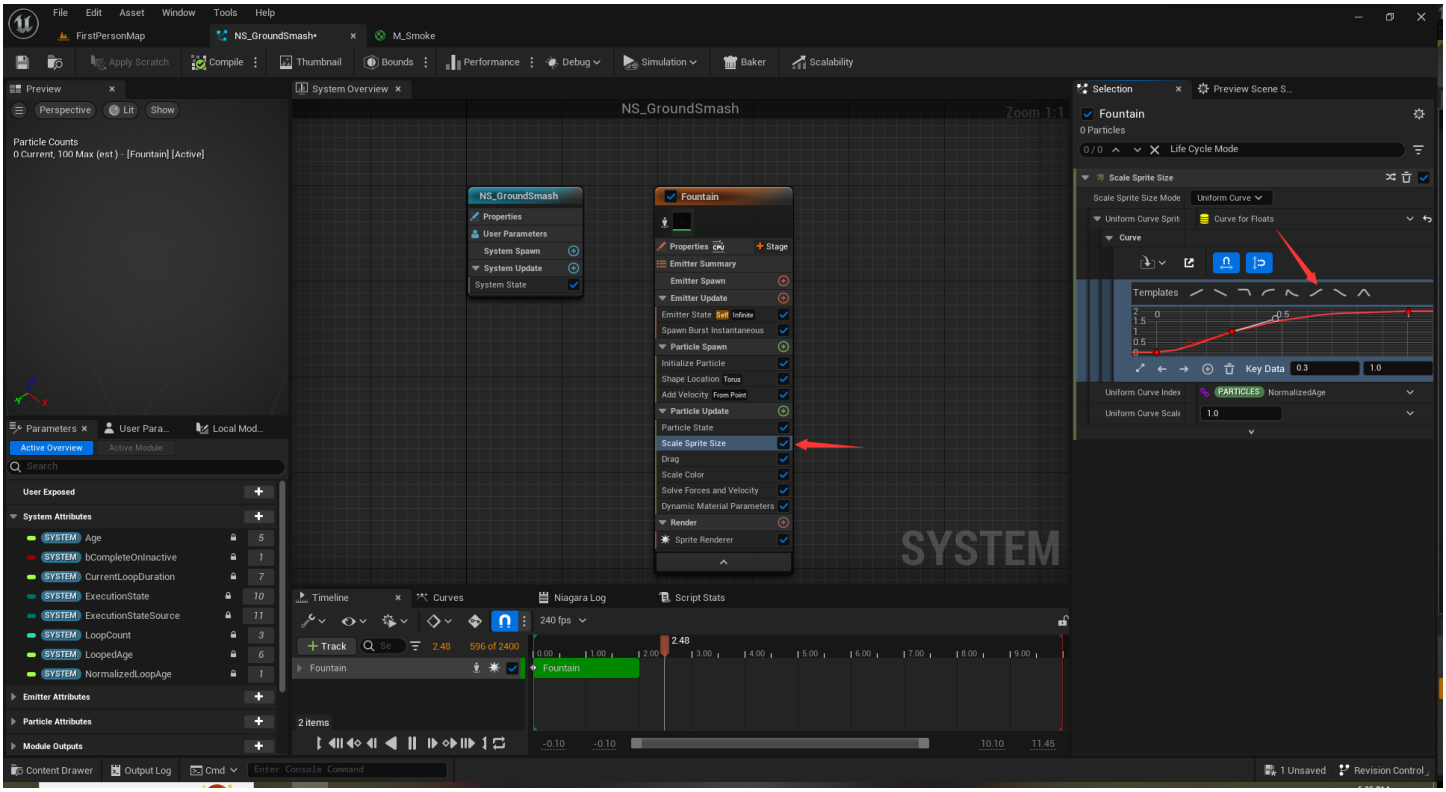
Delete old spawn node, adding a spawn burst instance node which can let the smoke torus generate from the center of circle.



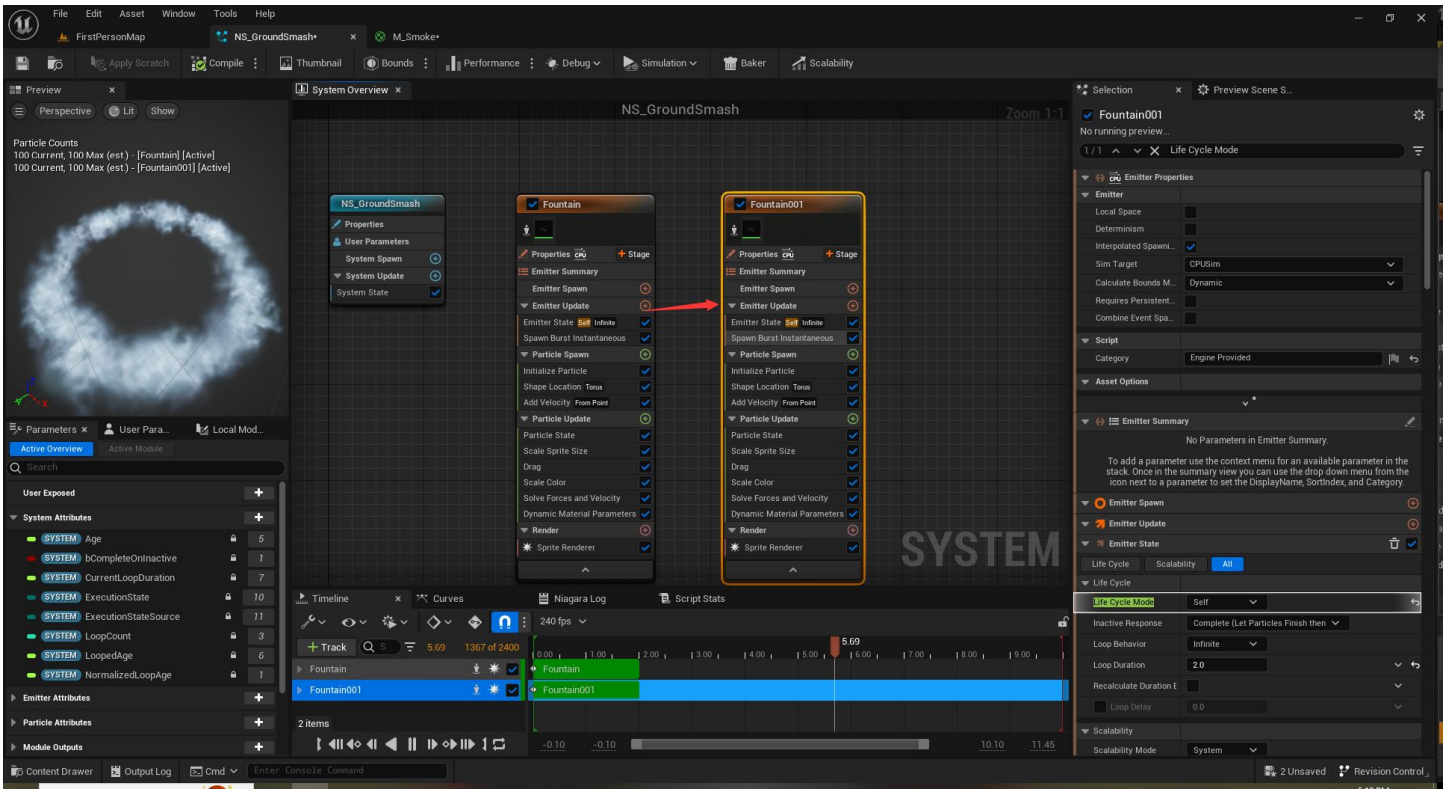
Add an node called Add Velocity which can control the generate speed of smoke.

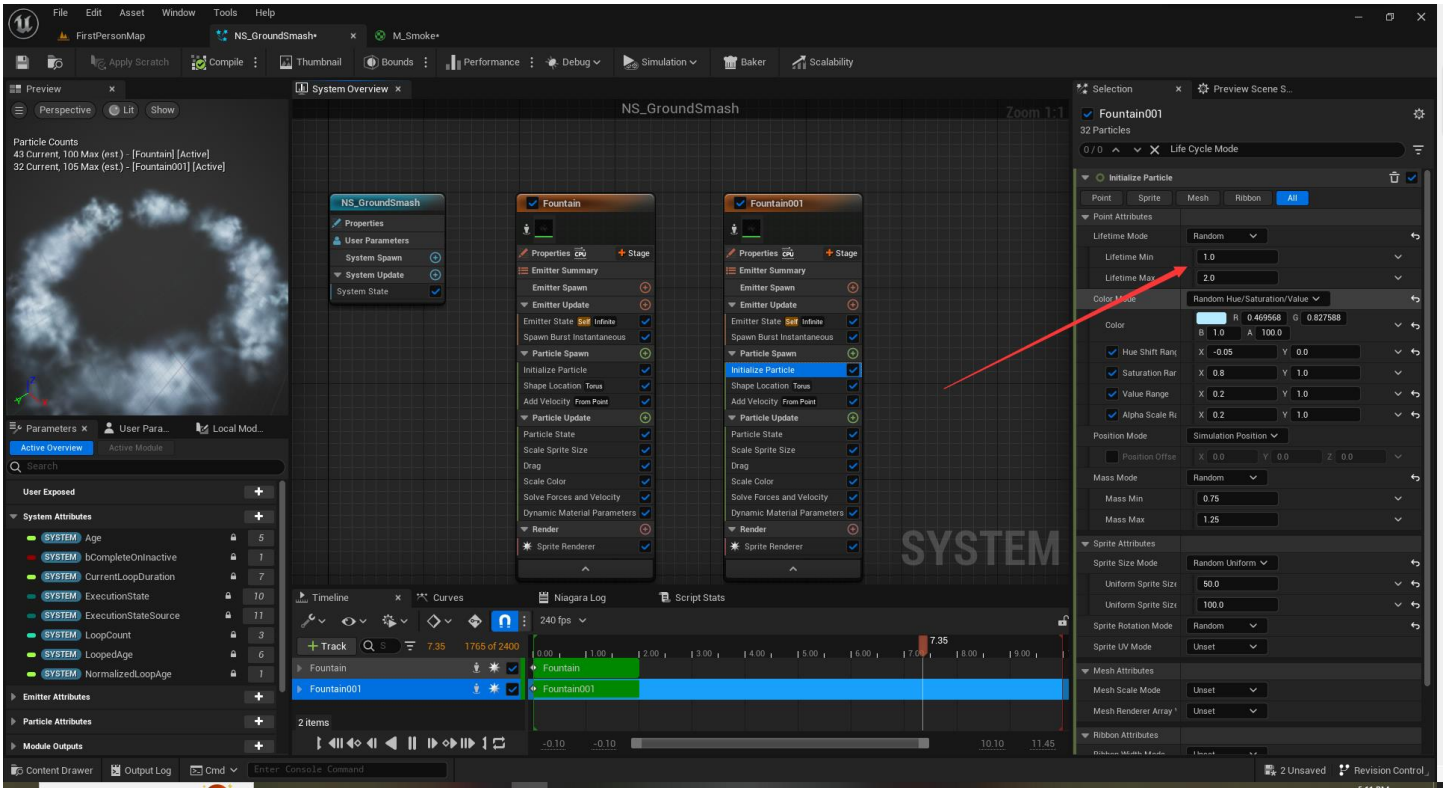


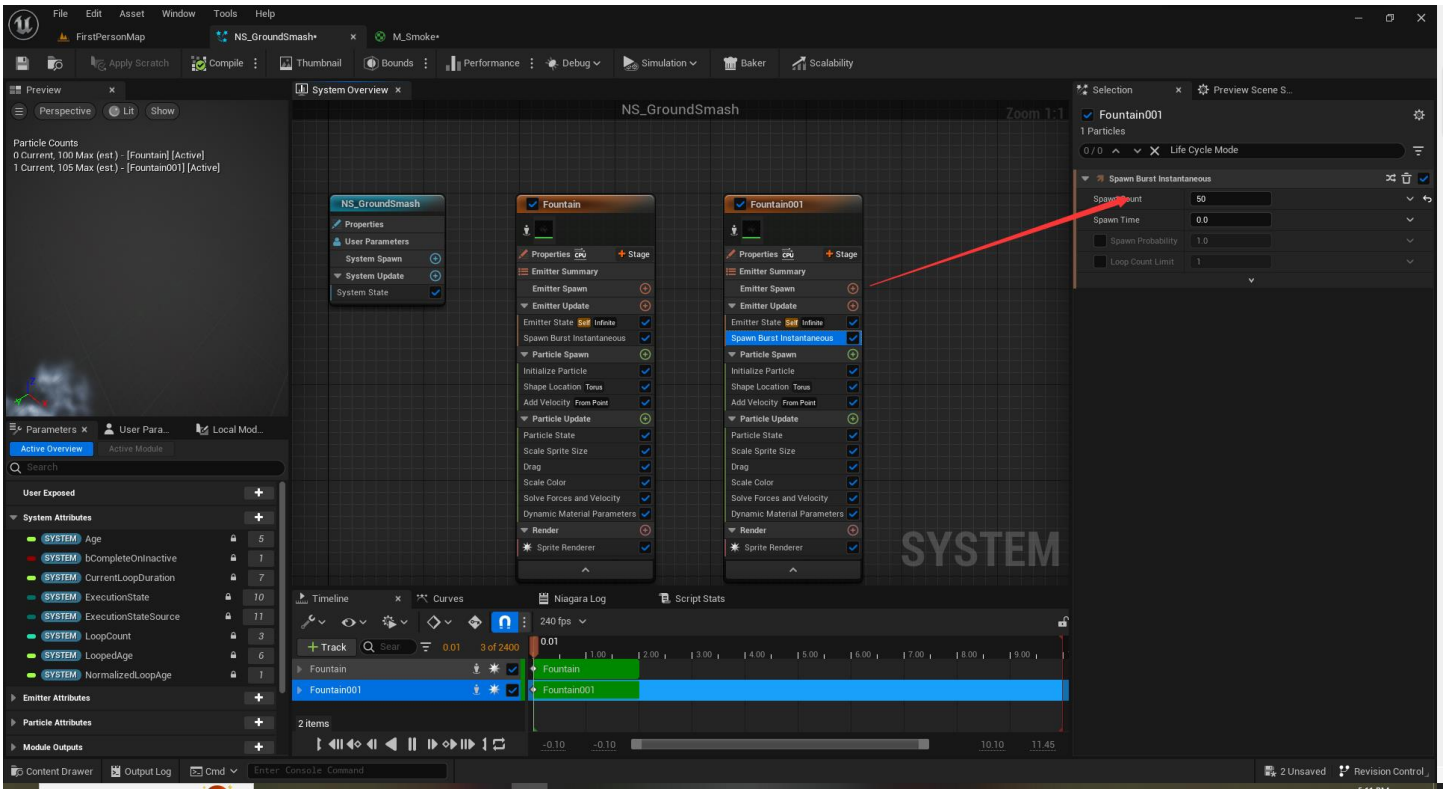
Add a node called scaled sprite size which could add variations to those sprites.

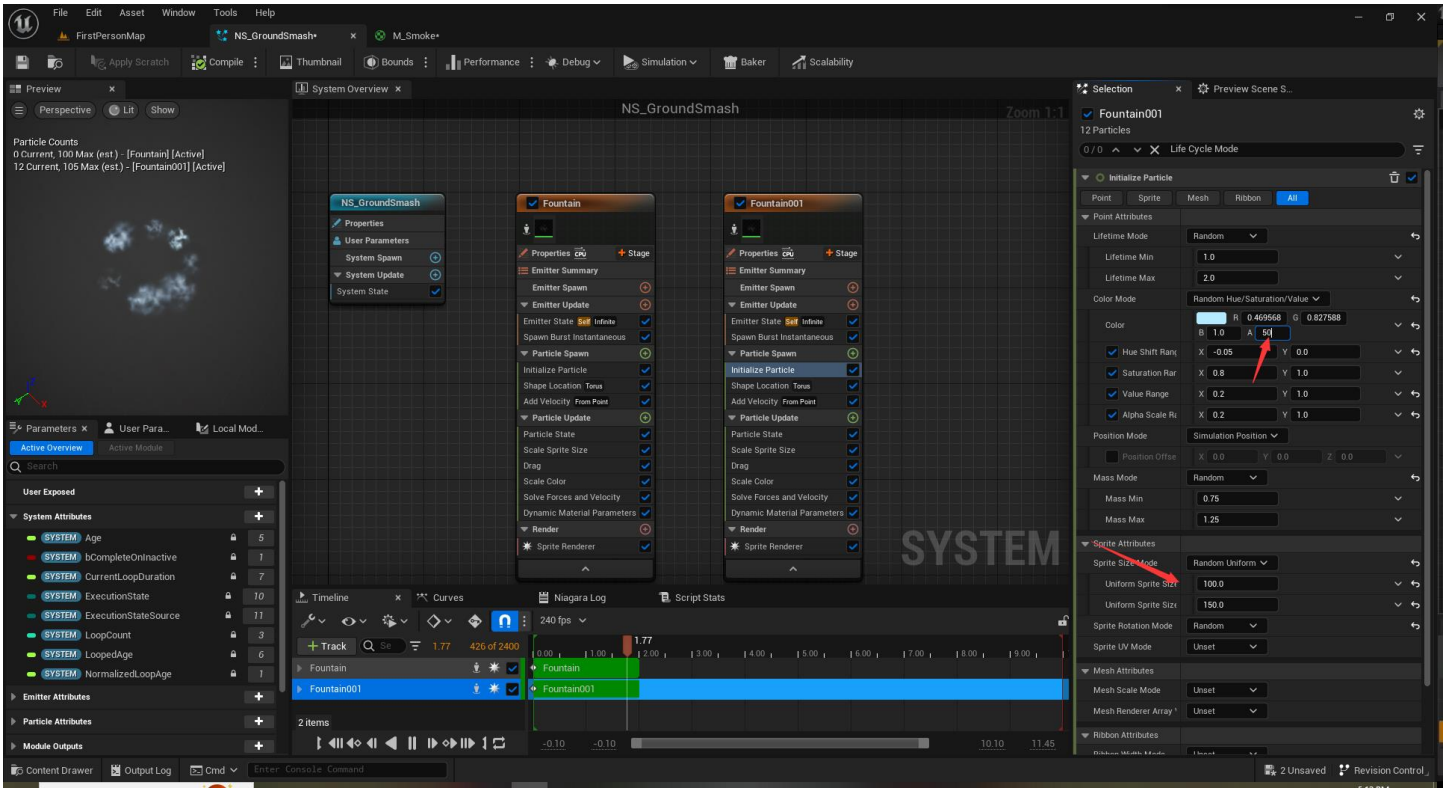


Duplicate the first VFX part and changing its lifetime and size to making a smaller smokecircle.

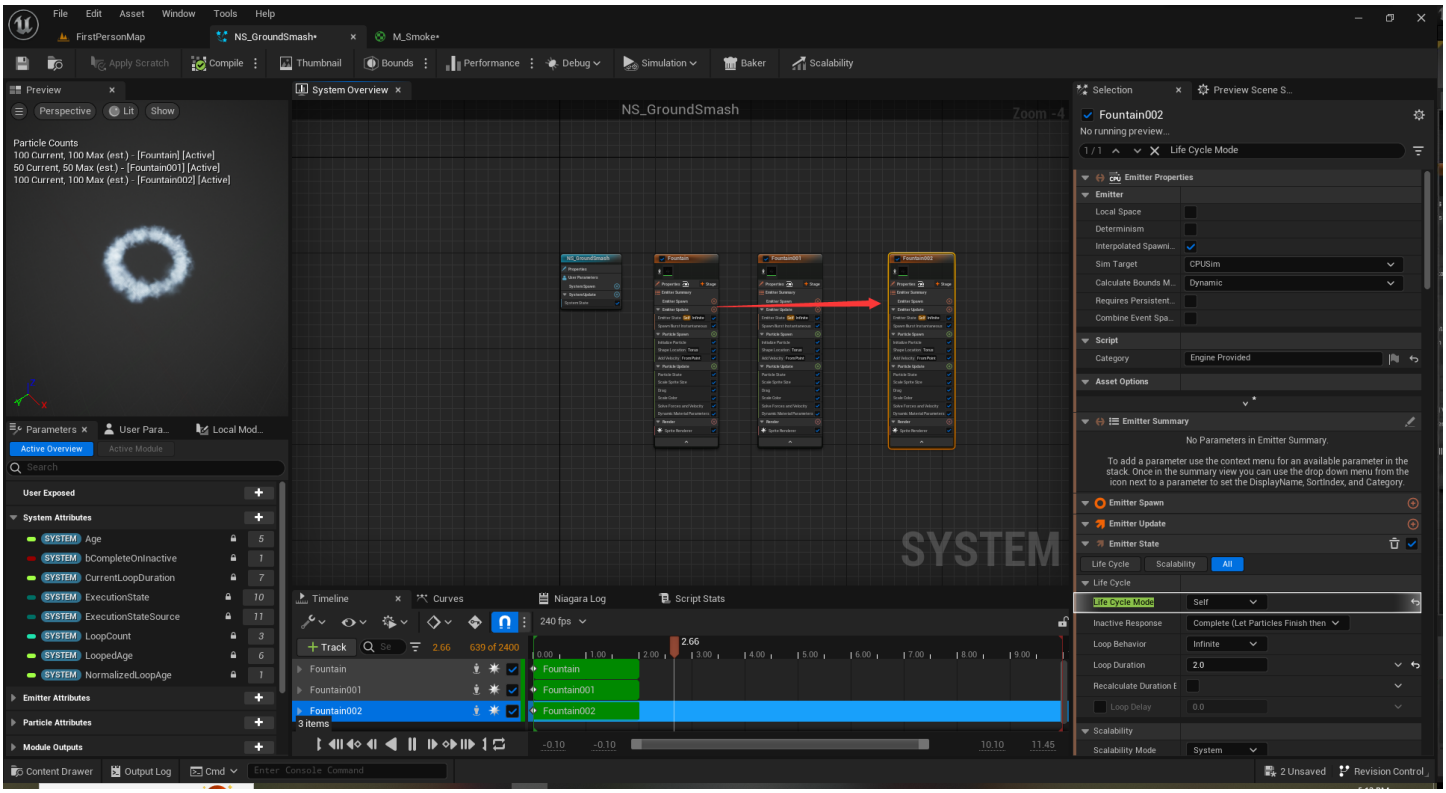

NS_GroundSmash
Fountain
Fountain001
SYSTEM
Particle Counts
100 Current, 100 Max (est.) - [Fountain] [Active]
100 Current, 100 Max (est.) - [Fountain001] [Active]

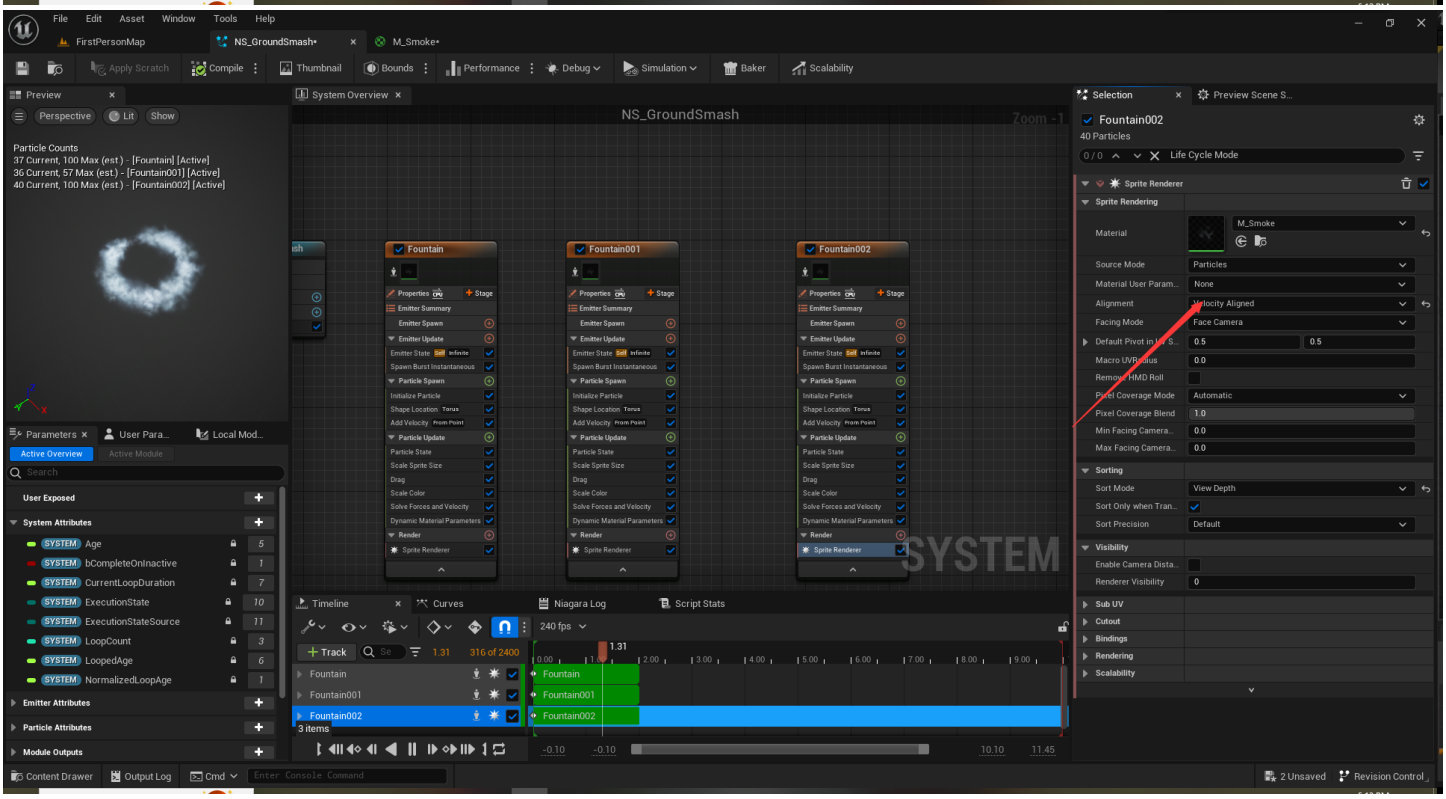

NS_GroundSmash
Fountain
Fountain001
SYSTEM
Particle Counts
43 Current, 100 Max (est.) - [Fountain] [Active]
32 Current, 105 Max (est.) - [Fountain001] [Active]

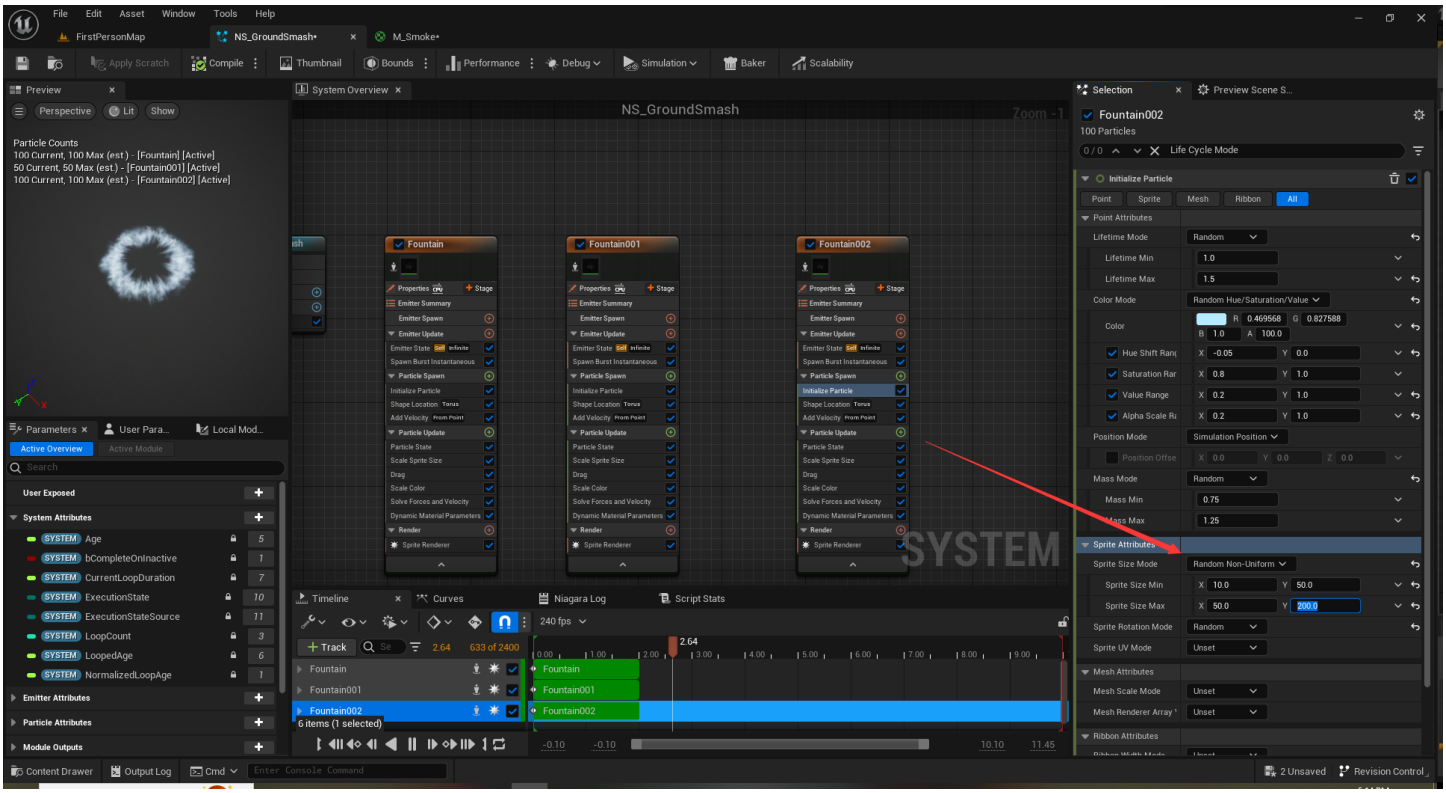


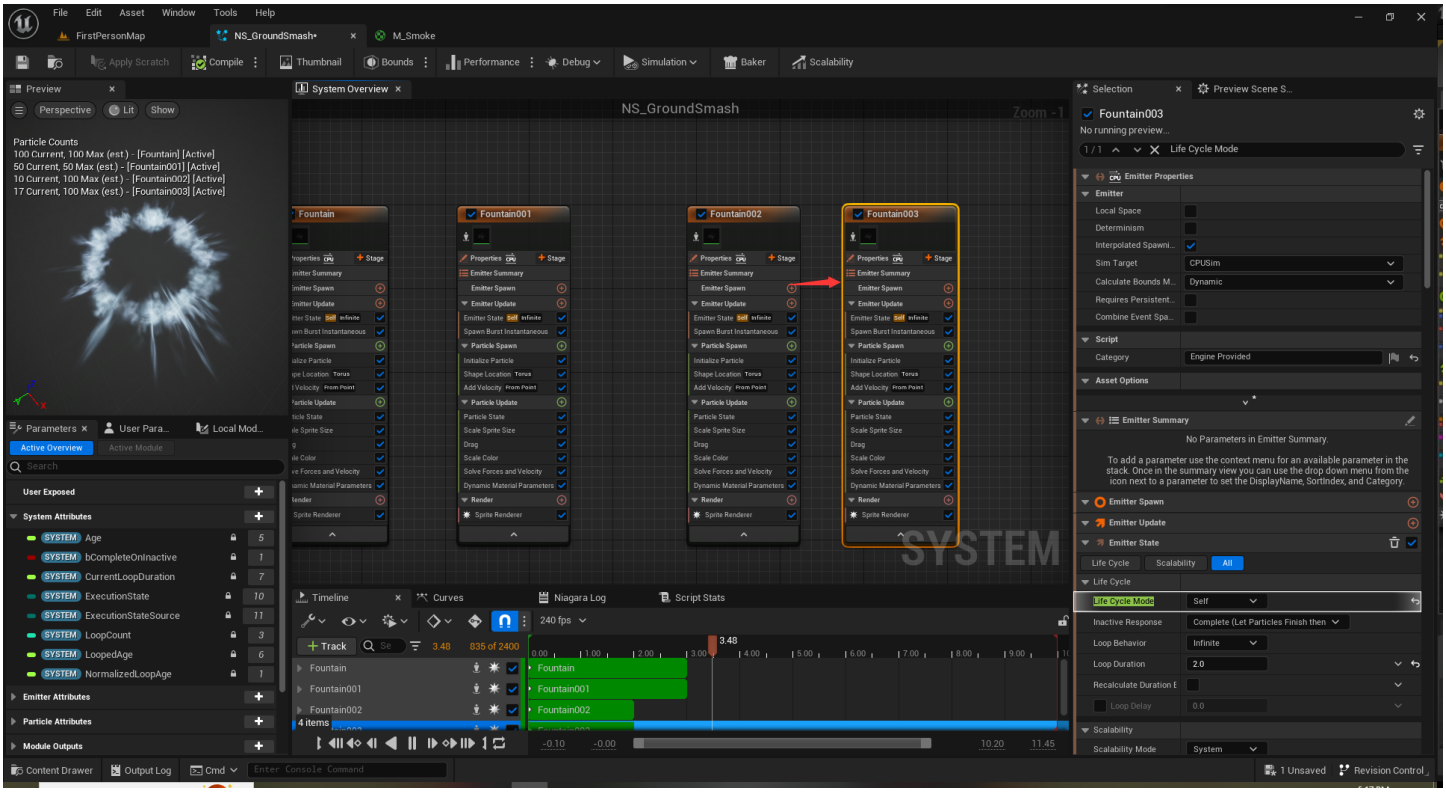


And then duplicate another one to make a speed line shaped smoke circle

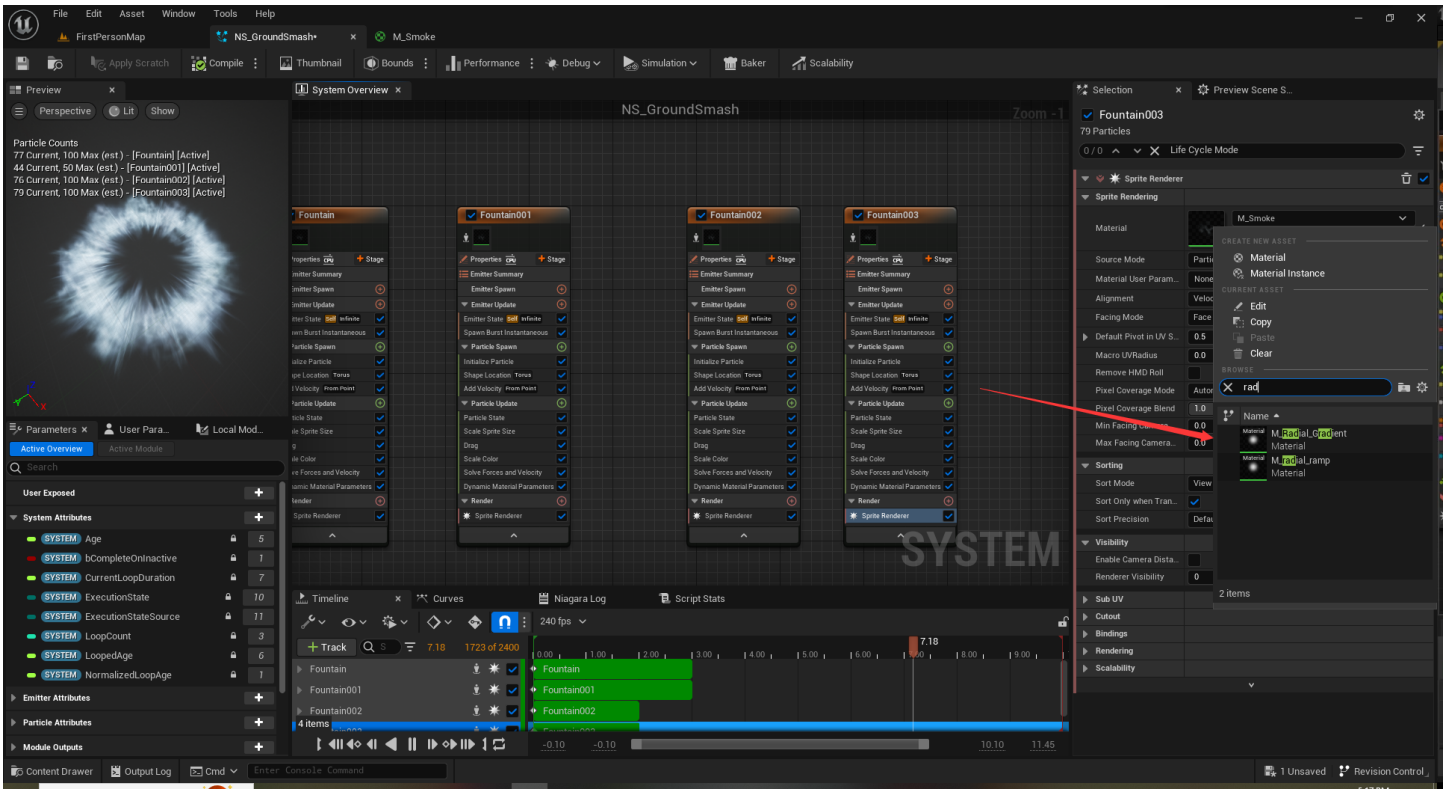

NS_GroundSmash
Fountain002
Emitter Properties
Emitter Summary
Emitter Spawn
Emitter Update
Emitter State
Life Cycle
Life Cycle Mode
Self
Loop Duration
2.0
Timeline
Curves
Niagara Log
Script Stats
Fountain
Fountain001
Fountain002
SYSTEM


NS_GroundSmash
Fountain002
40 Particles
Sprite Renderer
Sprite Rendering
Material
M_Smoke
Source Mode
Particles
Alignment
Velocity Aligned
Facing Mode
Face Camera
Sorting
Sort Mode
View Depth
Timeline
Curves
Niagara Log
Script Stats
Fountain
Fountain001
Fountain002
SYSTEM

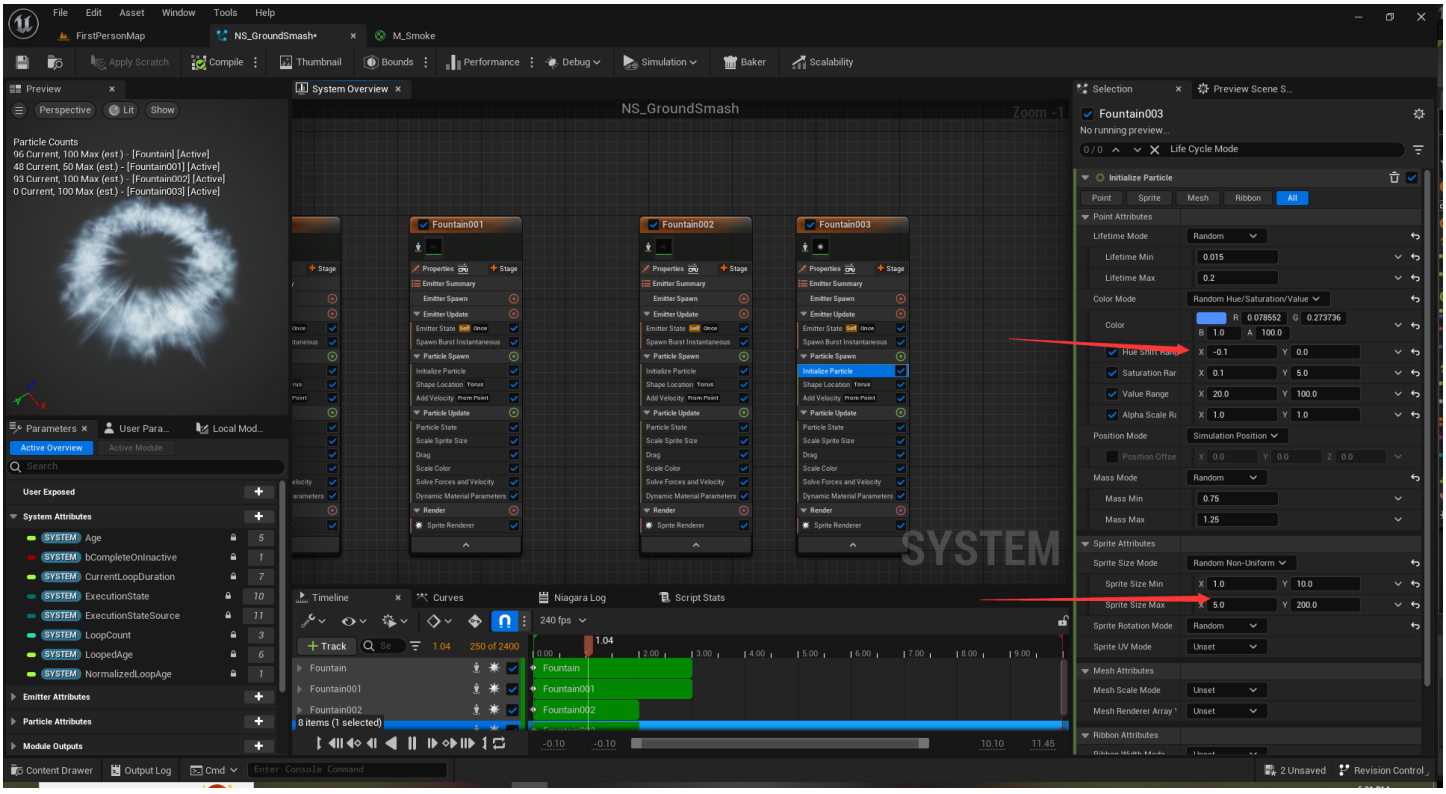

NS_GroundSmash
Fountain
Fountain001
Fountain002
Particle Counts
100 Current, 100 Max (est.) - [Fountain] [Active]
50 Current, 50 Max (est.) - [Fountain001] [Active]
100 Current, 100 Max (est.) - [Fountain002] [Active]
Fountain002
100 Particles
Initialize Particle
Point Attributes
Sprite Attributes
Mesh Attributes
Ribbon Attributes
SYSTEM
Timeline
Curves
Niagara Log
Script Stats
6 items (1 selected)

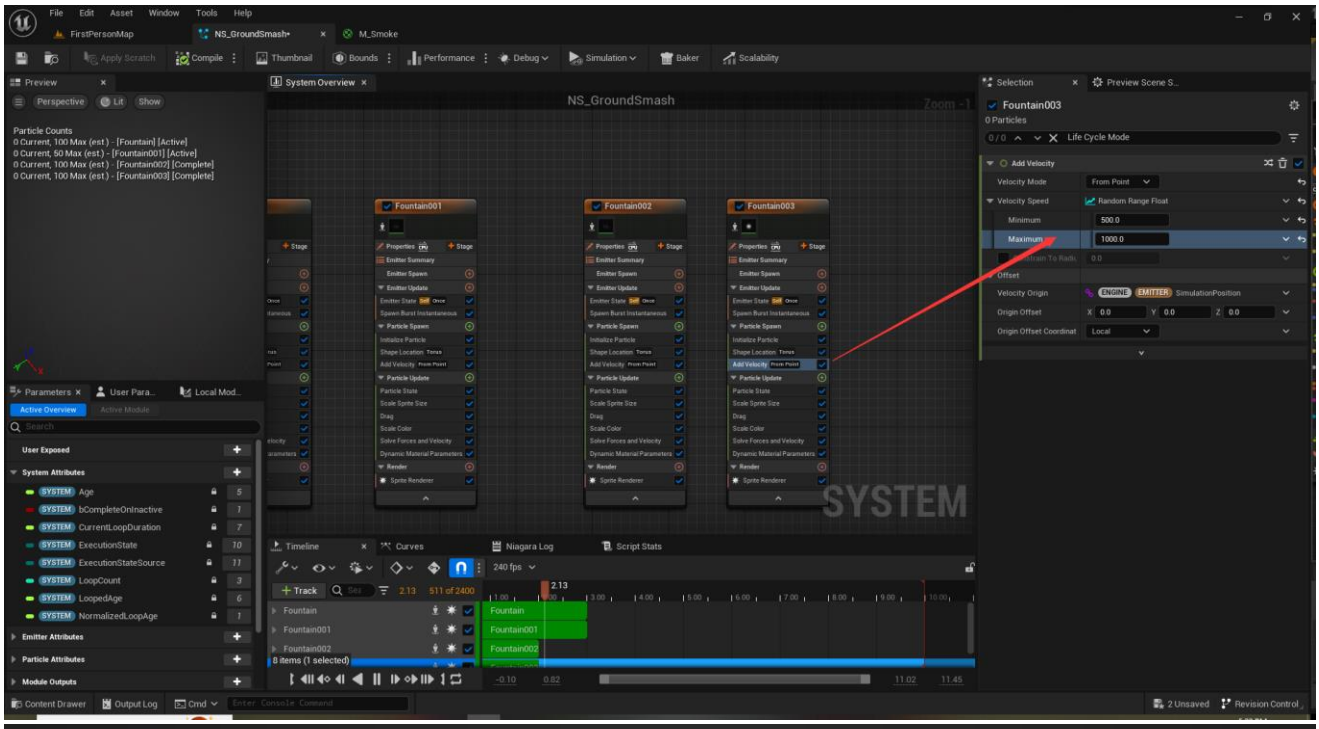

NS_GroundSmash
Fountain
Fountain001
Fountain002
Fountain003
Particle Counts
100 Current, 100 Max (est.) - [Fountain] [Active]
50 Current, 50 Max (est.) - [Fountain001] [Active]
10 Current, 100 Max (est.) - [Fountain002] [Active]
17 Current, 100 Max (est.) - [Fountain003] [Active]
Fountain003
No running preview...
Emitter Properties
Emitter Summary
No Parameters in Emitter Summary.
Emitter Spawn
Emitter Update
Emitter State
Life Cycle
Scalability
SYSTEM
Timeline
Curves
Niagara Log
Script Stats
4 items

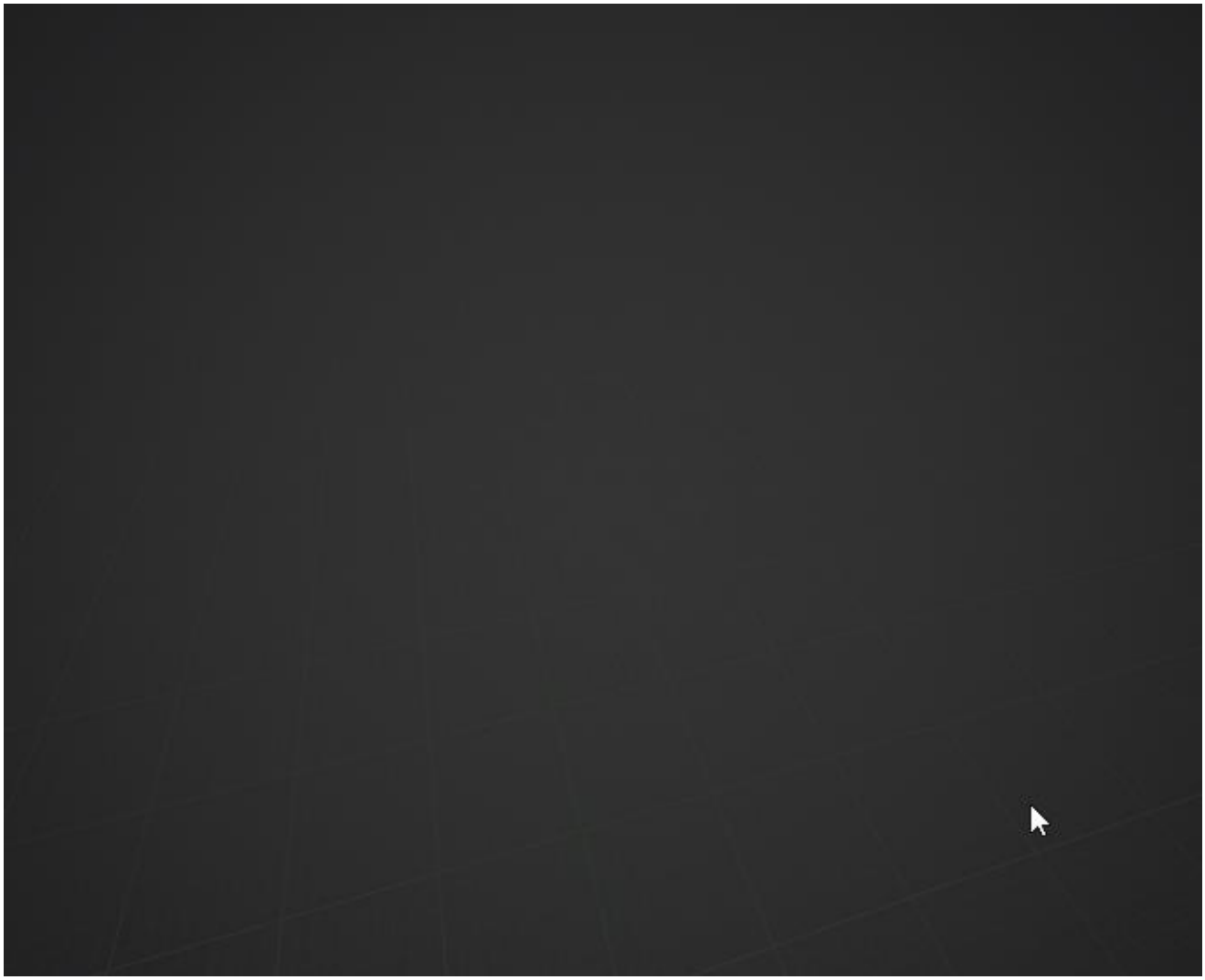
At last, duplicating the speed line shaped VFX part, changing its material to radial gradient material which could make it glow.



Chamhomh its size and speed to make it be a light effect.




NS_GroundSmash
Fountain001
Fountain002
Fountain003
SYSTEM



ALPHA

DESCRIPTION

For this milestone, the whole character shole be fully finished. I will have a polished character concept sheet, retopoed and textured character model with functional rigging system. And the model will be put in Unreal Engine. Those VFX will be apply on the character too.

SCHEDULING / PLANNING

THESIS III PRODUCTION - SCHEDULE

WEEK	TASKS / HOURS / JOURNAL
1	Refine the front art of character. – 6 hours Build template for the front art. – 3 hours Start to making high-ploy of spider mech.- 6 hours Start to making smash ground VFX. - 4 hours Organizing documentation, writing documentations. – 2 hours Refine the front art of character. – 6 hours Build template for the front art. – 3 hours Start to making high-ploy of spider mech.- 6 hours
2	Refine the template for the front art. – 3 hours Keep making high-ploy of spider mech.-10 hours Refining smash ground VFX. - 4 hours Refine the template for the front art. – 8 hours Keep making high-ploy of spider mech.-10 hours
3	Coloring the concept art of mannequin. – 4 hours. Keep making high-ploy of spider mech.-10 hours Start to build VFX blueprint. - 8 hours Keep making high-ploy of spider mech.-16 hours
4	Keep making high-ploy of spider mech.-8 hours Re-topo the mech. - 8 hours Keep building VFX blueprint. - 8 hours Keep making high-ploy of spider mech.-8 hours Re-topo the mech. - 8 hours
5	Unwarp the whole spider mech. – 10 hours

	Making textures for the mech. – 10 hours Unwarp the whole spider mech. – 10 hours Making textures for the mech. – 10 hours
6	Finishing textures. – 6 hours Apply proxy bones to the low poly mesh. – 6 hours Matching proxy rigging with new ploy mesh. - 10 hours Finishing textures. – 6 hours
7	Writing PPT for Alpha presentation. - 6 hours Organizing documentation, writing documentations. – 6 hours Attaching mannequin with mech rig. - 18 hours
8	ALPHA - MIDTERM PRESENTATION – TBD Fix issues according to feedback. – 16 hours Rerig mannequin and attach it with mech and test it in unreal. – 16 hours Making new blueprint of blackhole VFX. - 10 hours
9	Organizing documentation, writing documentations. – 6 hours Making portfolio render pieces of the project. - 4 hours Fix issues of concepting according to feedback. – 6 hours Rerigging mannequin parts. – 8 hours Rerigging mech parts. – 8 hours Polish materials. - 8 hours
10	Organizing documentation, writing documentations. – 6 hours Making portfolio render pieces of the project. - 4 hours Fix issues of rigging according to feedback. – 6 hours Rerigging mannequin parts. – 8 hours Rerigging mech parts. – 8 hours Build VFX system of black hole from charging to launch and attach it to default gun for demo. – 8 hours. – 8 hours
11	Organizing documentation, writing documentations. – 6 hours Making portfolio render pieces of the project. - 4 hours Fix issues of VFX according to feedback. – 6 hours

12	Organizing documentation, writing documentations. – 6 hours Making portfolio render pieces of the project. - 4 hours Fix issues according to feedback. – 6 hours Making 3 animations for character. – 8 hours Build blueprint to trigger animations and VFX. -12 hours
13	Evaluation for Defense Make old walking animation to new rigging model. – 8 hours Making new unreal present scene. – 4 hours Import walking animation in unreal. – 1 hour Adjusting VFX timeline. – 1 hour Making material instance and adding its variation to character animation BP.- 2 hours
14	*RTM - PRESENTATION
15	DEFENSES CAN BEGIN
16	

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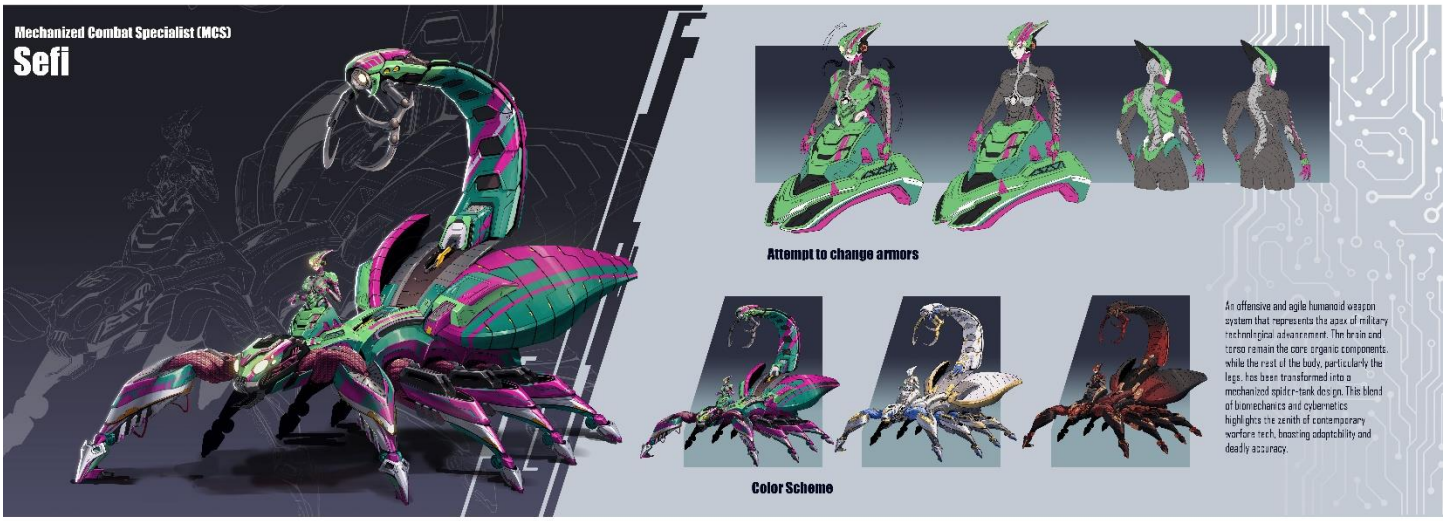
METHODOLOGIES

MASTERY TOPIC 1: CHARACTER CONCEPT

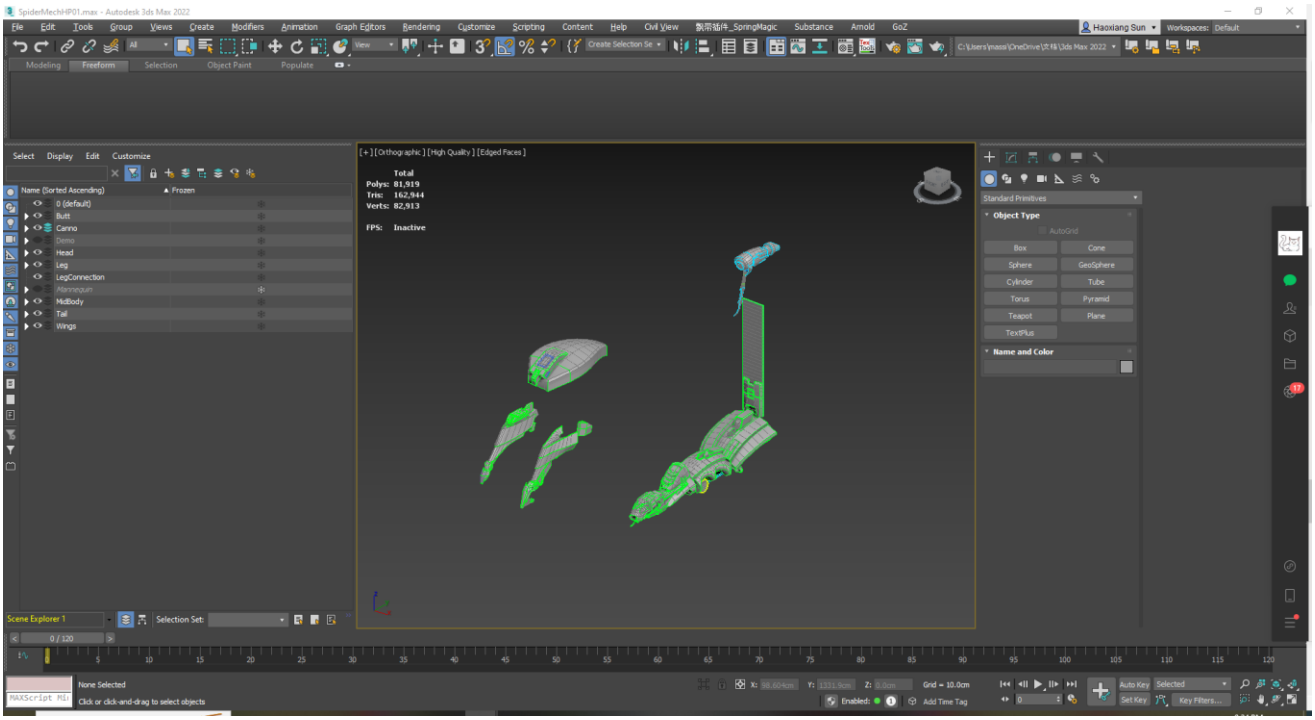
For my character's concept I referred multiple concept sheets from armature character artists, with my own experience of concepting, I made this concept sheet. This concept sheet included front art, front view and back views of mannequin, other color schemes of most popular ones and introduction of the character. The whole concept sheet is trying to deliver the details of the character for supporting 3D modeler's works.



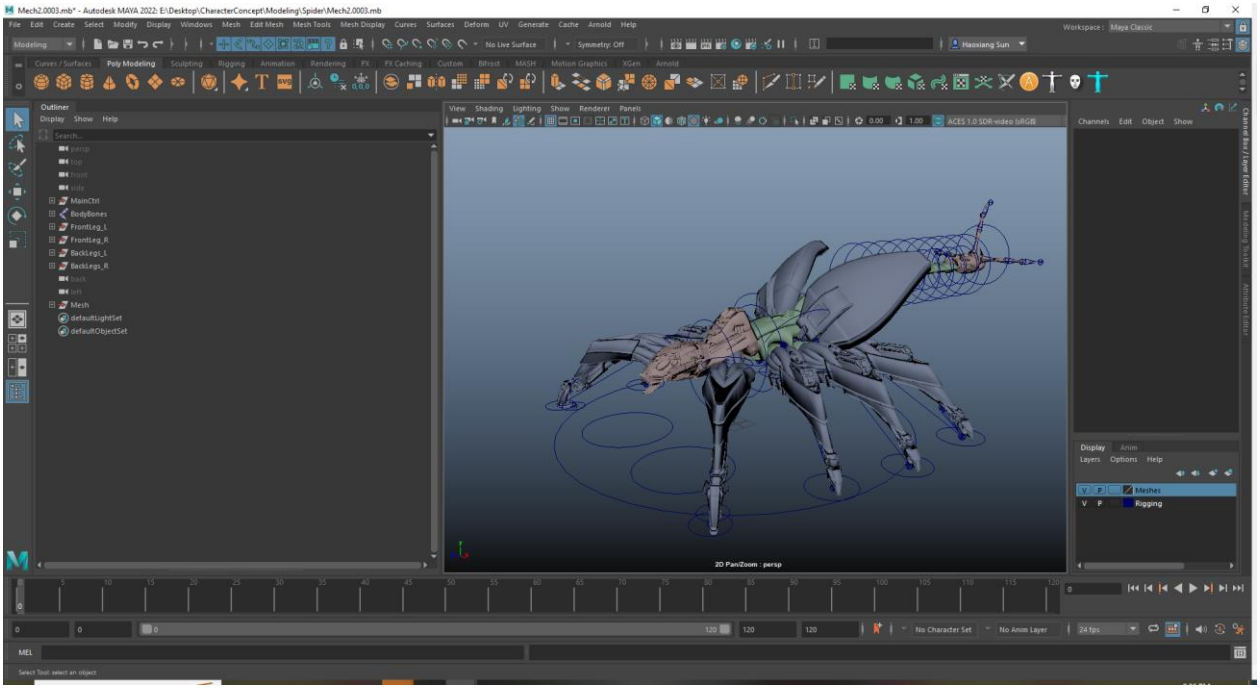
https://hsunyog.artstation.com/

MASTERY TOPIC 2: ADVANCED RIGGING

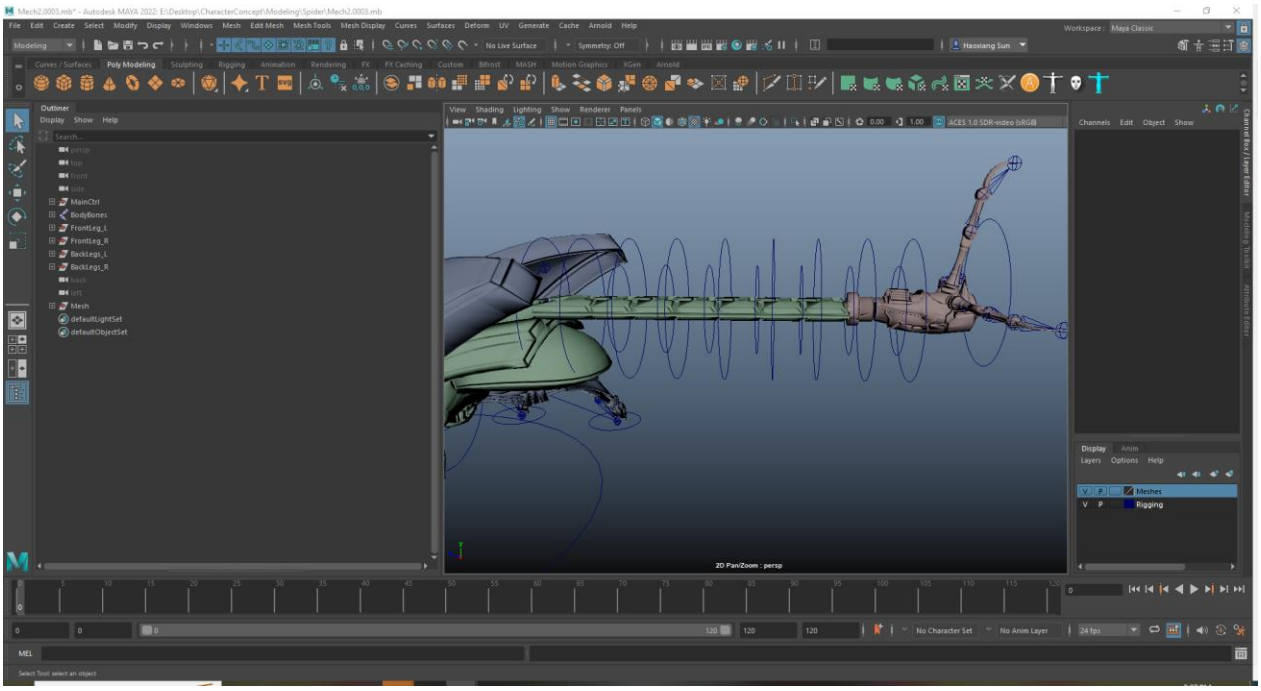
For modeling part of the mech, I used crease set and open subdivide to build highres mesh. And I baked highres model in substance painter, following preview of materials.

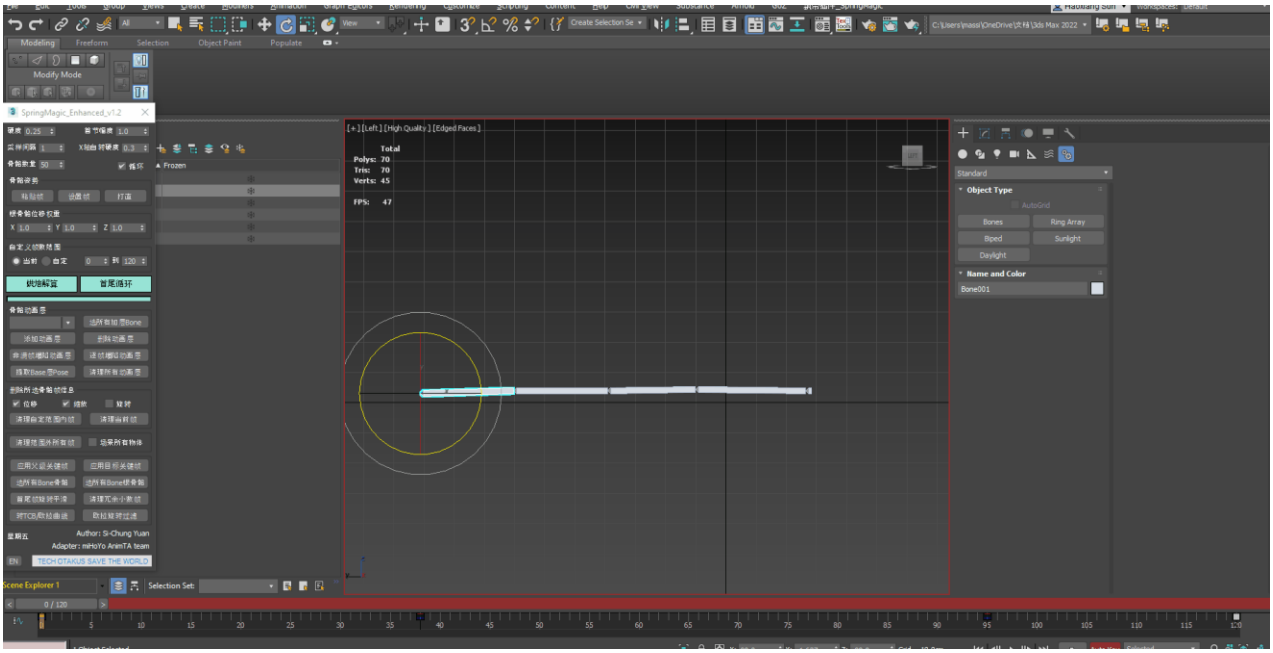


. Then matched the mech with rigging system I made in proxy phaser. There was some position modified therefore it took me a while to match the new meshes.

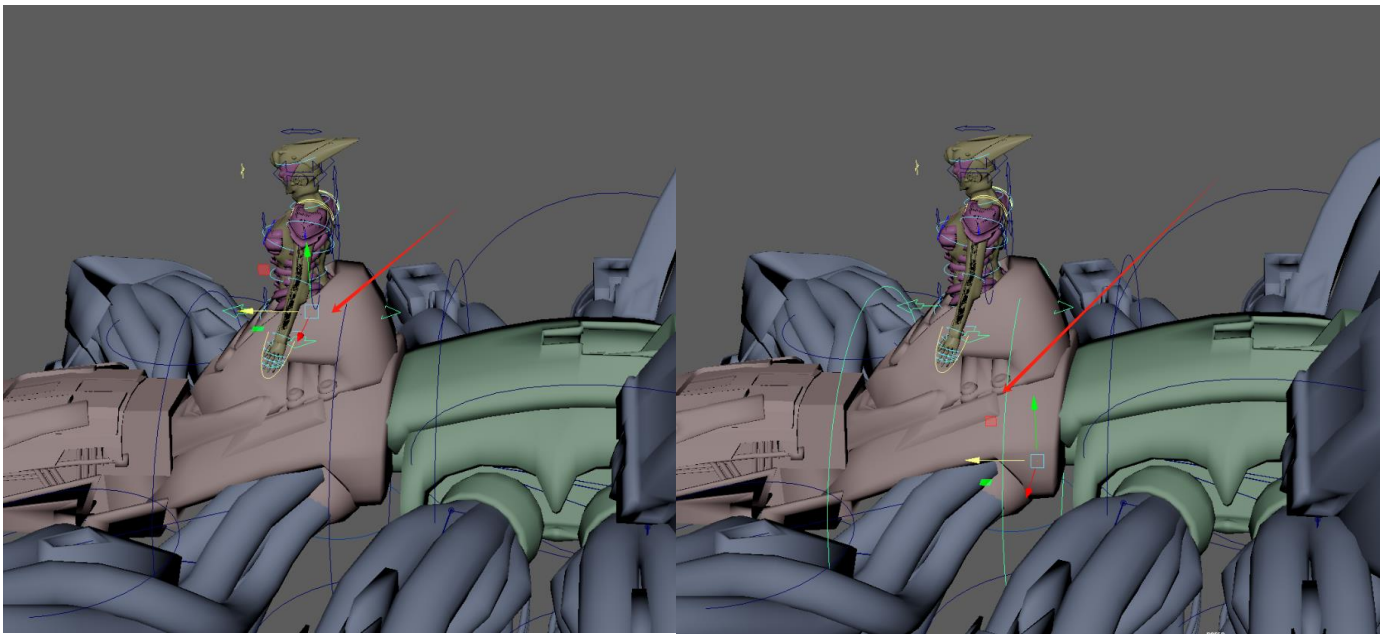


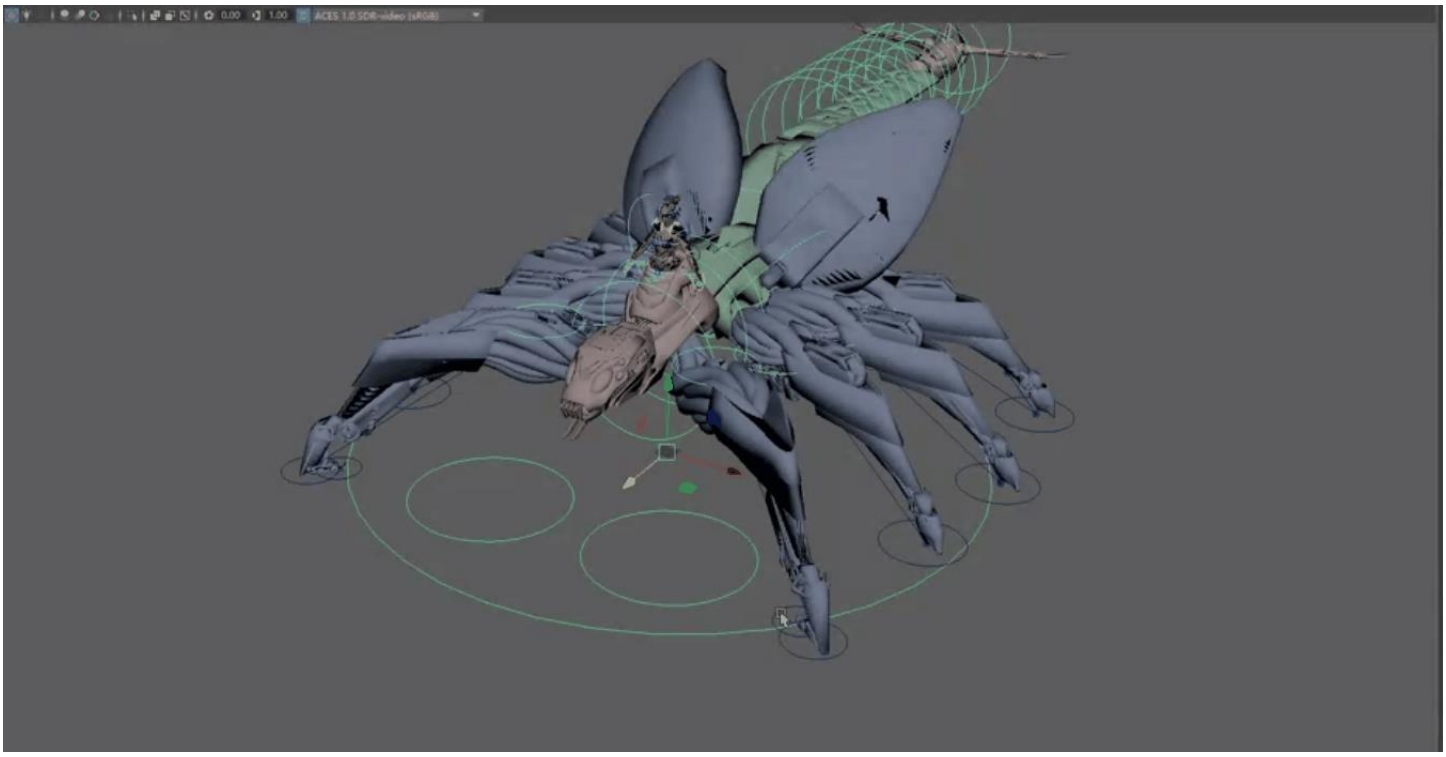
I asked a senior animator in China who refuse to say his name. He suggests me to keep those multiple controllers of the tail because most of industry now will use plugin to anima this kind of ribbon-like object floats as the body swings. Following demo of how this plugin works.



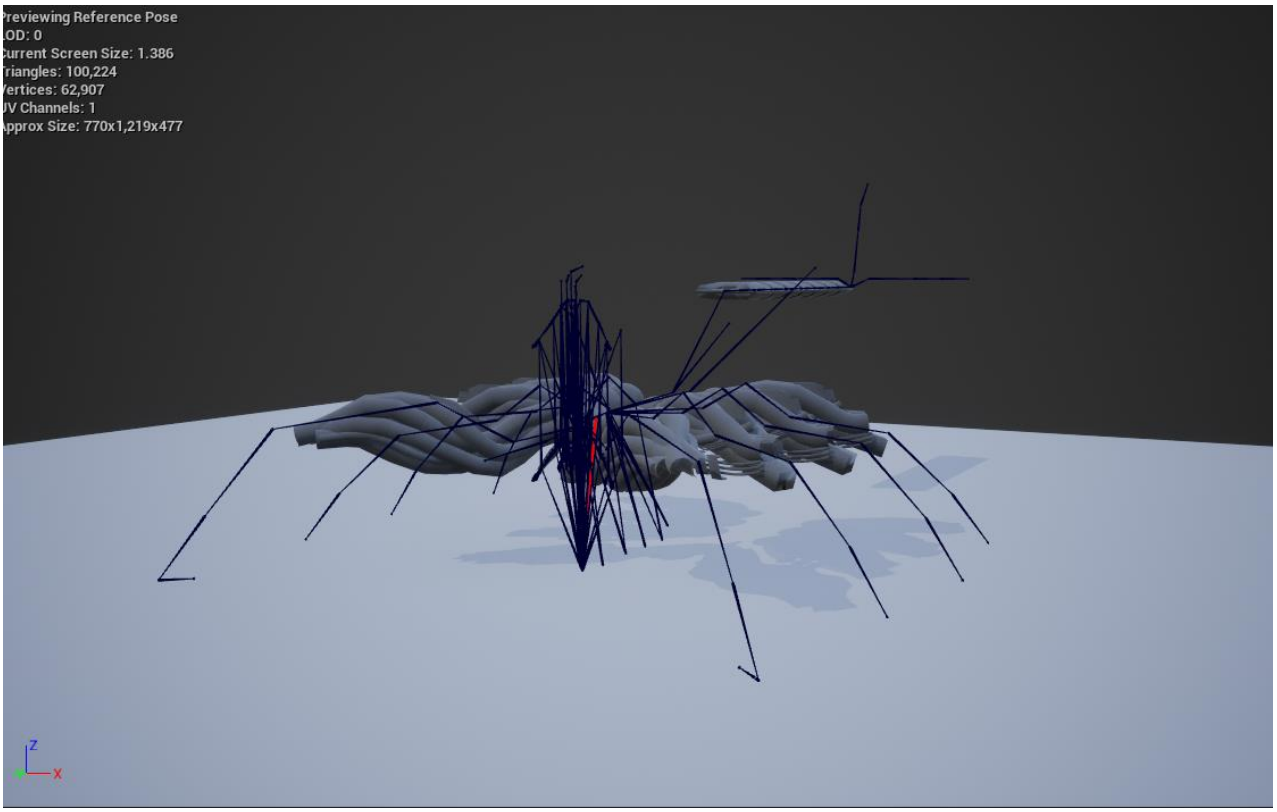


What I tried but I didn't success is combine tow parts of my character together. I parented the mannequin rig to the spider. I found the reason of it, I used Advanced Skeleton to create the mannequin, but this rigging system will trigger bug when it attached to another hand rigging system. So what I need to do is hand rig the mannequin again.

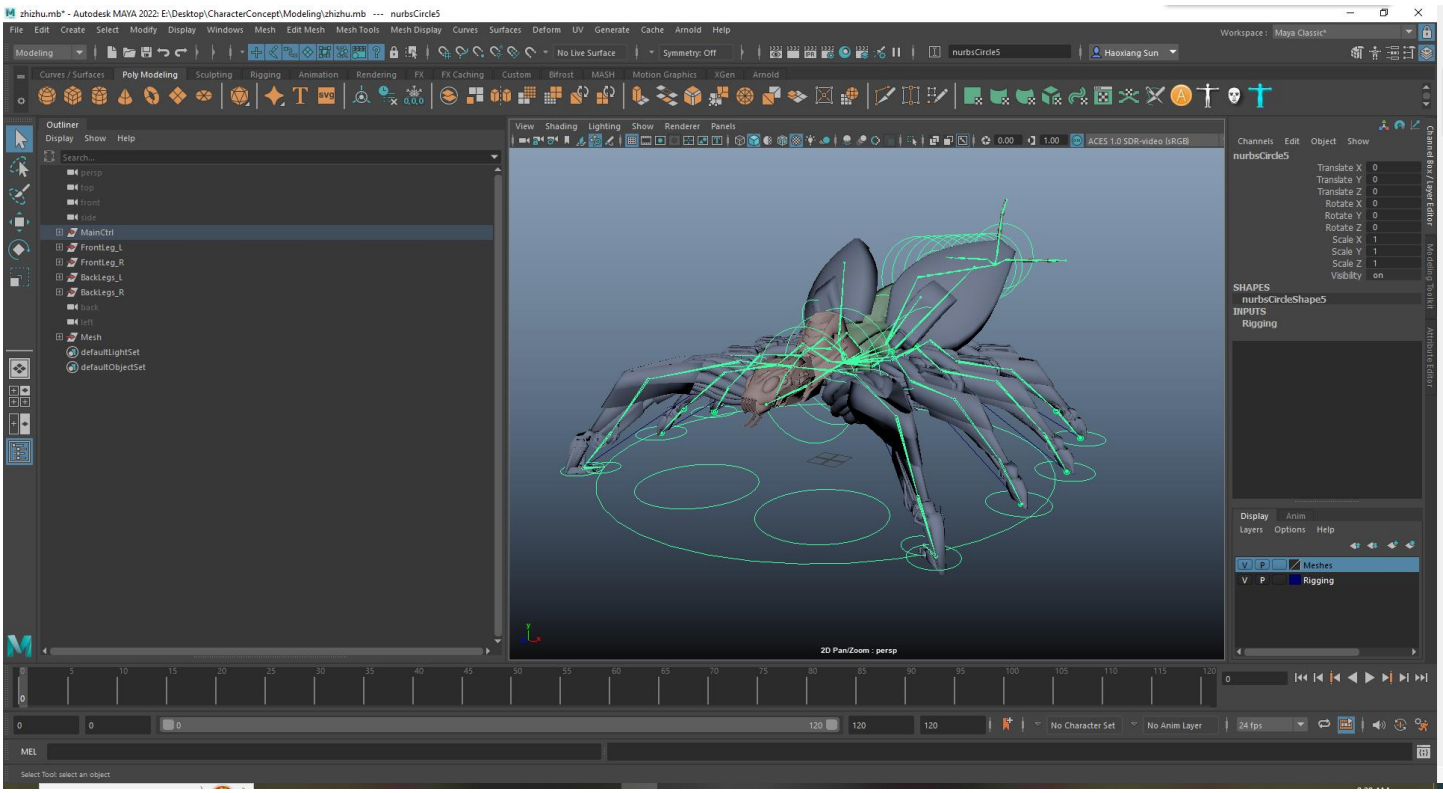


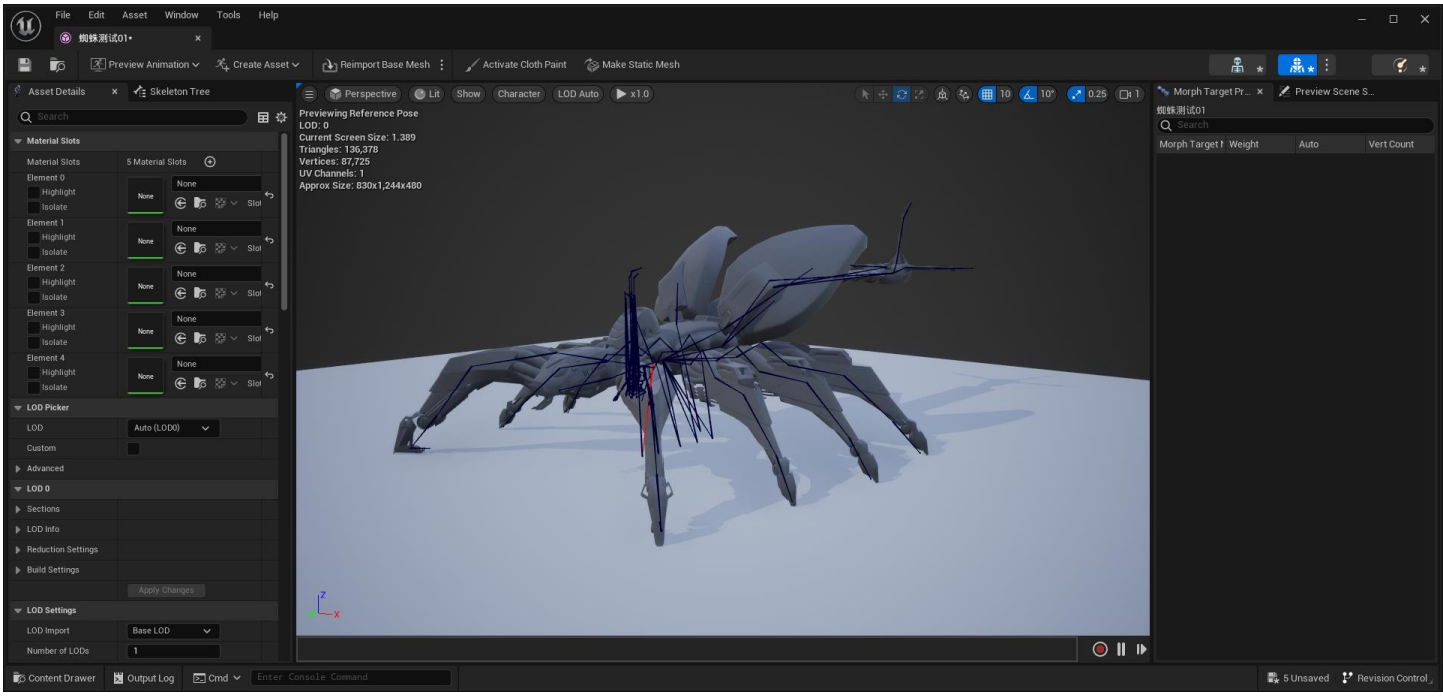


But the whole character will drift apart.

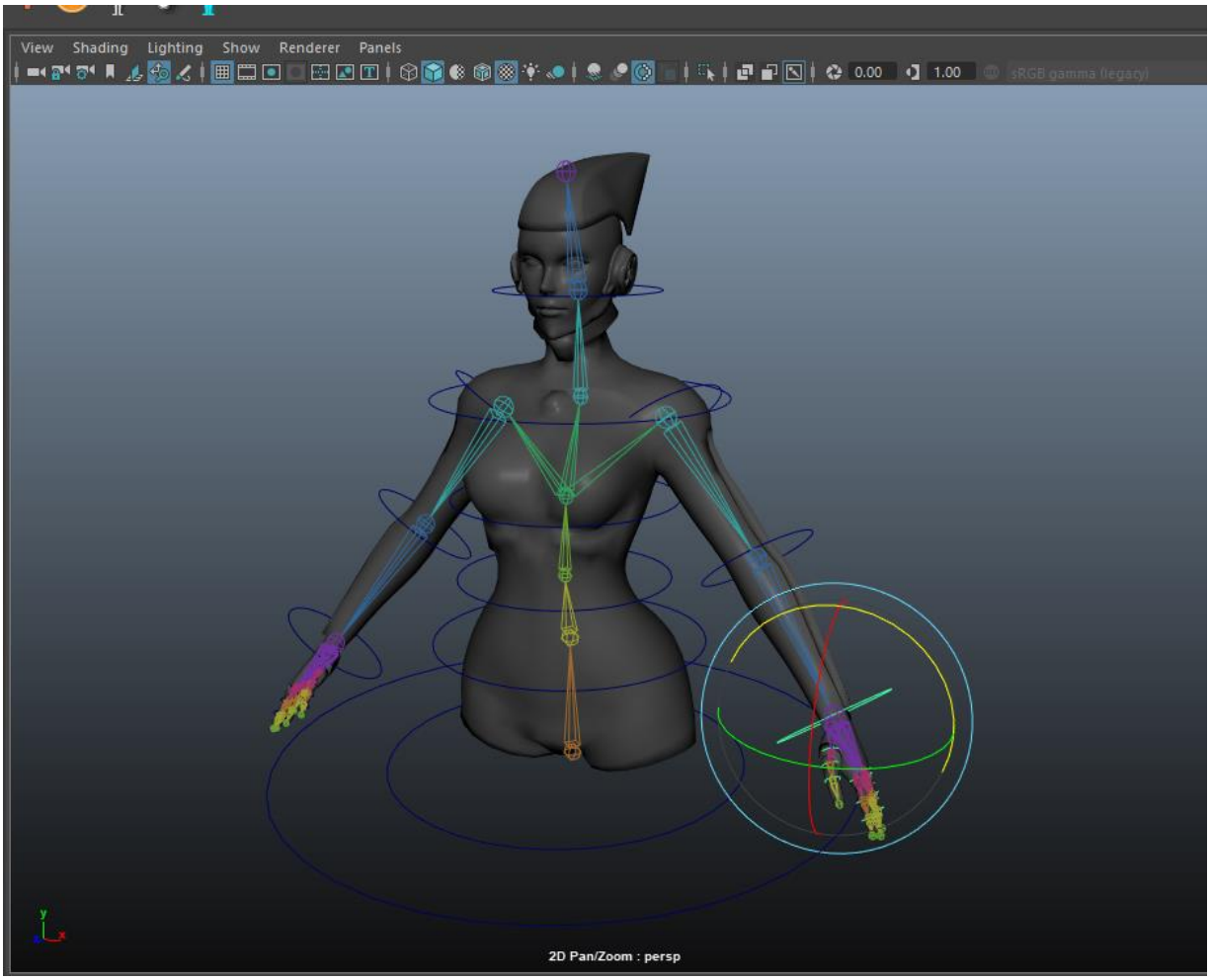


So, I started trouble shooting. I found I didn't fully finish the rigging of the spider because I didn't parent all the controllers and bones to the main controller. Once I did that, I could import the spider successfully.





But in alpha phase I still didn’t find a good way to combine them together, which I will start to explore immediately in next phase.


View
Shading
Lighting
Show
Renderer
Panels
0.00
1.00
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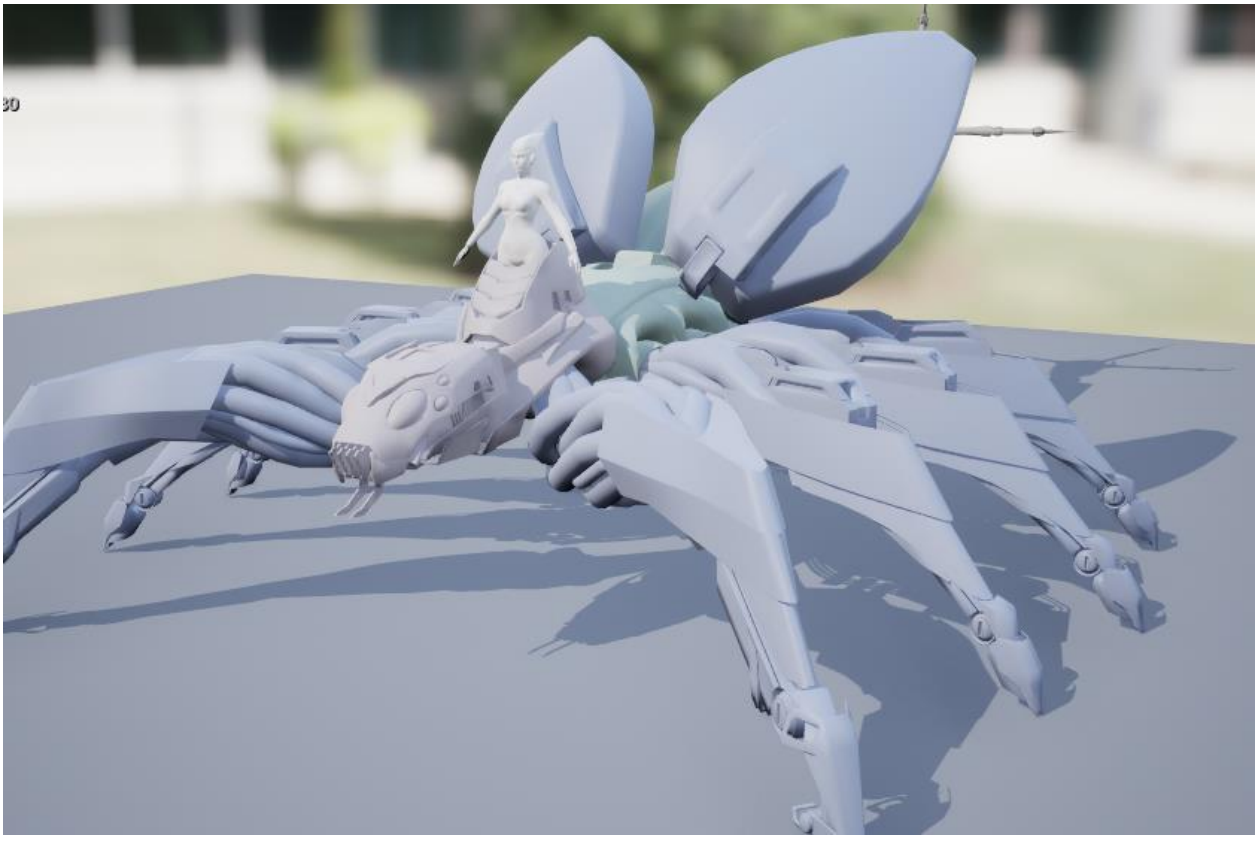
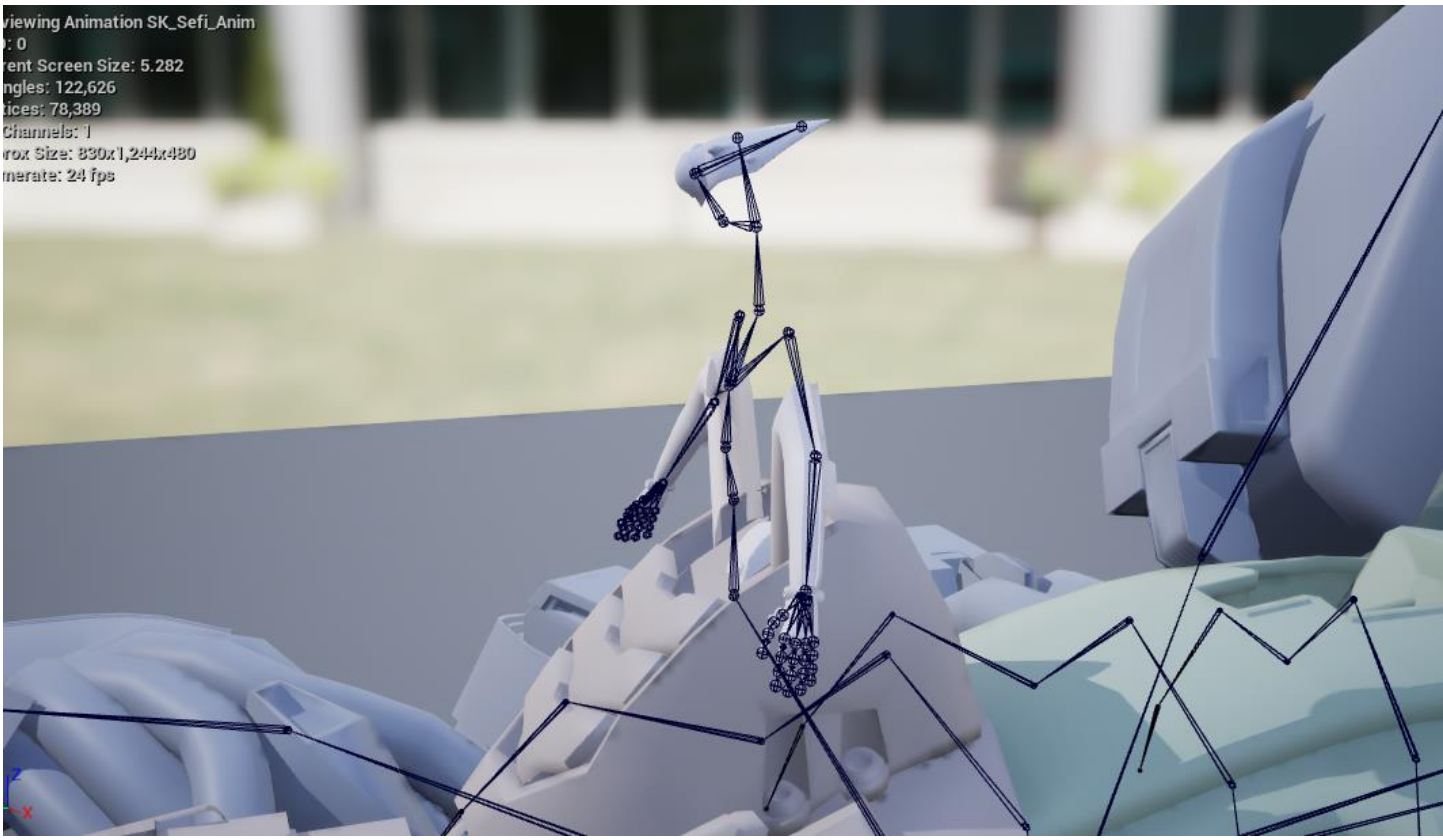
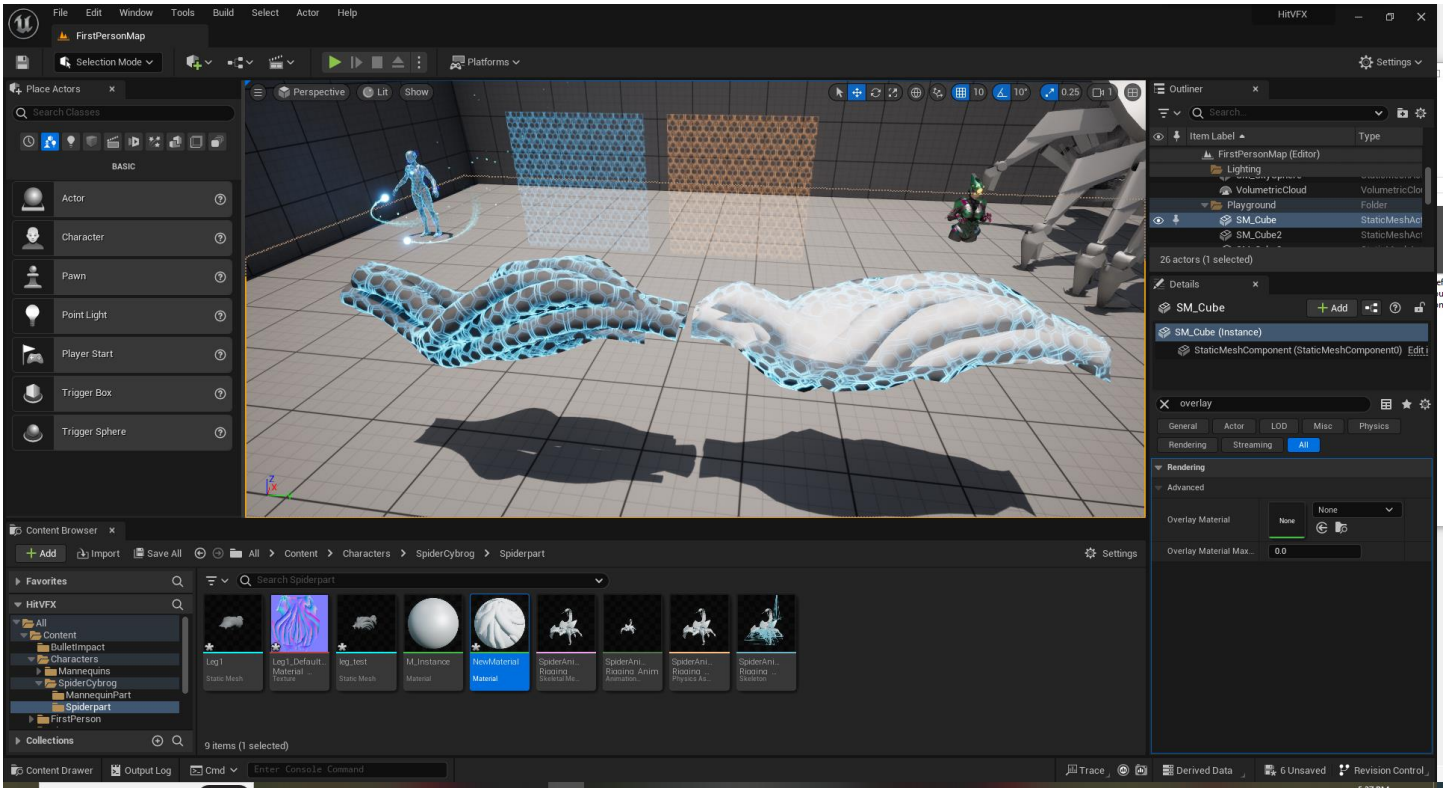


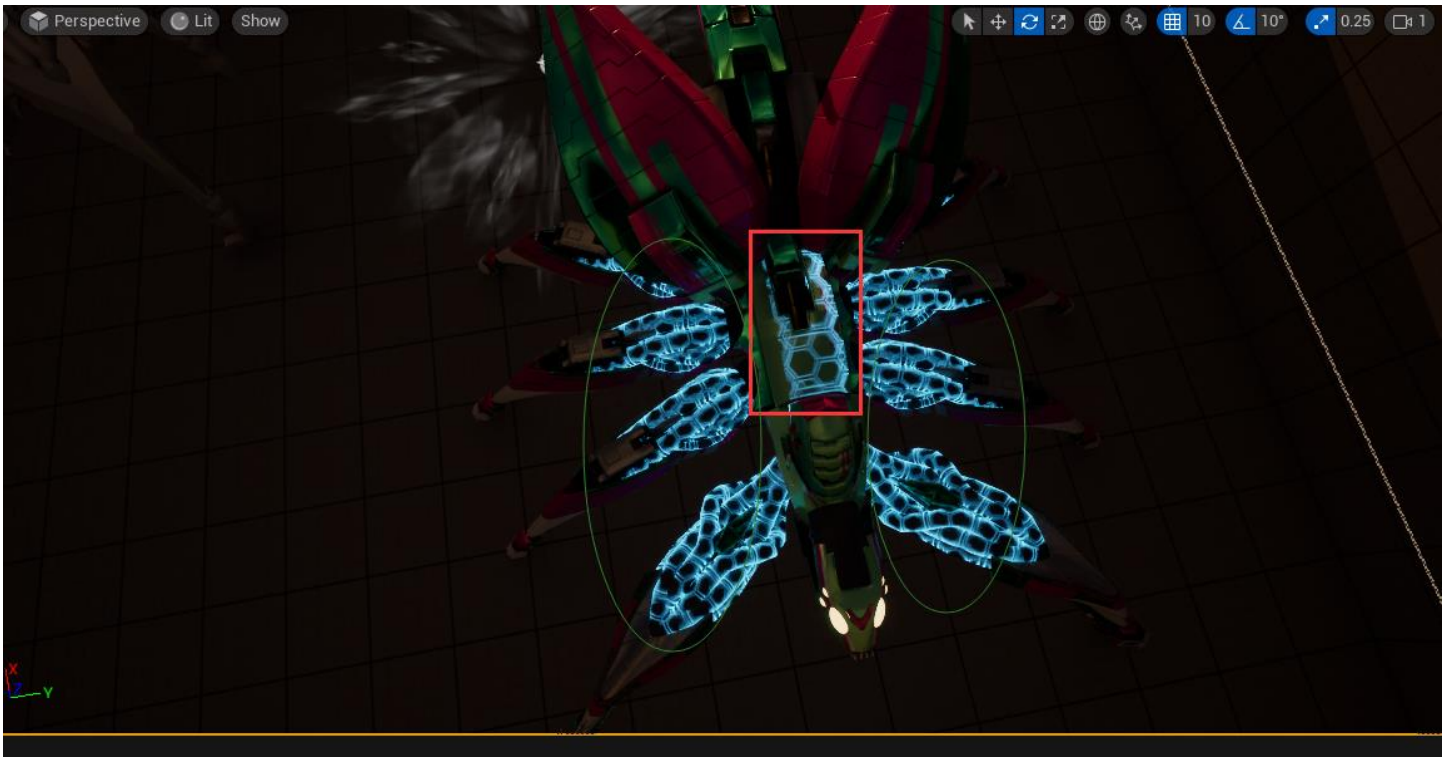


MASTERY TOPIC 3: VFX

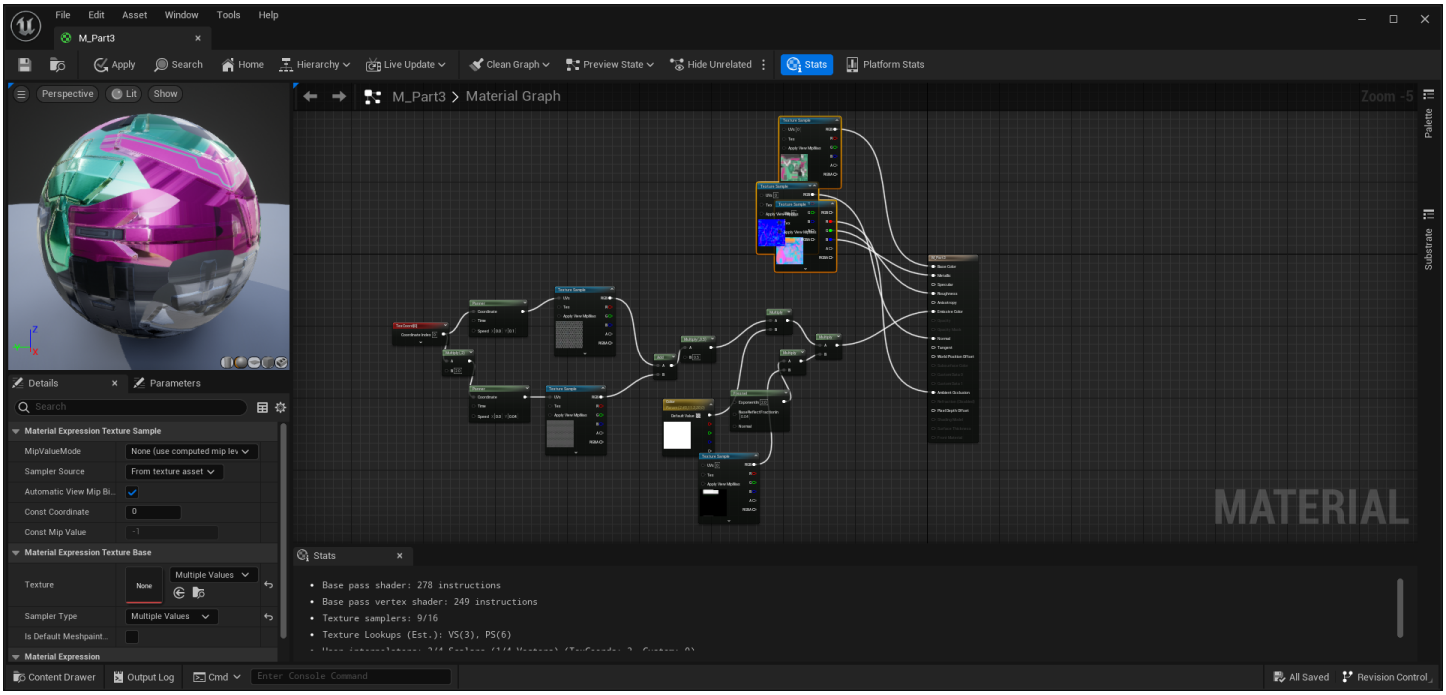
In VFX part, I explored applying the hexagon VFX to the model. I compared to kind of leg-connection part method to demonstrate the VFX and I decided the left one because it is more layering.

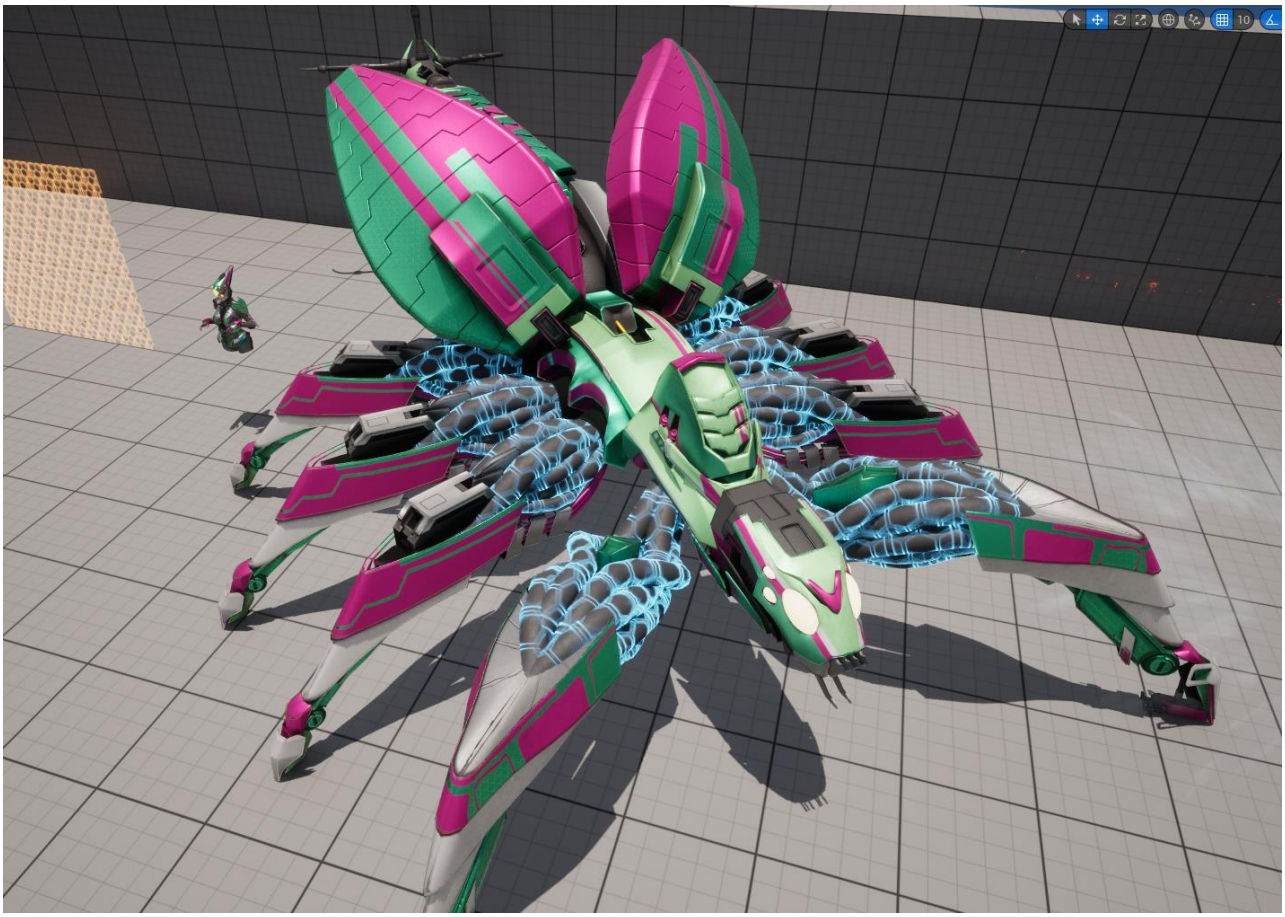


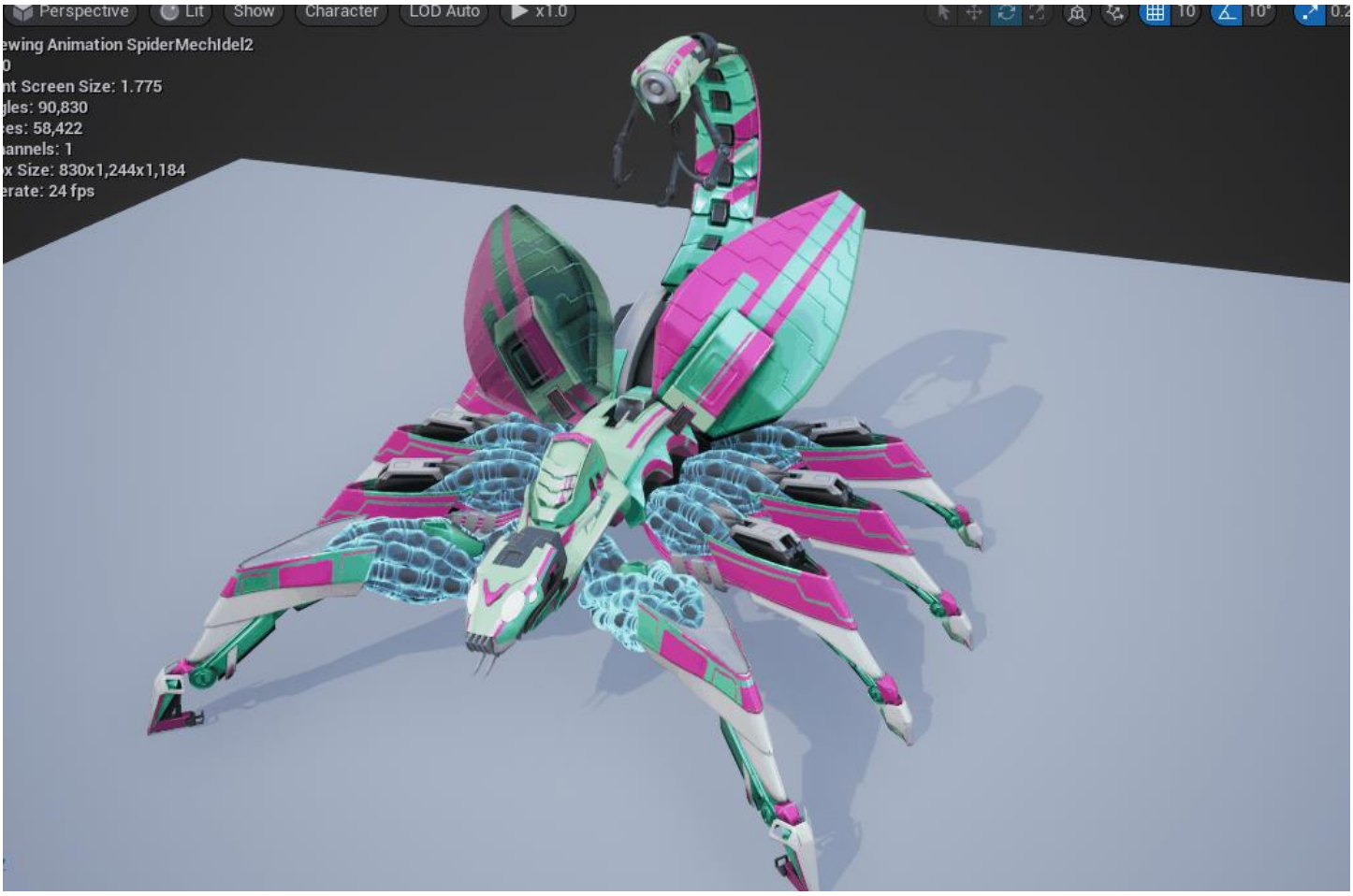
Once I applied them to the model, I realized even I gave the overlay material mask, due to I set multiple materials to the spider mech, I still will have error when hexagon show up.



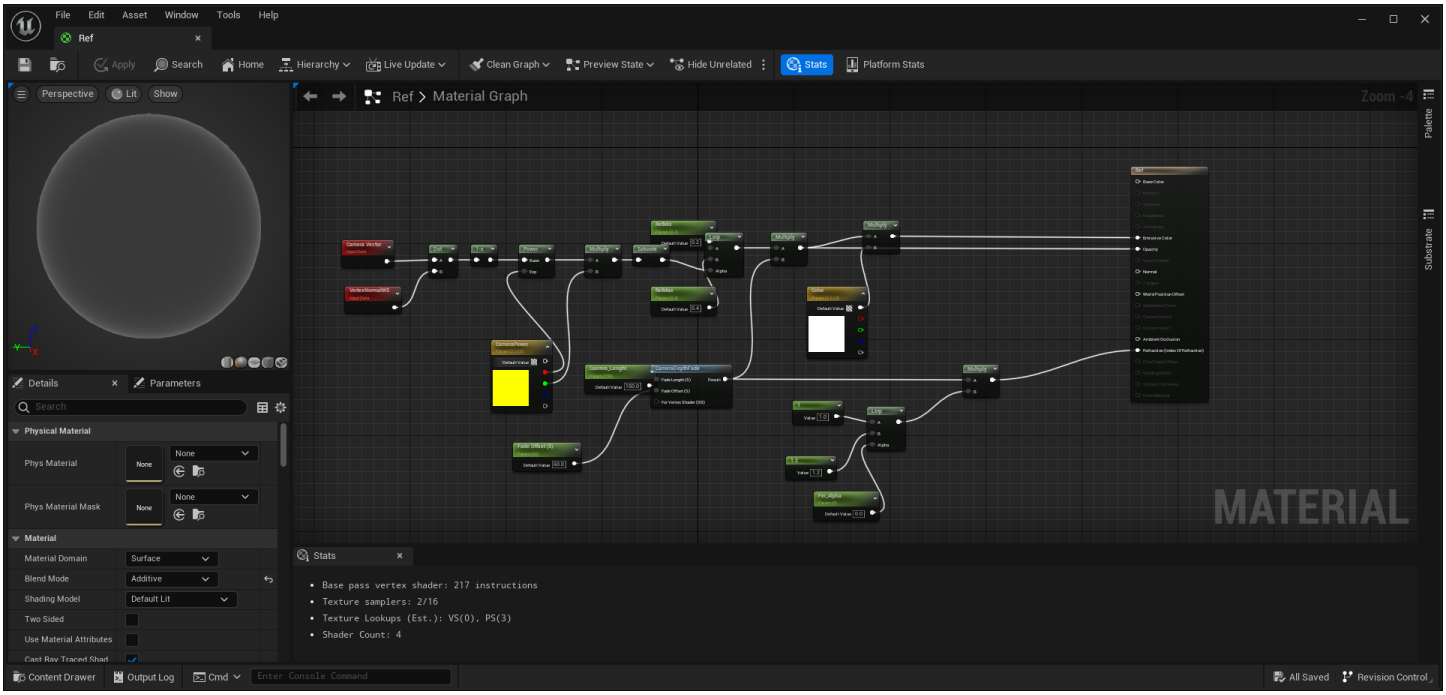
I researched many videos and people, but I believe there is no way to limit the overlay material to certain material in a multi-material model. So, I copied the blue prints of the overlay material into the material included leg-connection part. Following demo of how it look.

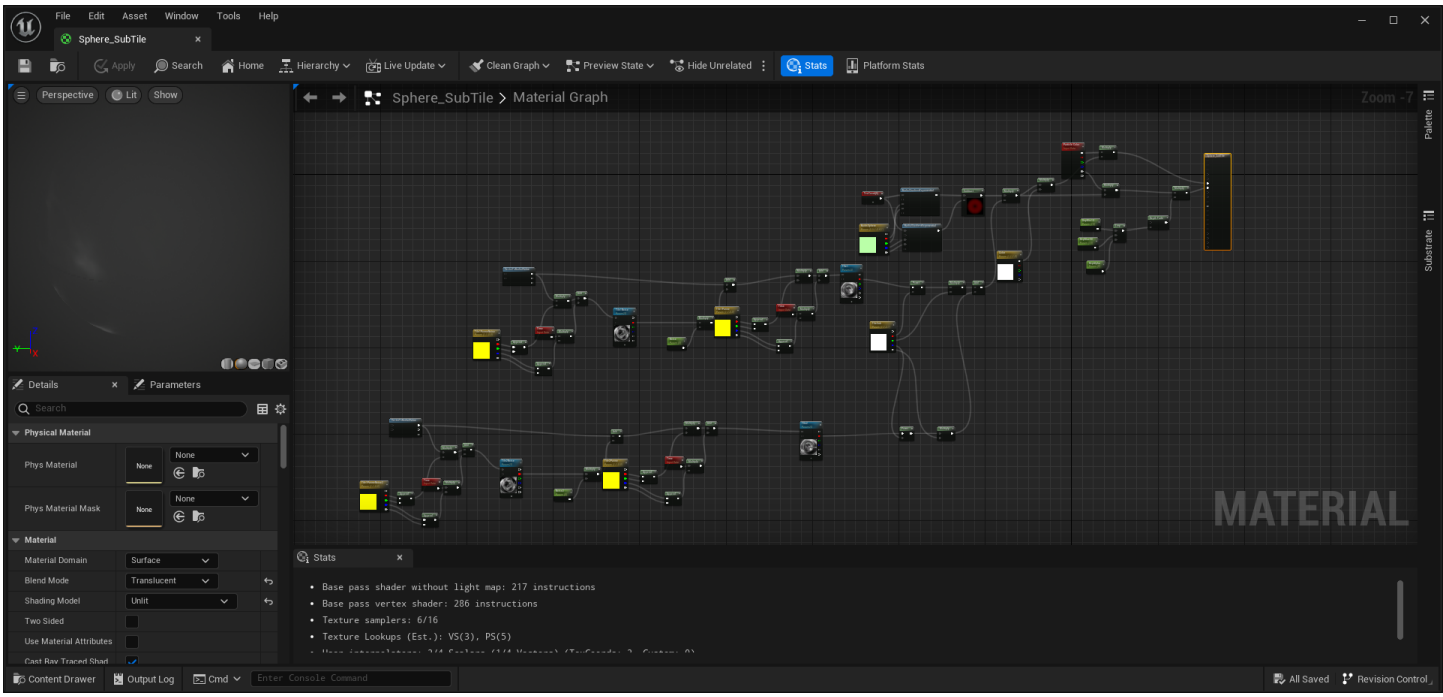

File Edit Asset Window Tools Help
M_Part3
Apply Search Home Hierarchy Live Update Clean Graph Preview State Hide Unrelated Stats Platform Stats
Perspective Lit Show
M_Part3 > Material Graph
Zoom -5
Palette
Substrate
Details
Parameters
Material Expression Texture Sample
MipValueMode
None (use computed mip lev
Sampler Source
From texture asset
Automatic View Mip Bi...
Const Coordinate
Const Mip Value
Material Expression Texture Base
Texture
None
Multiple Values
Sampler Type
Multiple Values
Is Default Meshpaint...
Material Expression
MATERIAL
Stats
Base pass shader: 278 instructions
Base pass vertex shader: 249 instructions
Texture samplers: 9/16
Texture Lookups (Est.): VS(3), PS(6)
Content Drawer
Output Log
Cmd
Enter Console Command
All Saved
Revision Control

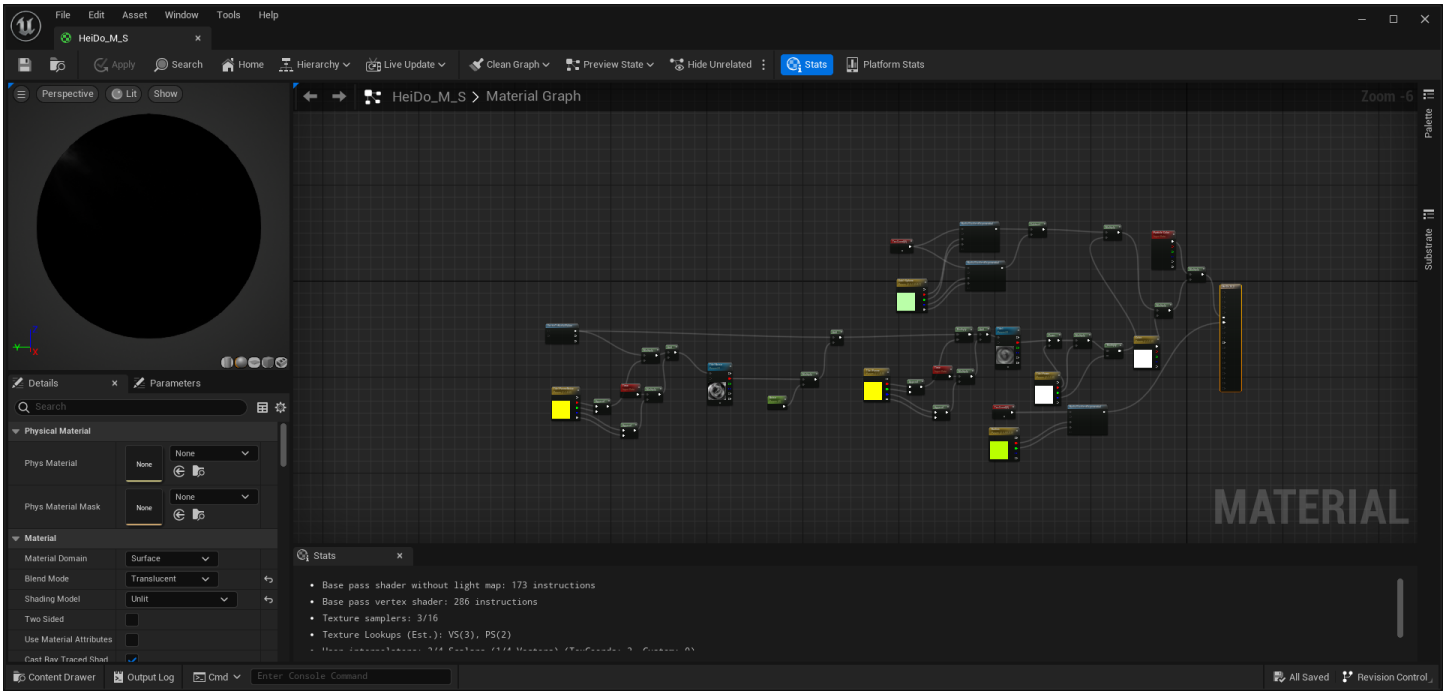


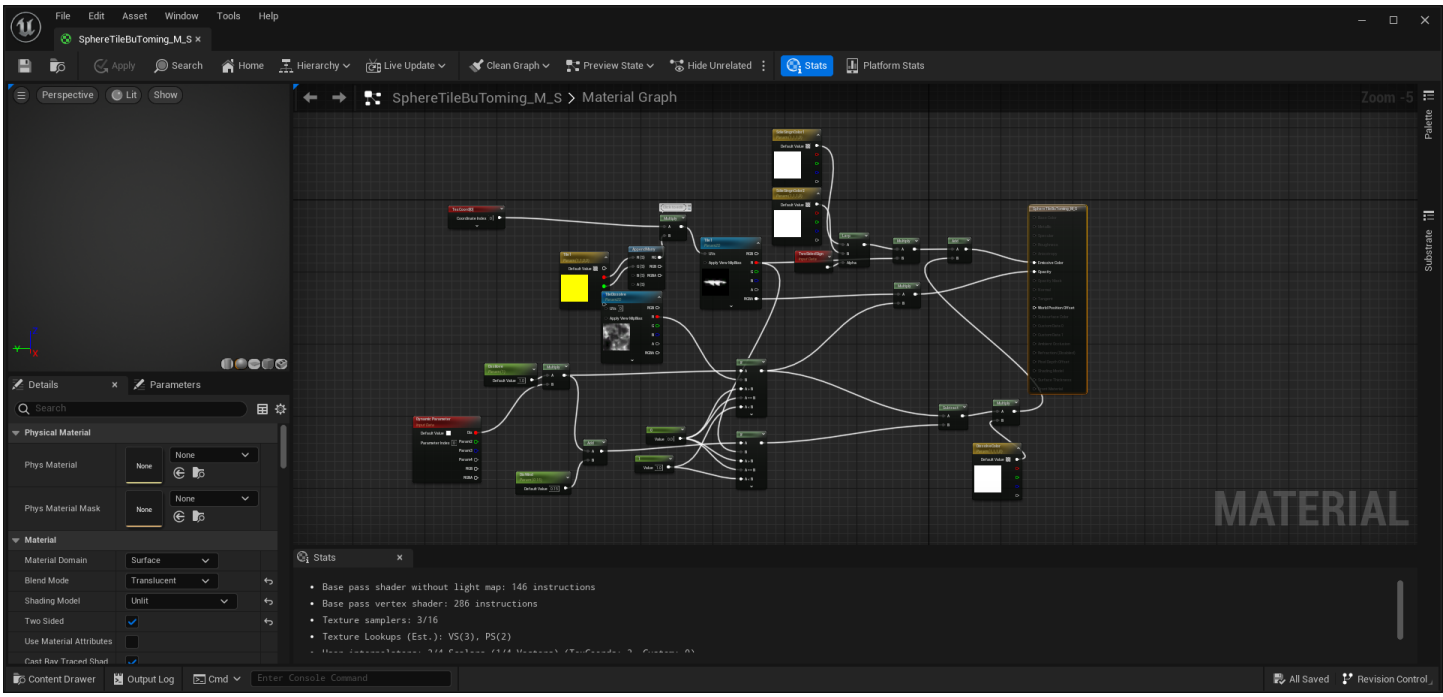


I updated the blackhole launch VFX, and composed them as a full launch process. Following materials updated from last milestone.

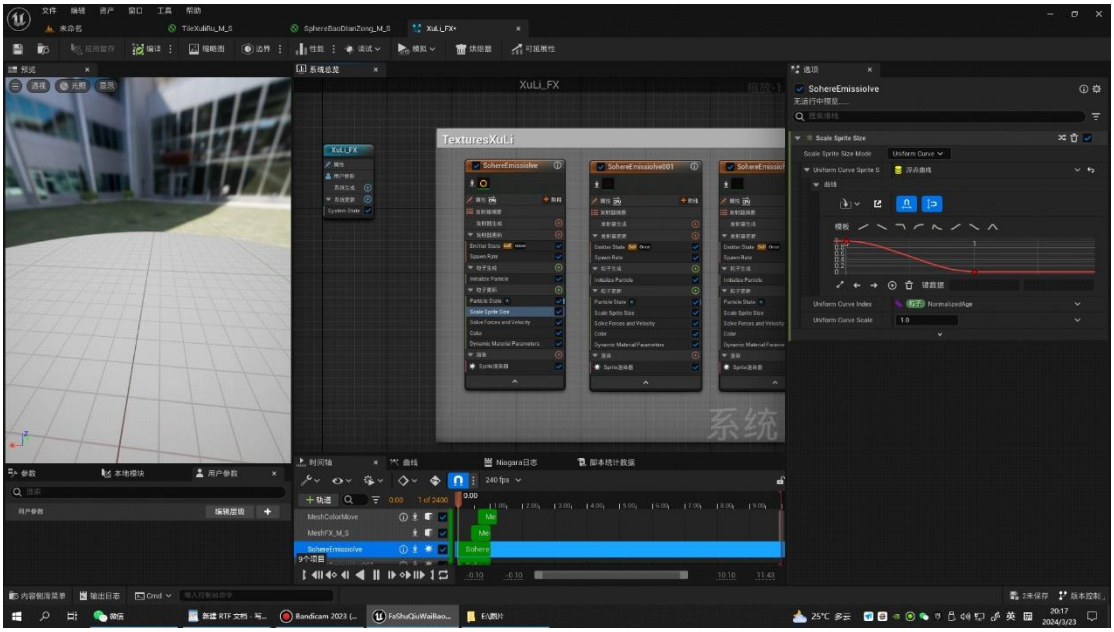

File Edit Asset Window Tools Help
Ref
Apply Search Home Hierarchy Live Update Clean Graph Preview State Hide Unrelated Stats Platform Stats
Perspective Lit Show
Ref > Material Graph
Zoom -4
Palette
Substrate
Details
Parameters
Physical Material
Phys Material
Phys Material Mask
None
Material
Material Domain
Surface
Blend Mode
Additive
Shading Model
Default Lit
Two Sided
Use Material Attributes
Cast Ray Traced Shad
MATERIAL
Stats
Base pass vertex shader: 217 instructions
Texture samplers: 2/16
Texture Lookups (Est.): VS(0), PS(3)
Shader Count: 4
Content Drawer
Output Log
Cmd
Enter Console Command
All Saved
Revision Control

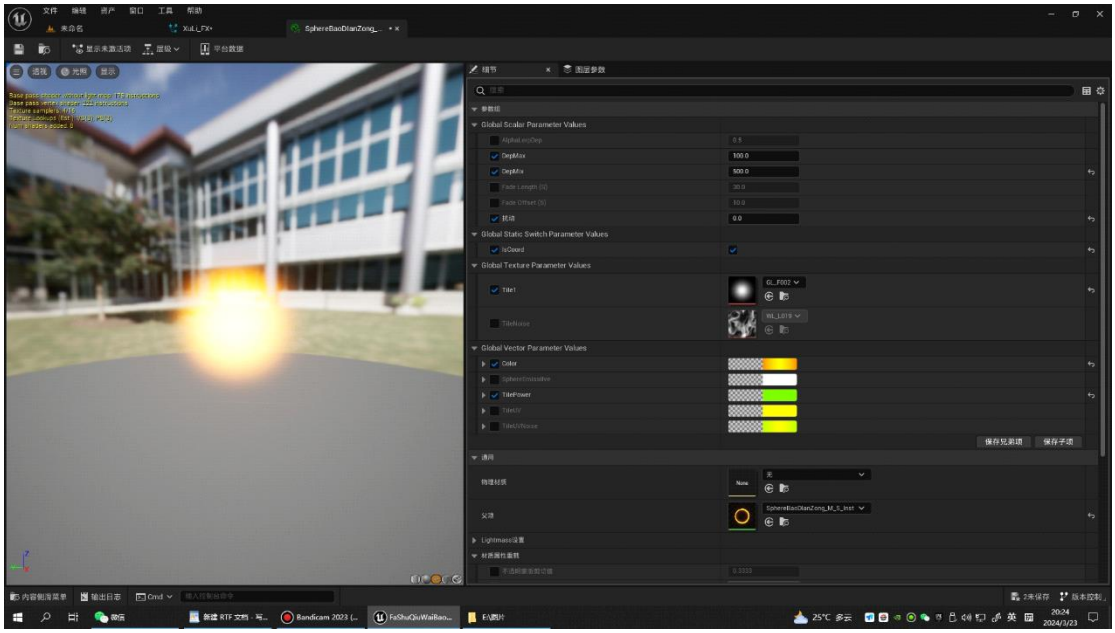

File Edit Asset Window Tools Help
Sphere_SubTile
Apply Search Home Hierarchy Live Update Clean Graph Preview State Hide Unrelated Stats Platform Stats
Perspective Lit Show
Sphere_SubTile > Material Graph
Zoom -7
Palette
Substrate
Details
Parameters
Physical Material
Phys Material
Phys Material Mask
None
Material
Material Domain
Surface
Blend Mode
Translucent
Shading Model
Unlit
Two Sided
Use Material Attributes
Cast Ray Traced Shad
MATERIAL
Stats
Base pass shader without light map: 217 instructions
Base pass vertex shader: 286 instructions
Texture samplers: 6/16
Texture Lookups (Est.): VS(3), PS(5)
Content Drawer
Output Log
Cmd
Enter Console Command
All Saved
Revision Control

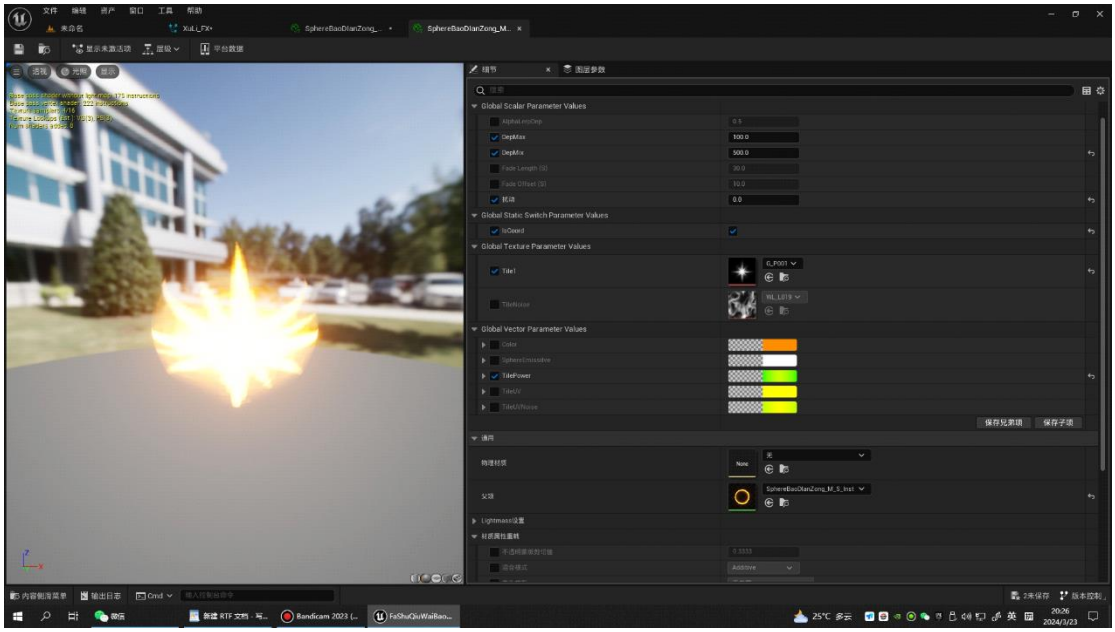


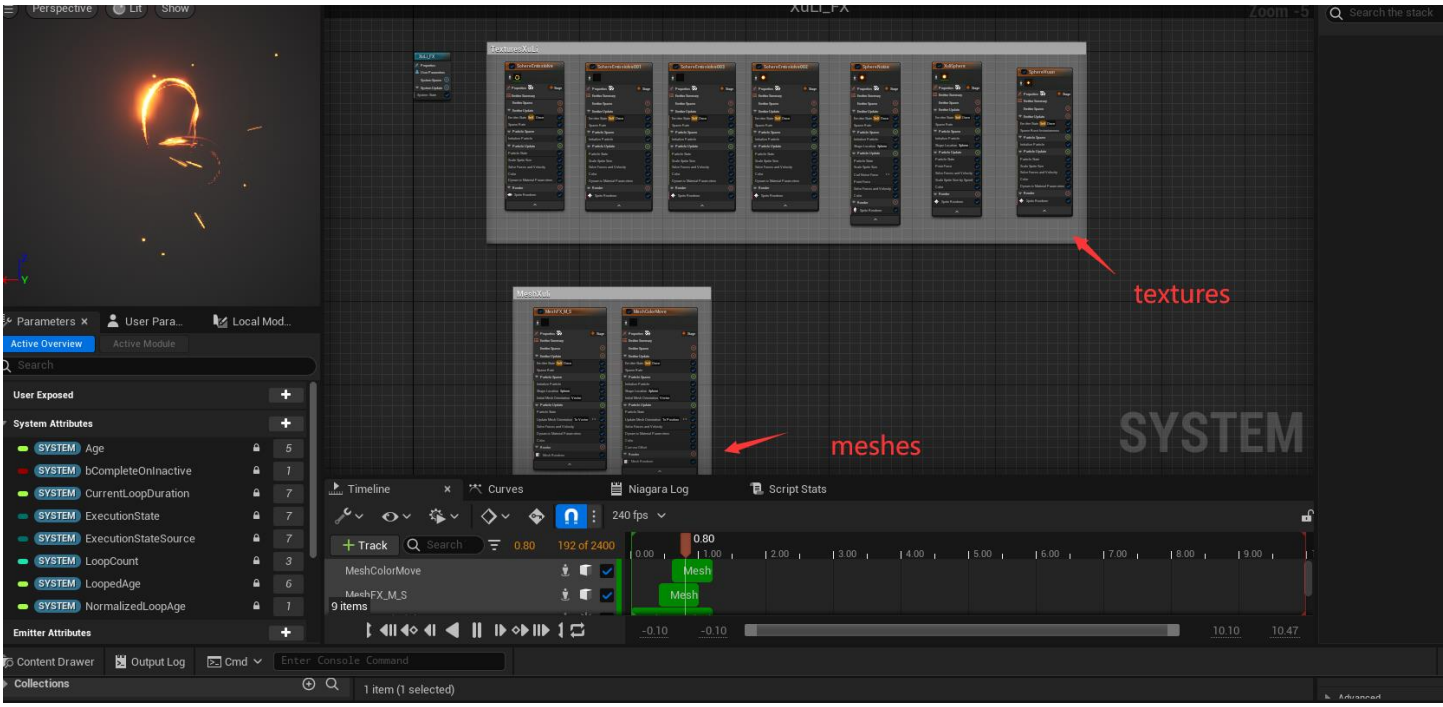


With the Niagara system I could have a color adjustable charging VFX.

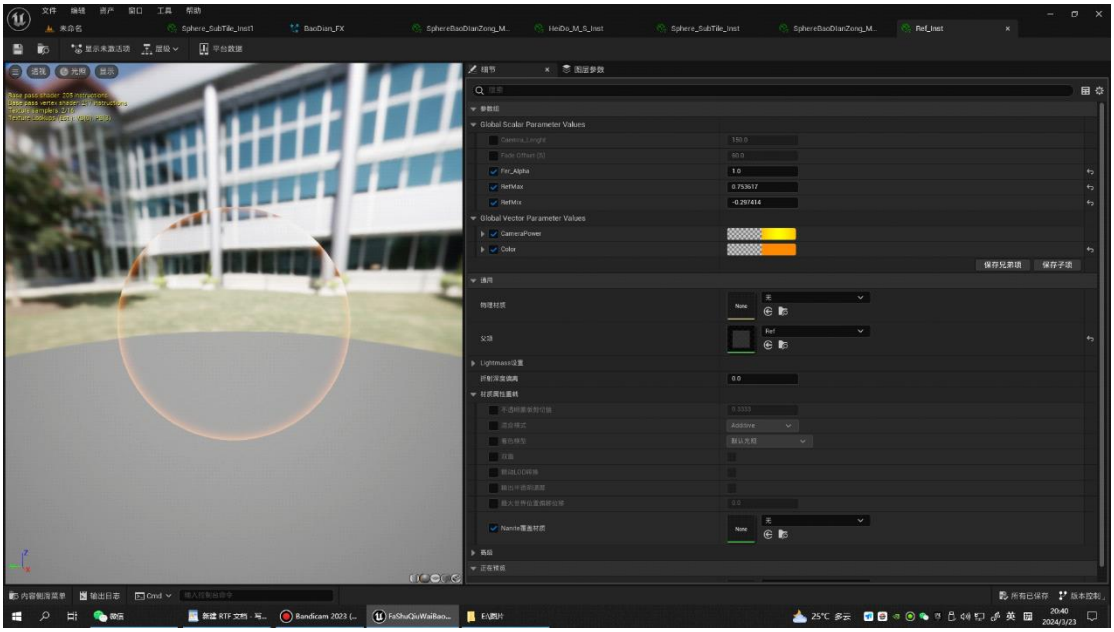

XuLi_FX
TexturesXuLi
SphereEmissiolve
SphereEmissiolve001
系统

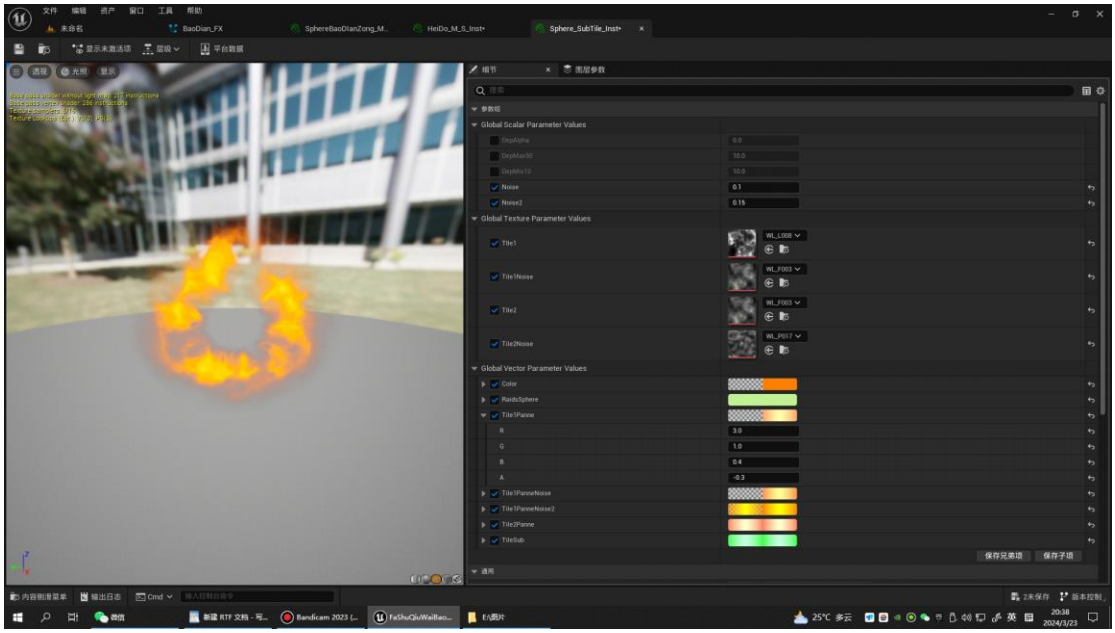

Global Scalar Parameter Values
Global Static Switch Parameter Values
Global Texture Parameter Values
Global Vector Parameter Values



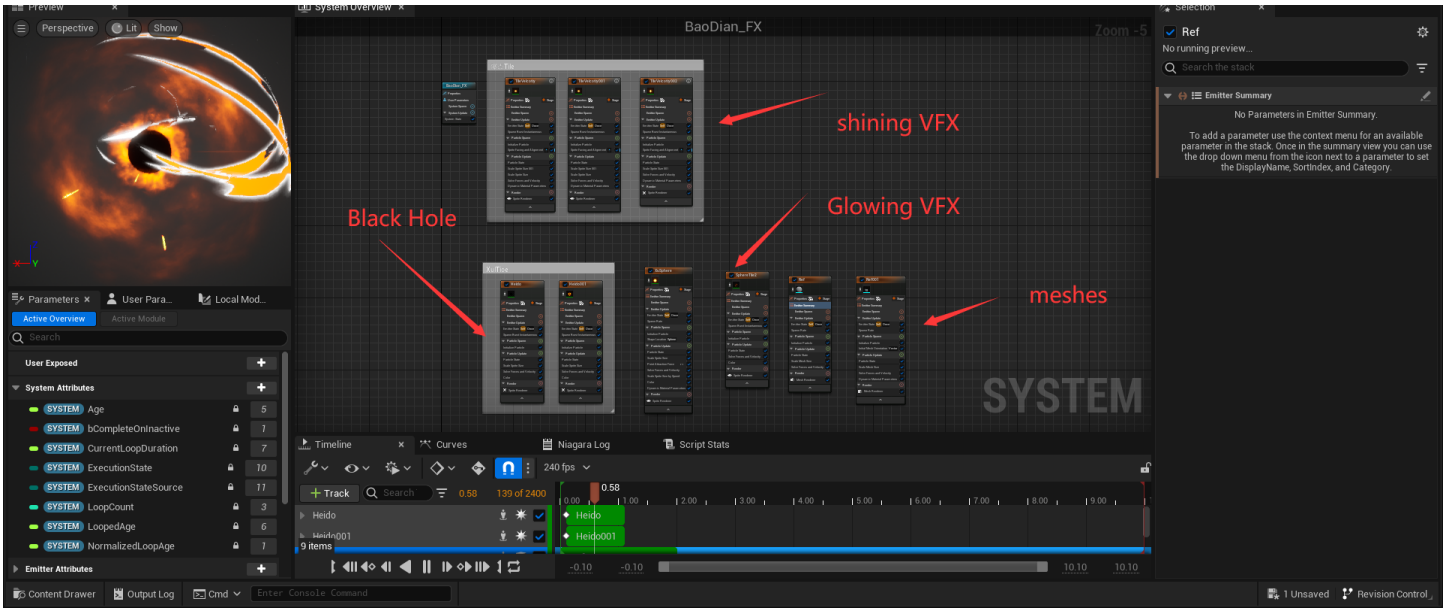

textures
meshes
SYSTEM
Timeline
Curves
Niagara Log
Script Stats
Track
MeshColorMove
MeshFX_M_S
9 items
Mesh
Mesh
Parameters
User Para...
Local Mod...
Active Overview
Active Module
User Exposed
System Attributes
SYSTEM Age
SYSTEM bCompleteOnInactive
SYSTEM CurrentLoopDuration
SYSTEM ExecutionState
SYSTEM ExecutionStateSource
SYSTEM LoopCount
SYSTEM LoopedAge
SYSTEM NormalizedLoopAge
Emitter Attributes
Content Drawer
Output Log
Cmd
Enter Console Command
Collections
1 item (1 selected)

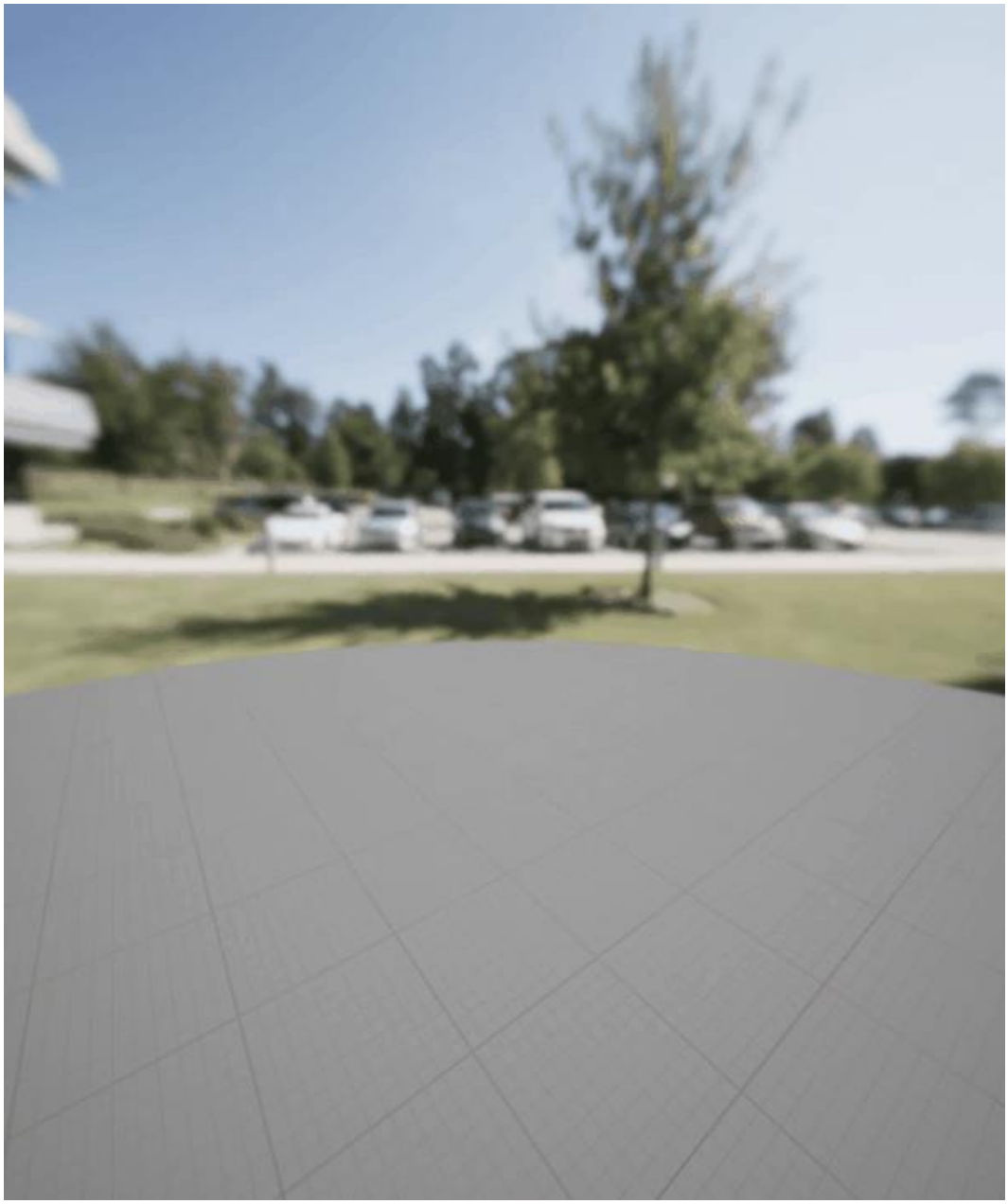
Also, I used updated materials and made an explosive VFX with decal mesh.





This is the decal mesh that will surrounding the black hole.





To have a better understand of launch, I referred following video.

Black hole launch reference

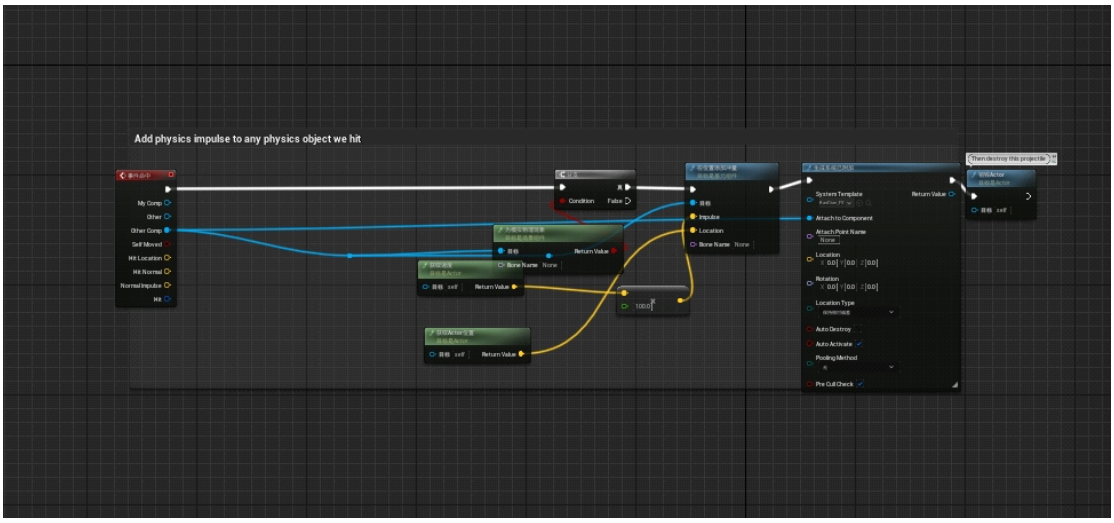
https://www.youtube.com/watch?v=tSb4hTmIuSs&ab_channel=474

With undated materials, I got the new tail VFX.

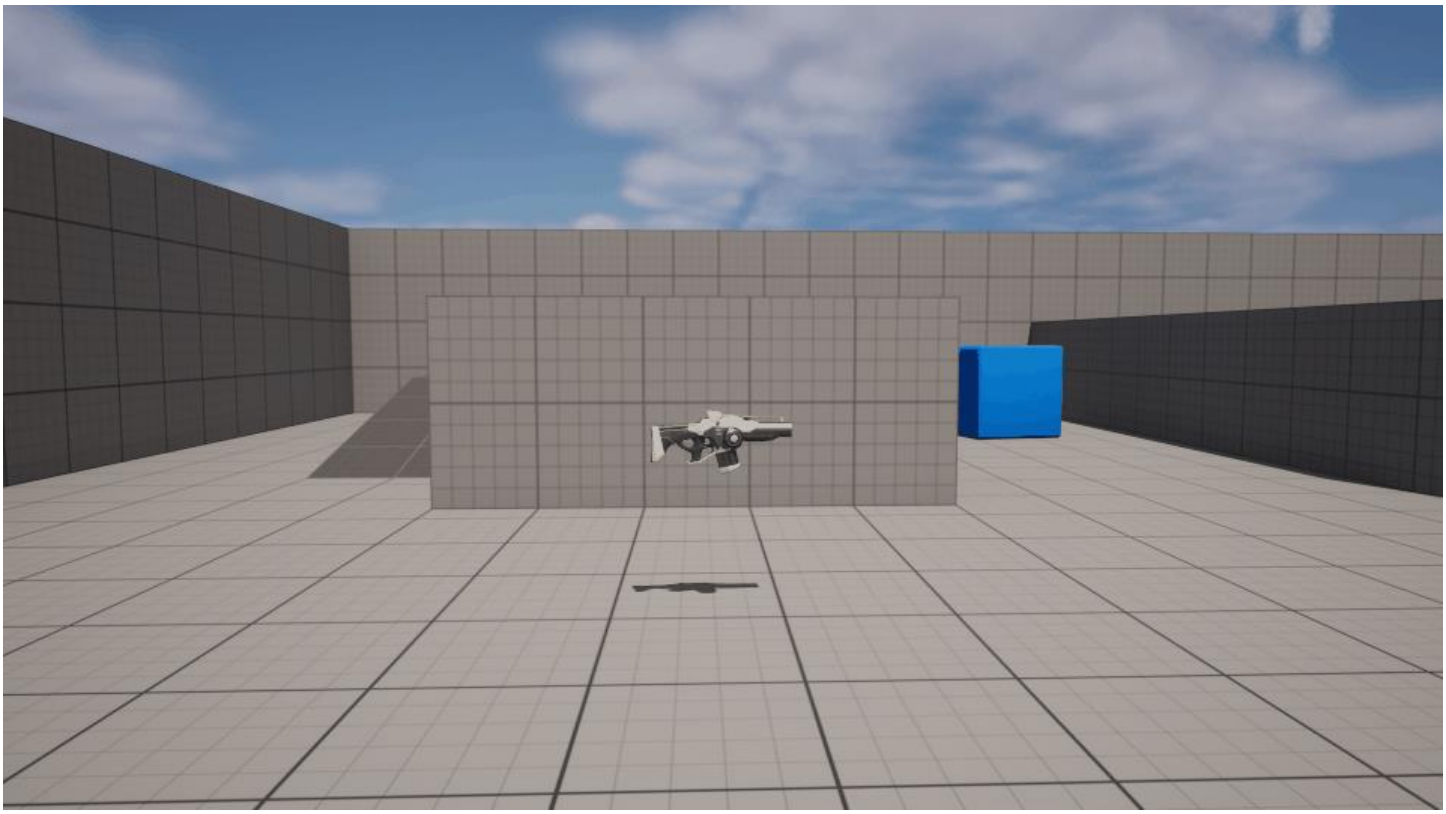
<u>With undated materials, I got the new tail VFX.</u>

So, the main logic of combine them together is use blueprint to trigger different VFX in different section of animation time line.

Trigger charging effects during animation playback of shooting. Following launch special effects, Blueprint.



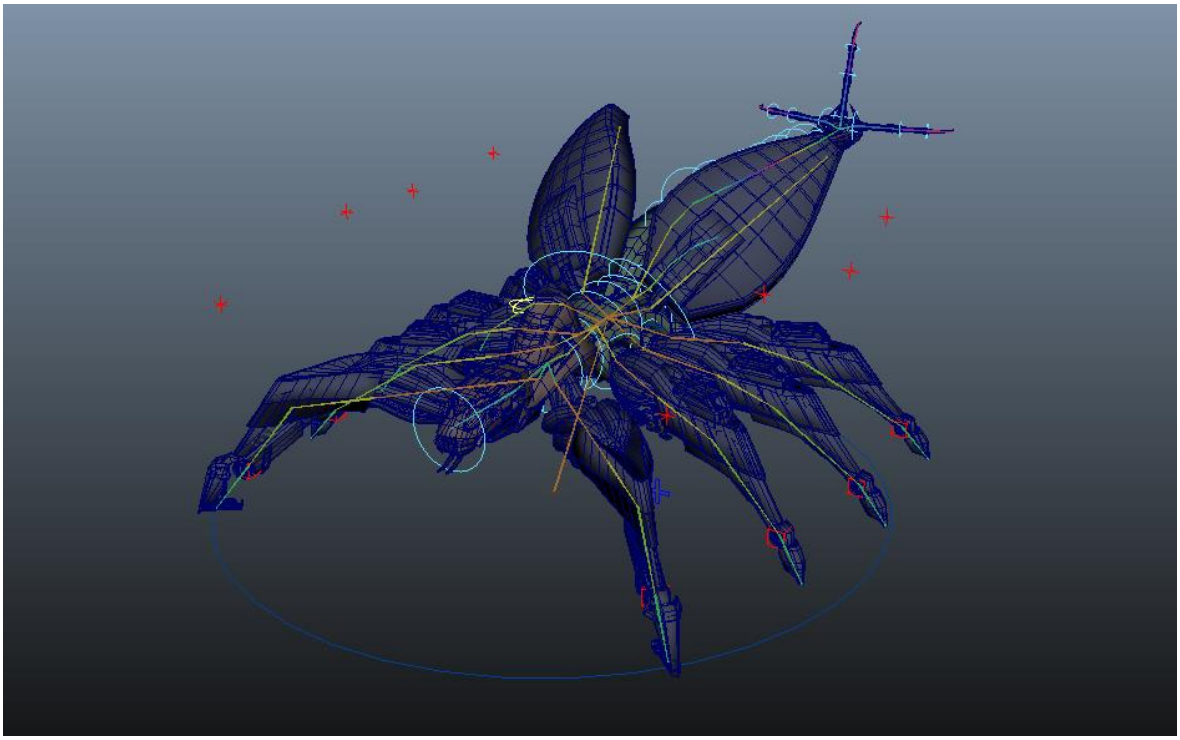
Determine the hit event to assess if the target is hit. If a hit occurs, enable physics simulation for the object. Set up an impulse addition on the hit event. Use the "Other Comp" to obtain the location of the impact, then acquire its velocity and multiply by 100. If the hit causes the object to be propelled 100 meters, generate special effects (with the system already attached). Then, configure the destruction of the Actor itself.

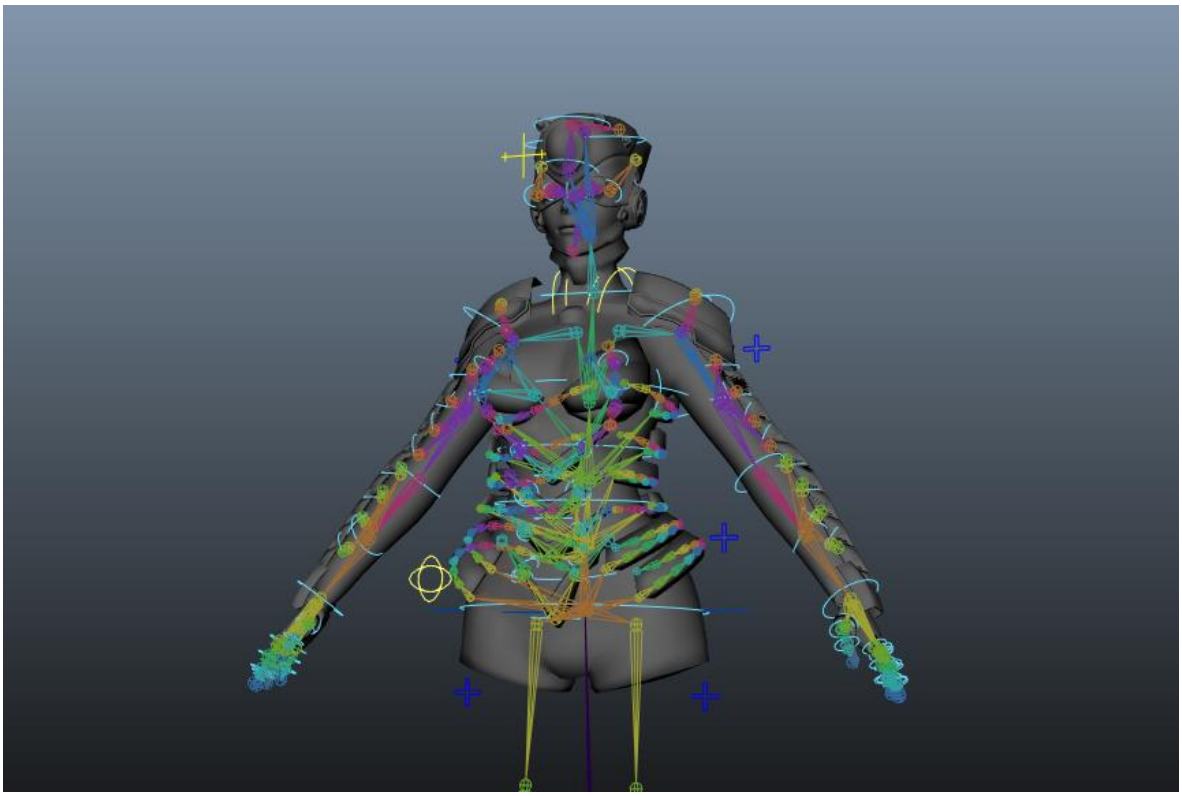


BETA

POLISH

I spilite 2 parts and polished rigging systems, with techniques I used before. What I decided is just keep them split and making animations together





For knowing industrial approaches of how to animate 2 attached skeleton meshes, for instance, weapon and character, I found 2 forum technical exchange. The first point of view is, depending on your game's requirements, you might choose to animate arms and weapons together in the same files for consistency or animate them separately to allow for more detailed control over each element. This decision impacts how you set up your animation blueprints and state machines in Unreal Engine

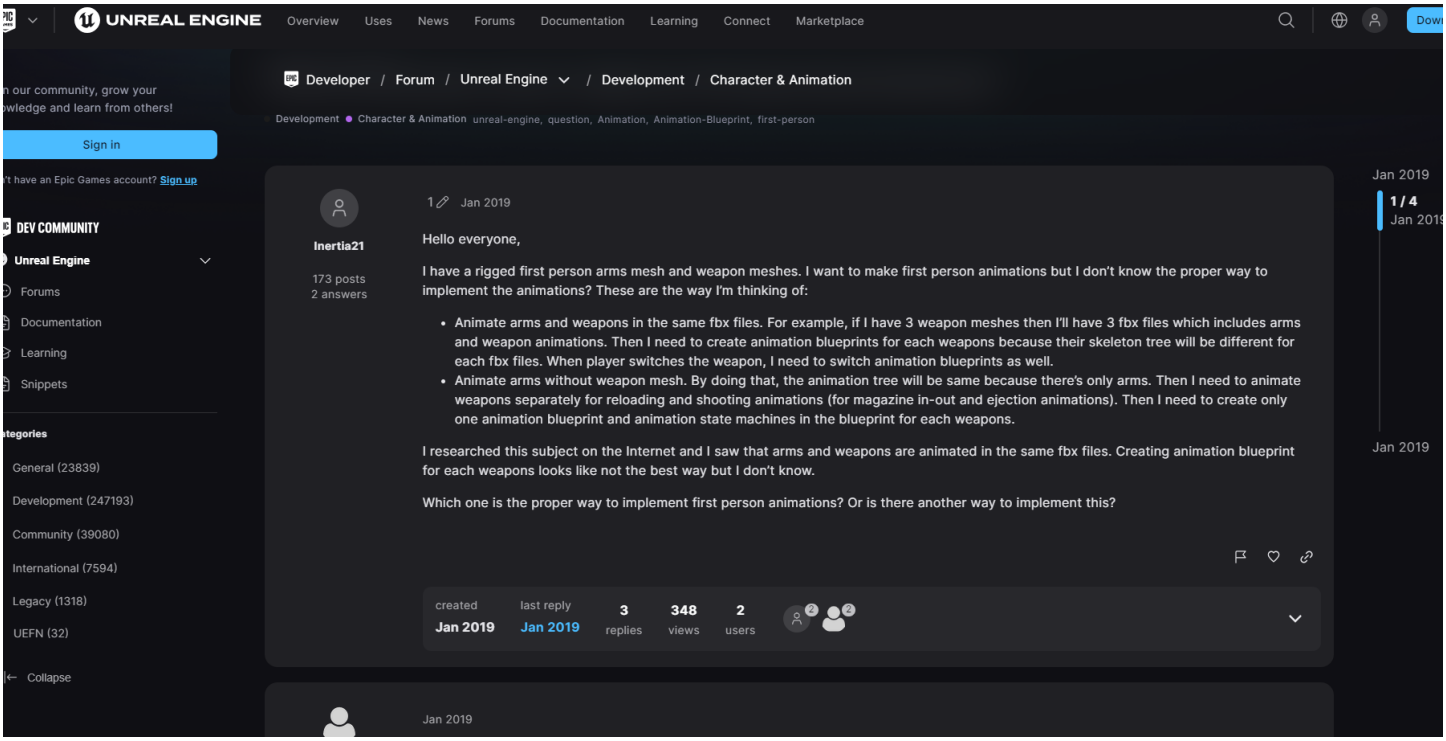


Figure 31 – What is the proper way to implement first person animations?

https://forums.unrealengine.com/t/what-is-the-proper-way-to-implement-first-person-animations/441269

The second point of view is, A good approach to managing weapon and arm animations in video games is to attach weapon animations to the arm animations during the creation process. This synchronization of

motions helps ensure that the movements of the arms and the weapon are coordinated. Typically, this involves setting up proper parent-child relationships and constraints in the animation software to ensure consistency and synchronization of animations across the character's movements and the weapon's actions. Basically it's the method I attach my character and mech.

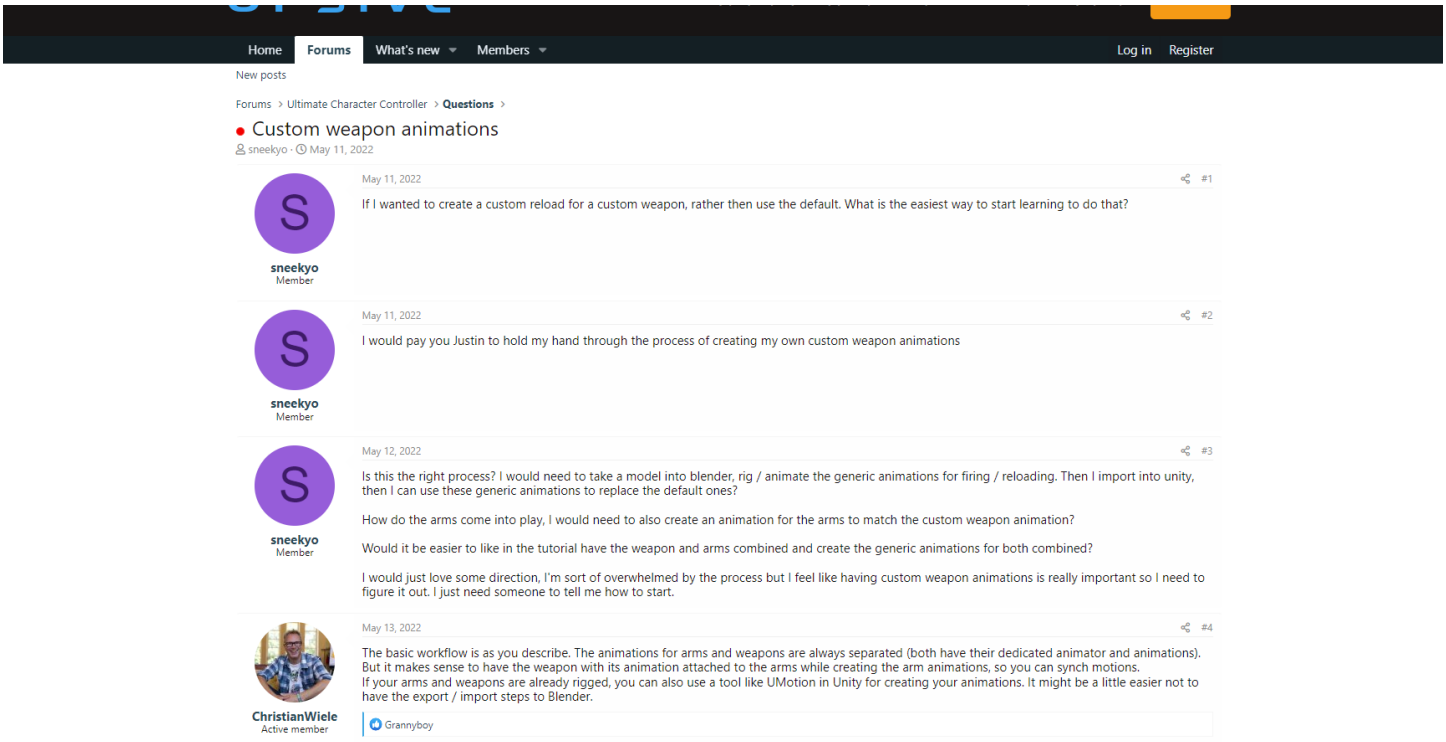
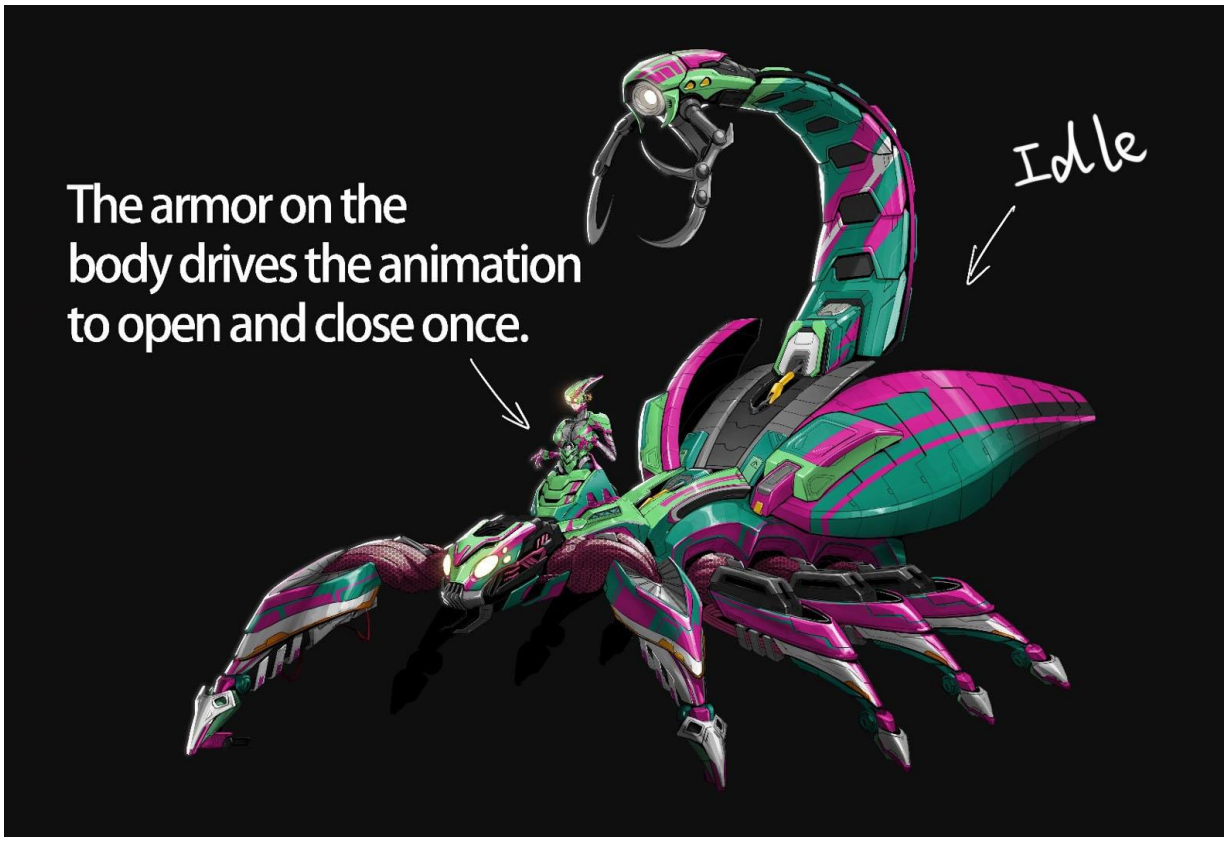
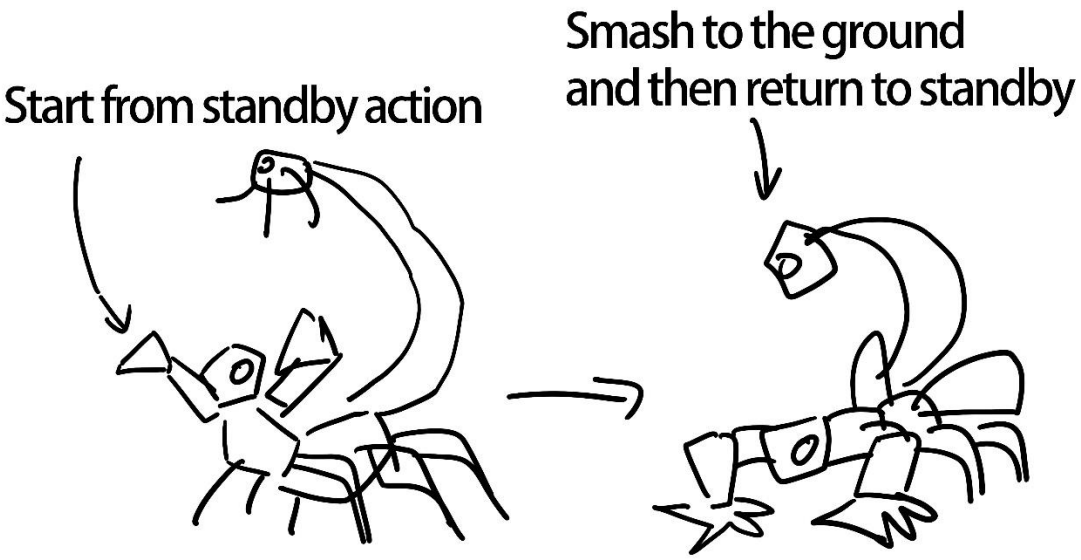


Figure 32 – Custom weapon animations

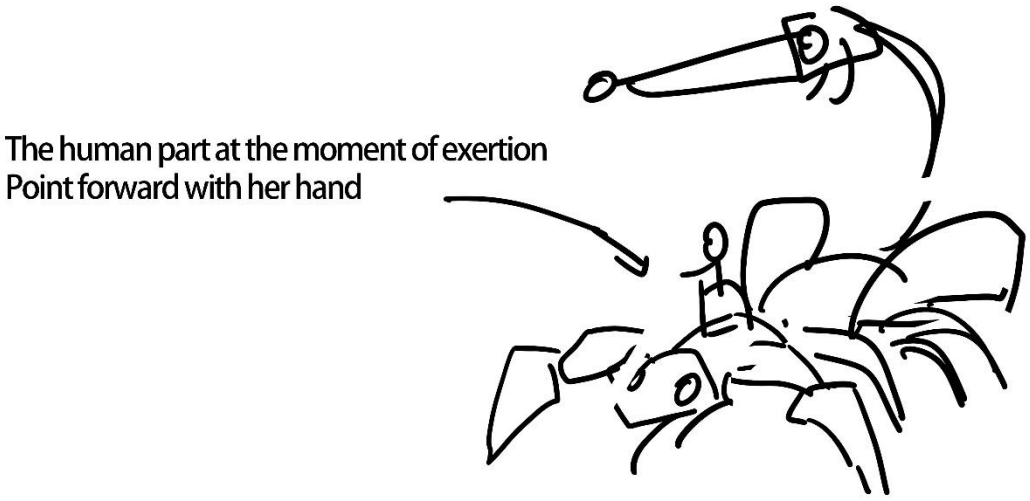
https://www.opsive.com/forum/index.php?threads/custom-weapon-animations.7924/

To make animations that could co work with 2 VFX, I made following animation references.

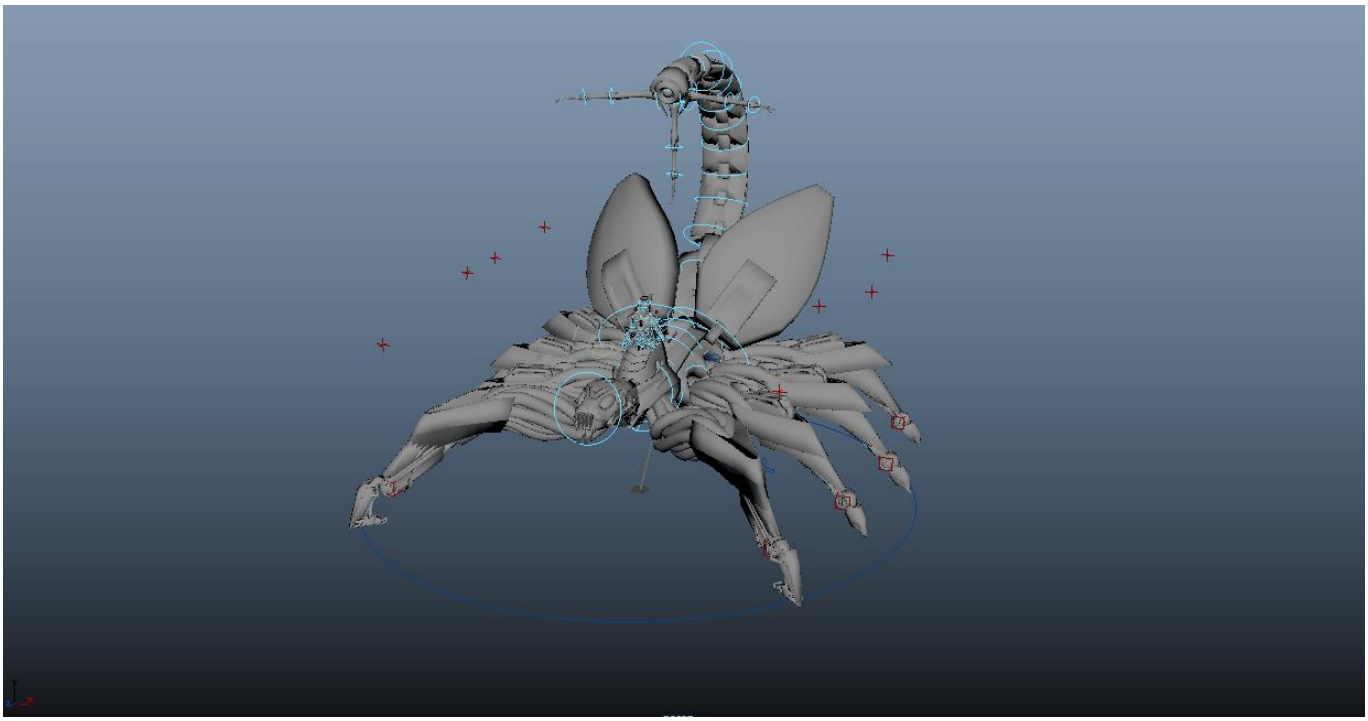


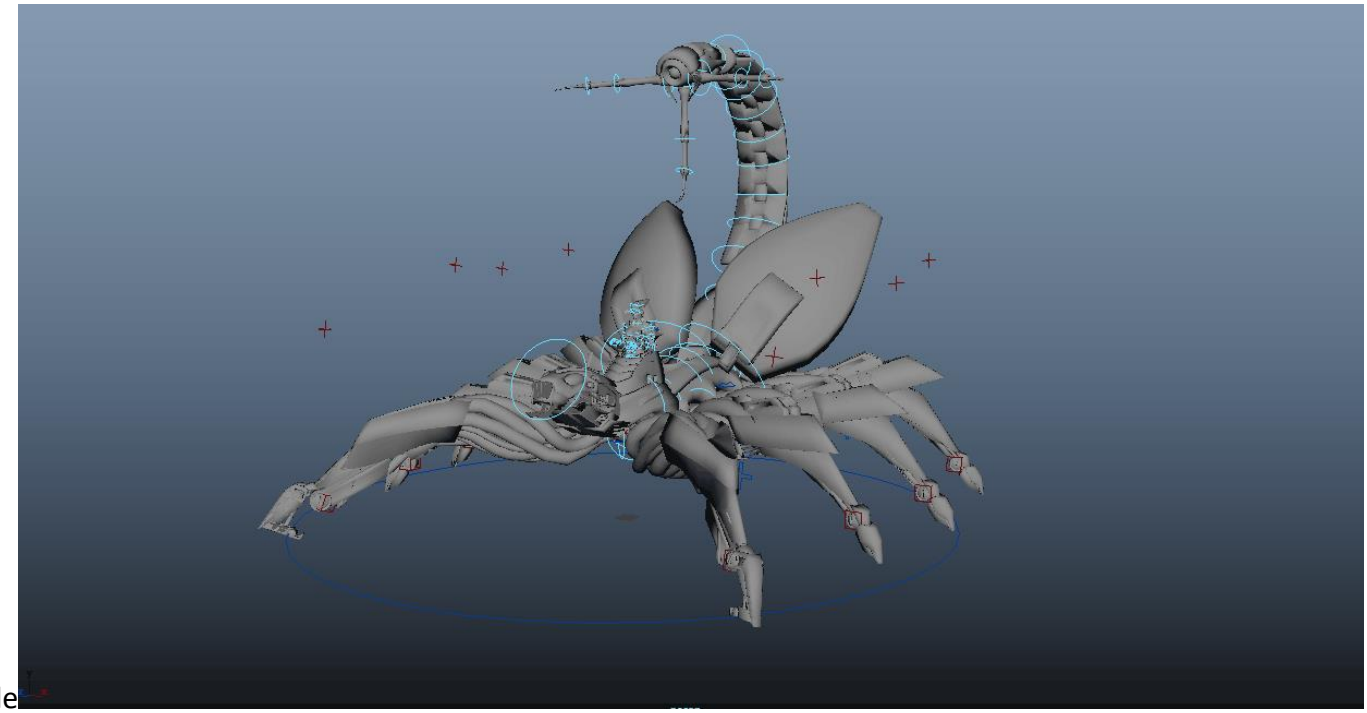


Starting from standby and accumulating power, the whole spider will sink downwards.
, like exerting force when going to the toilet, and then suddenly jumping up
Represents laser emission



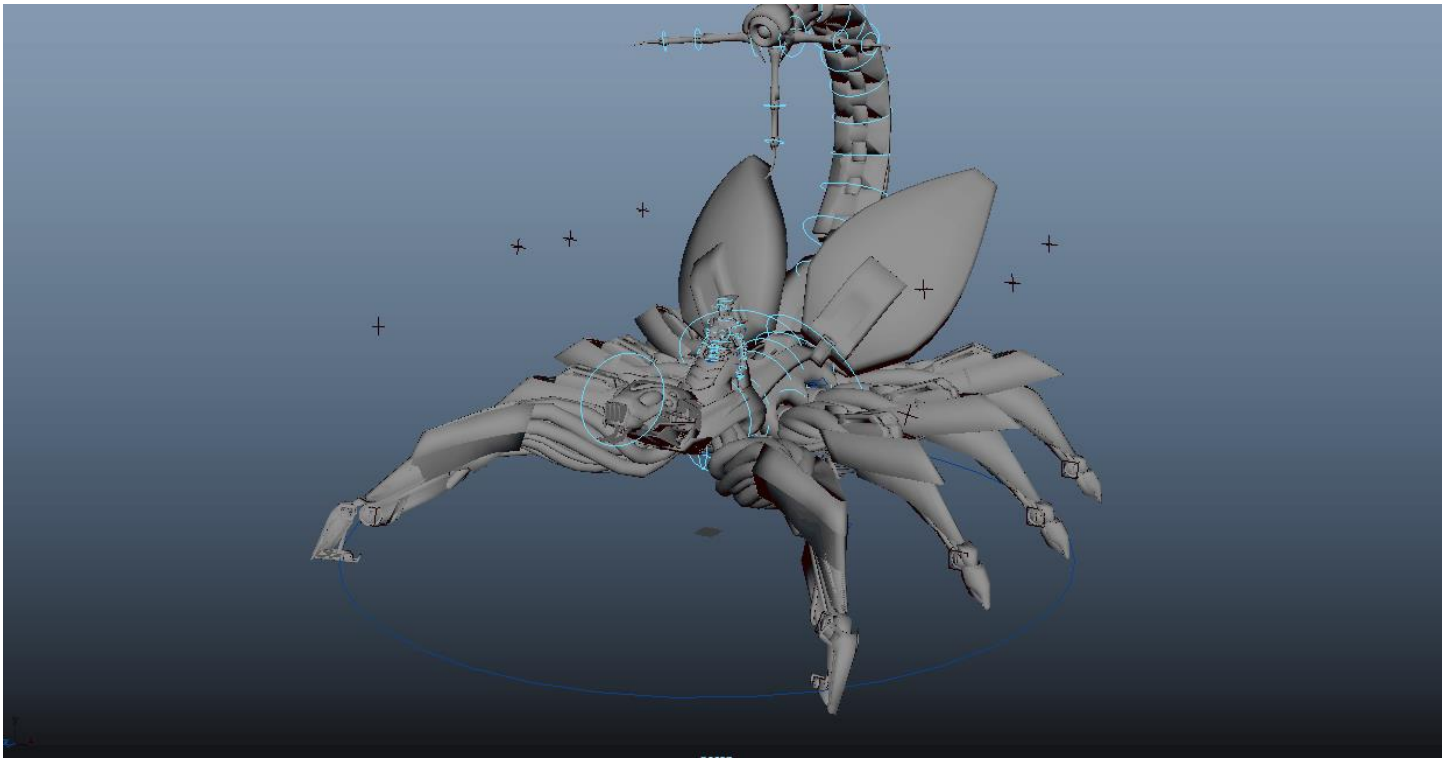
Following animations I made:





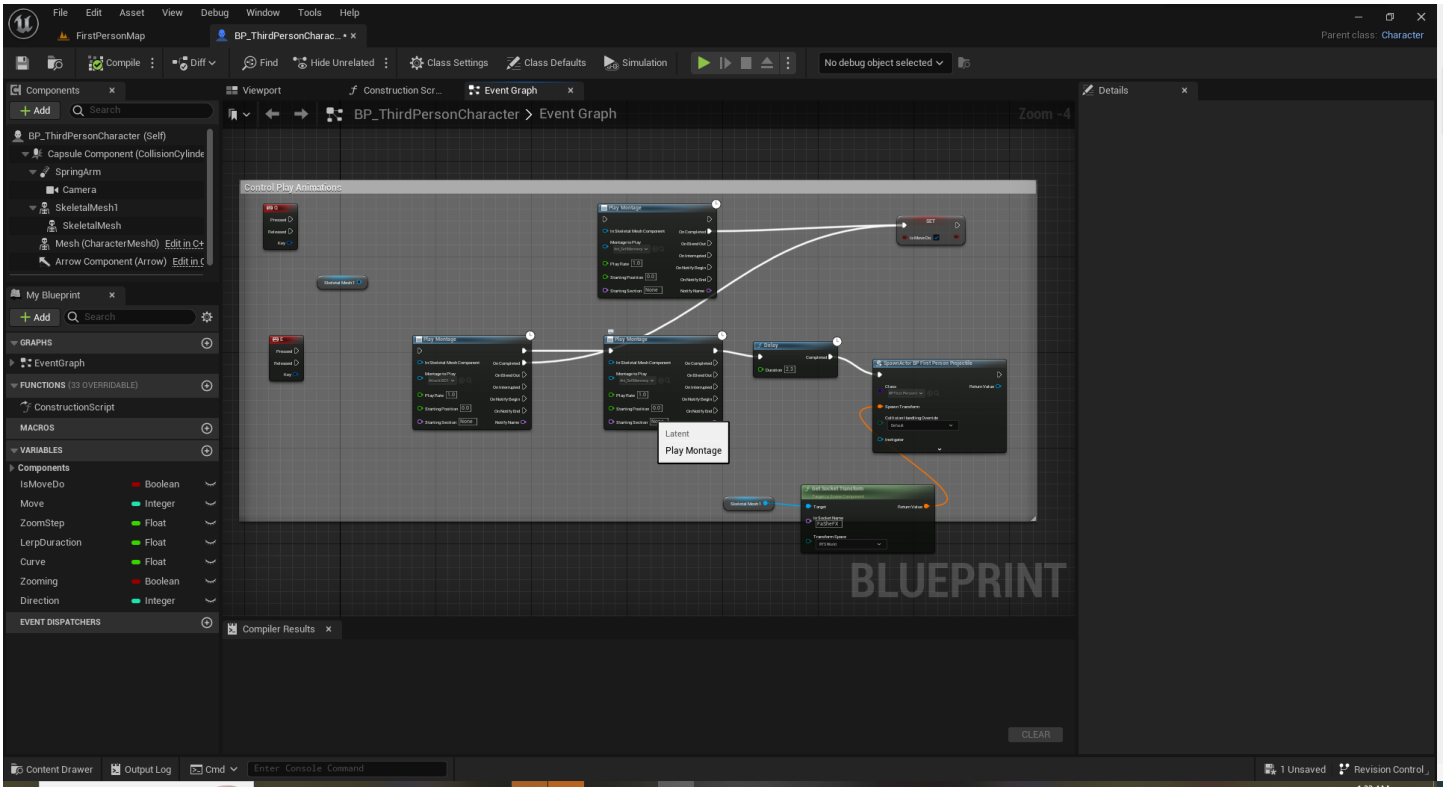
Idle

Smash



Charge

I am not a programmer, so I modified the default Third person BP from Unreal. Basiclly I combined Q and E keys to charging and smashing animations and VFX, following the changes I made:

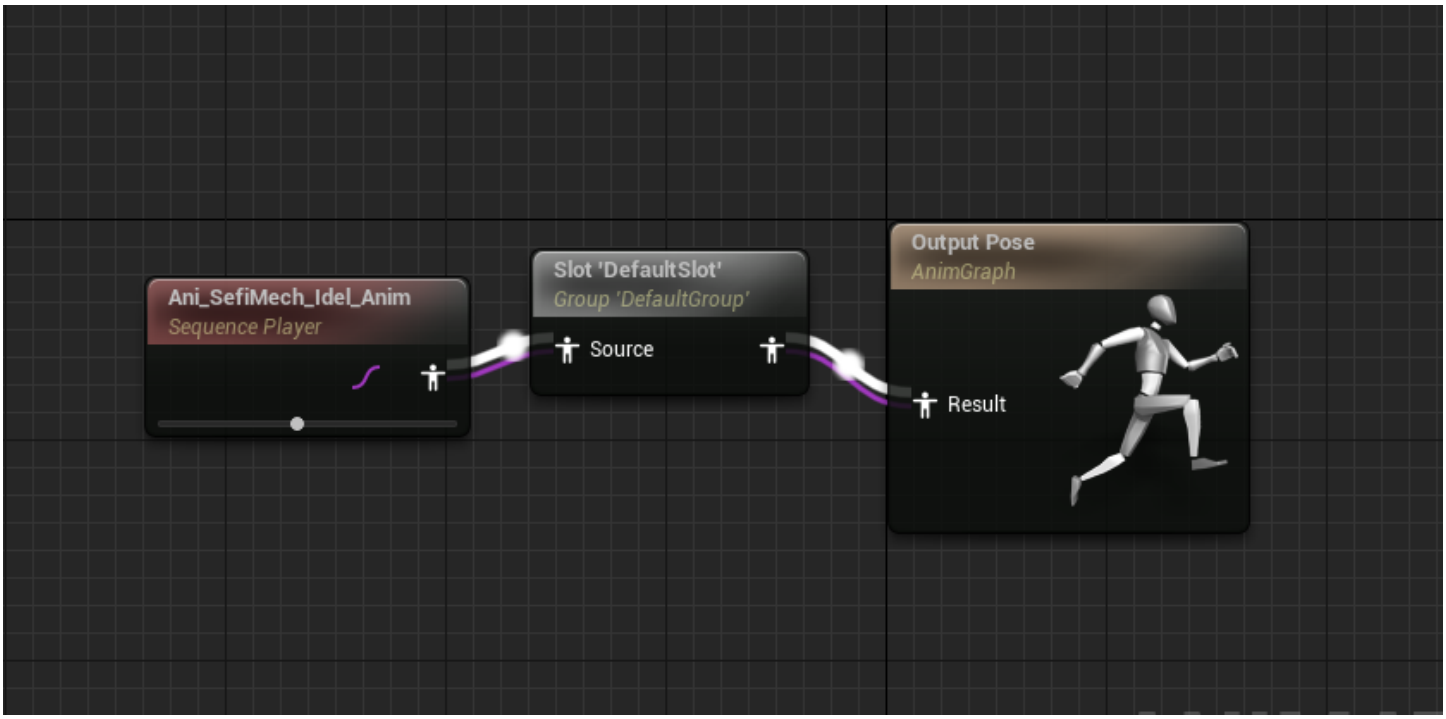


BP_Mech

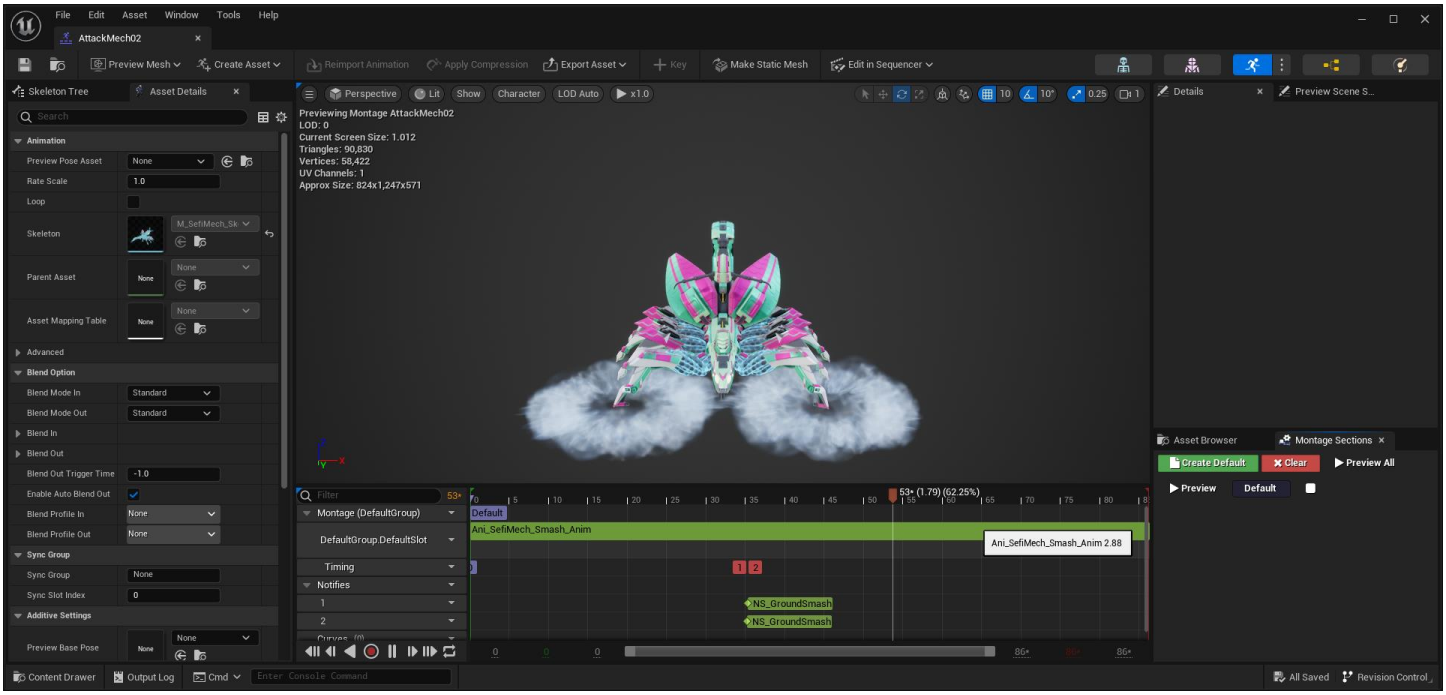
Because VFX attached with mech skeleton mesh, so modifies are gathered in mech skeleton mesh. The mannequin attached in the slot of BP.

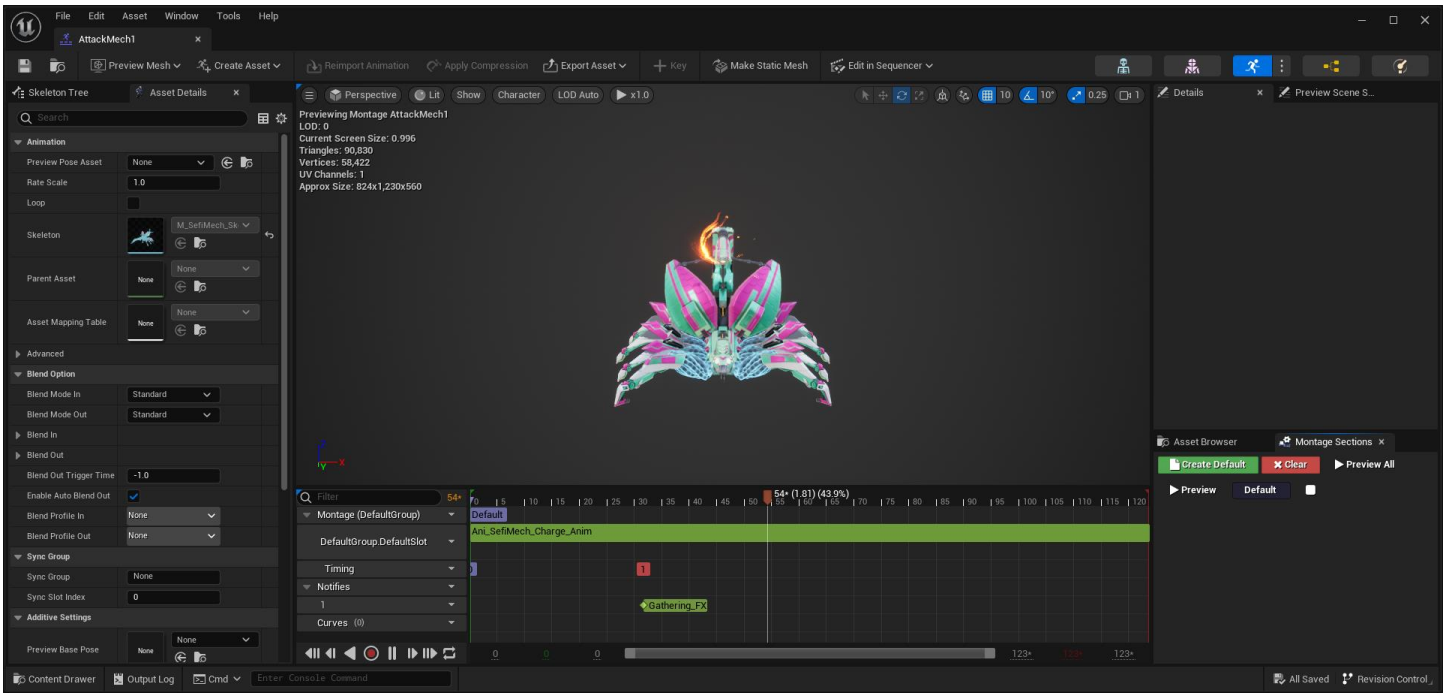
Q Key: Play the Ground Smash Animation Montage targeting the Scorpion model. Then, play the Character Animation Montage. In variables, add a Boolean variable and set it to true.

E Key: Play the Charging Animation Montage targeting the Scorpion model. Then, play the Character Animation Montage, add a delay of 2.3 seconds, and then spawn an actor. The class is BP_FirstPersonProjectile, its Spawn Transform should get the slot transformation named Tail, targeting the Scorpion model.



Blueprint Animation





Add a slot otherwise the Animation Montage won't display.

Following demo in Beta unreal project:

OPTIMIZATIONS

How performance was improved and why.

CONCLUSION

RTM

DESCRIPTION

Fix issues and polish 3 masteries, including concept sheet lay out, VFX time line and color dynamic, adding walking animation as a feature. For optimize, focused on shrink texture size from 4k to 2k.

METHODOLOGIES

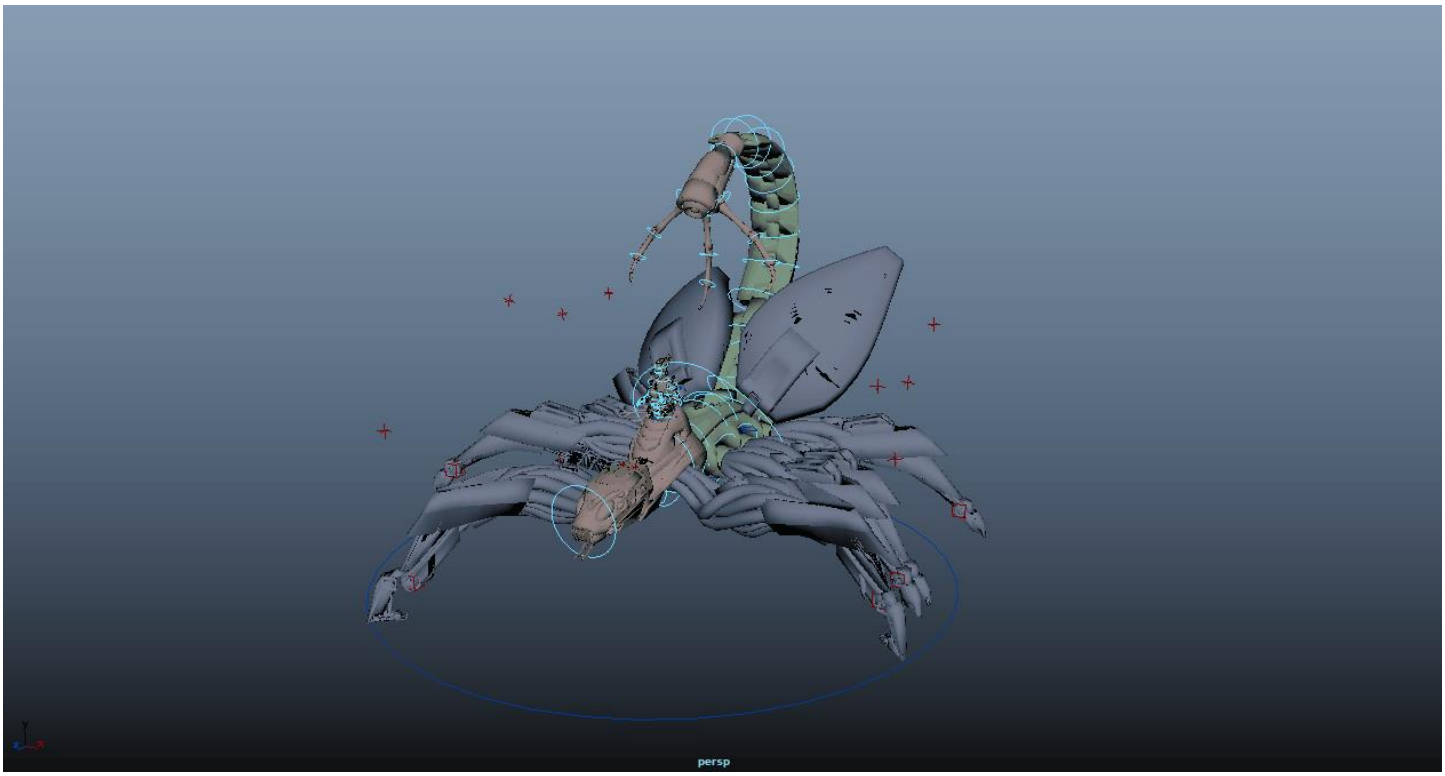
In RTM phase, I didn't use any new methods but methods demonstrated before. Following changes made in this phase:

Concept:

In the final layout of concept sheet, I removed background story but added Attacking VFX demo which related with my thesis more.

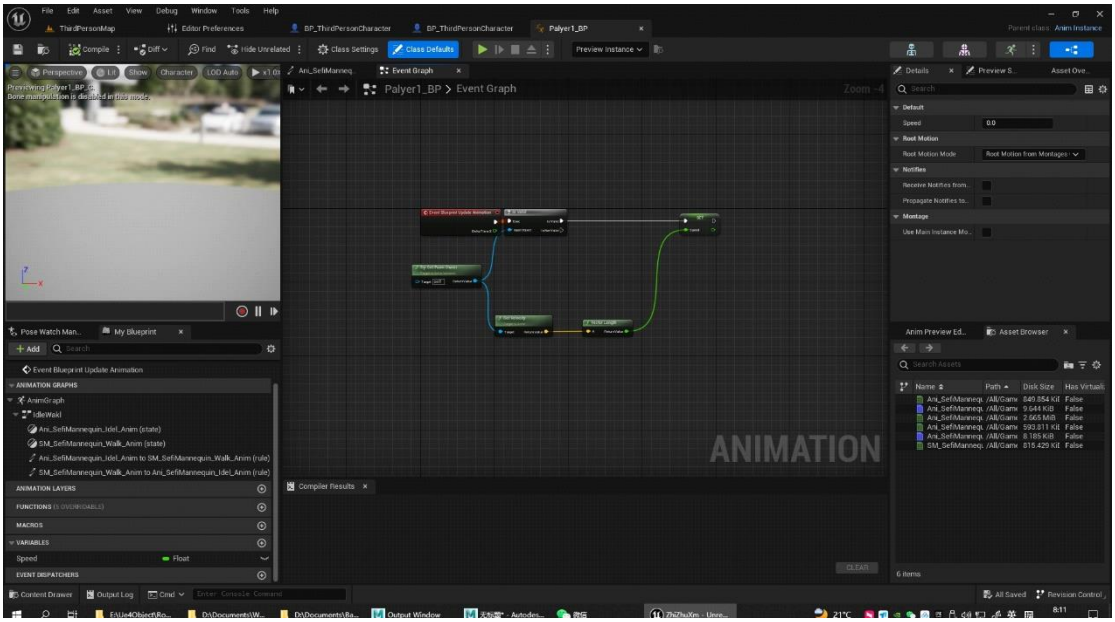
Rigging

I modified old walking animations which putted in Unreal project, it could demonstrate my rigging function more.

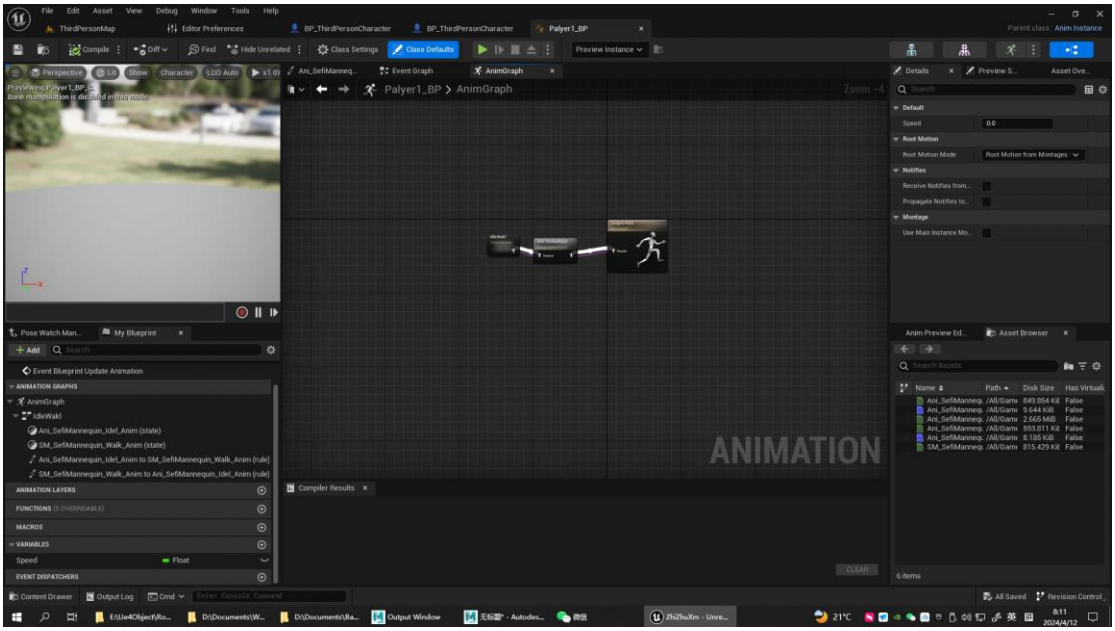


Adding walking animation to Animation Blueprint.

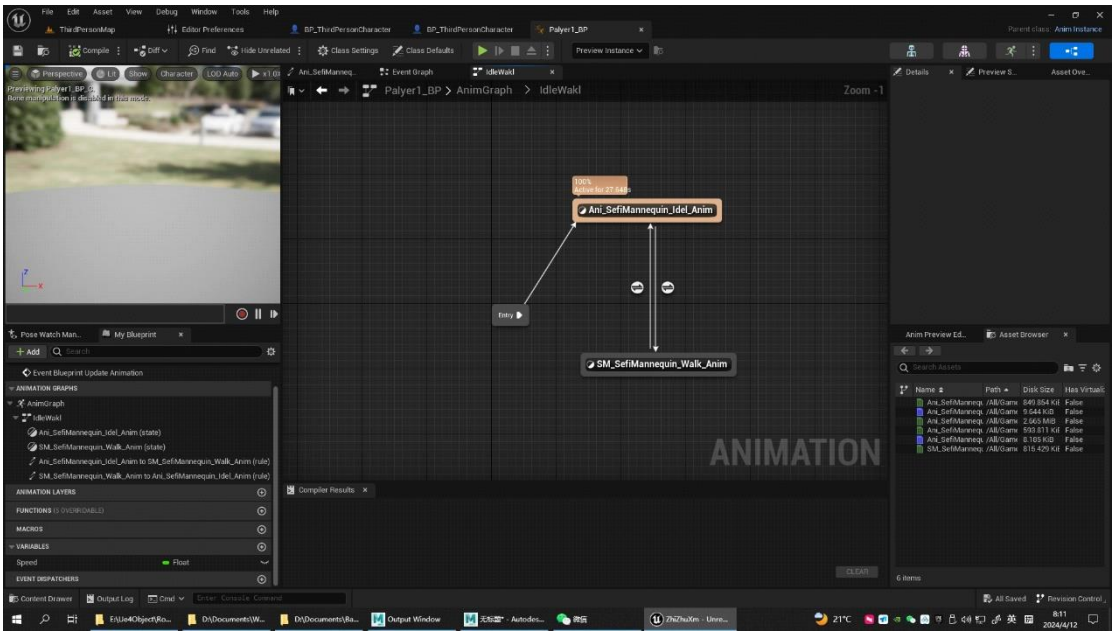
1.Add a variable Speed of type float.



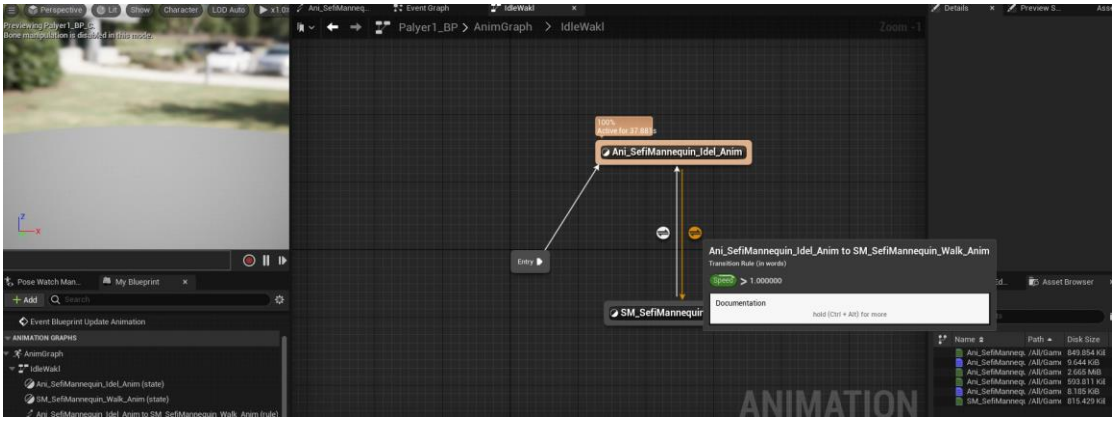
2.Adding a Slot.



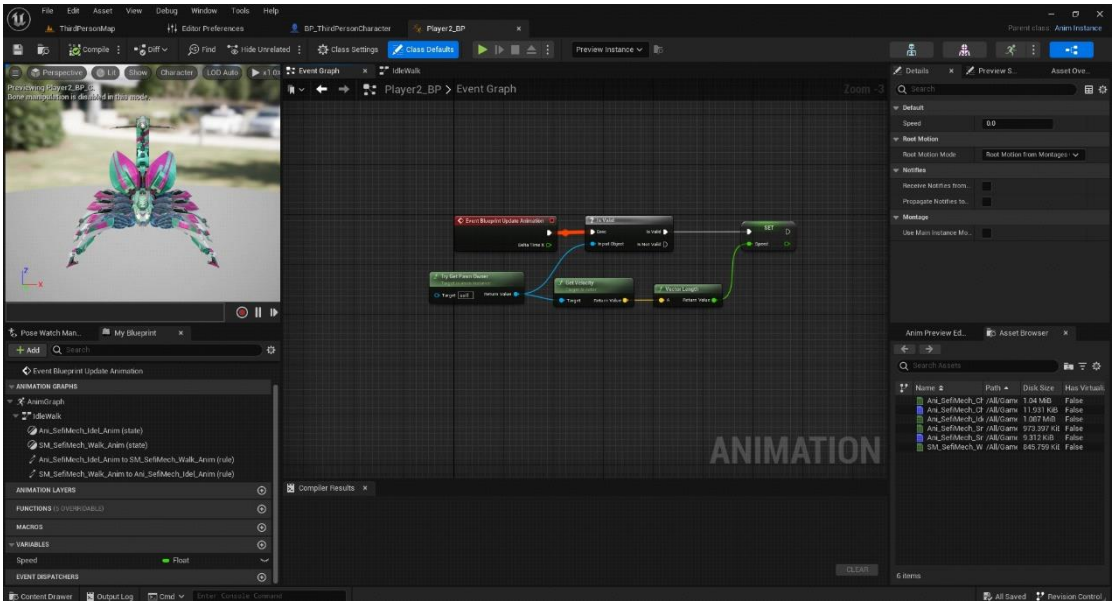
3.Import the Idle animation and the Walk animation.



4.Check if it's greater than 1; if so, play the Walk animation. On the left, check if it's less than 0.1; if less than 0.1, revert to the Idle animation.



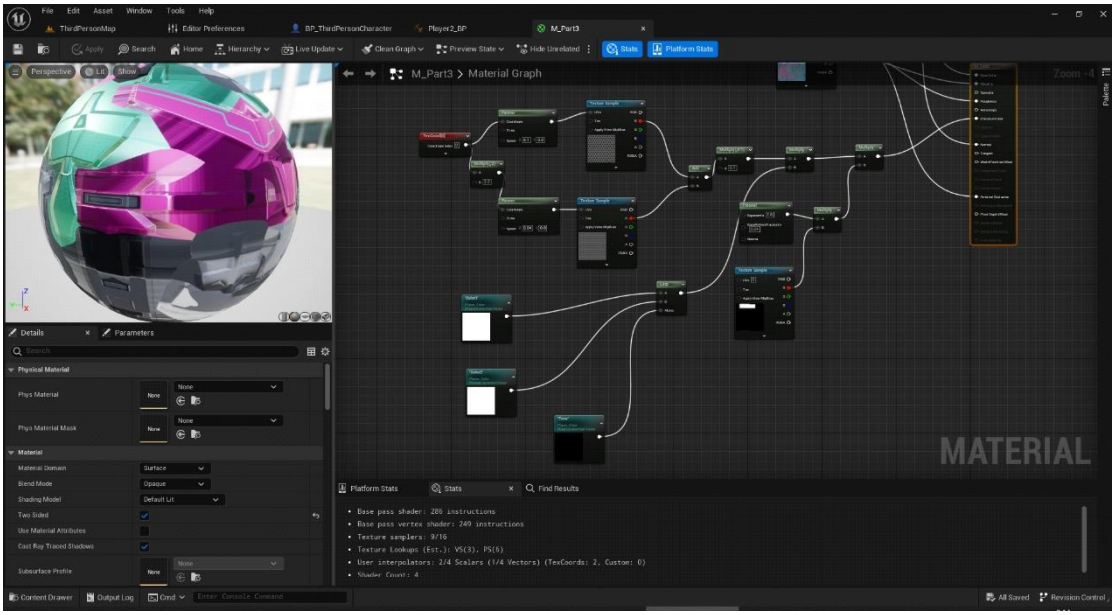
*The spider animation is identical to the character animation.



VFX

Before and after playing the animation with the E key in the Blueprint, there will be an Add Time setting to change the material color. The instance of the material is used for this setting:

Add a material parameter



Import material instance to the character animation BP slot, during charging animation, the color of blue hexagon will become red.

FINAL OPTIMIZATIONS

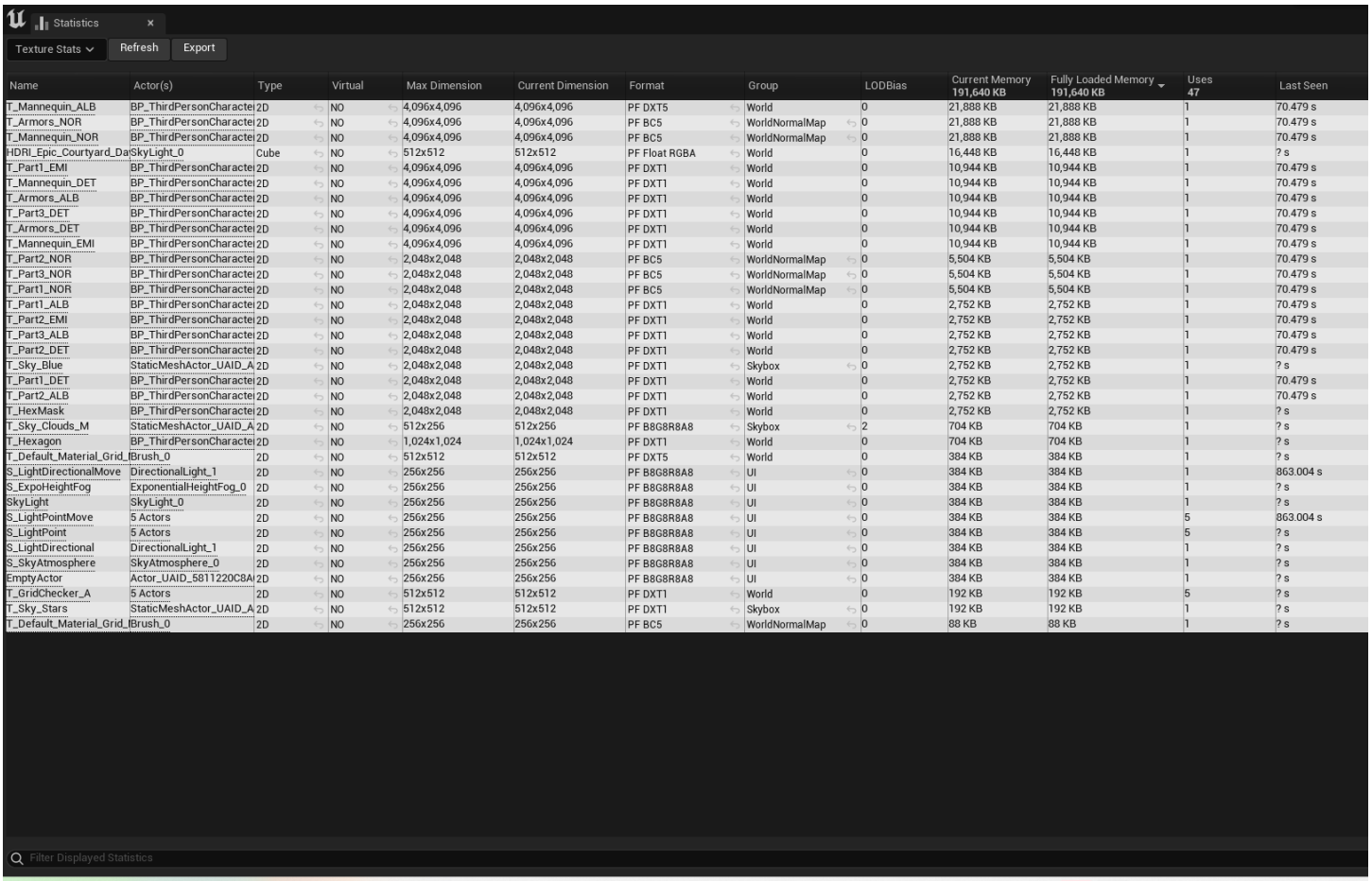
1. Optimized precent scene:

I replace default unreal scene to an infinite precent scene so users could be focused on the character.

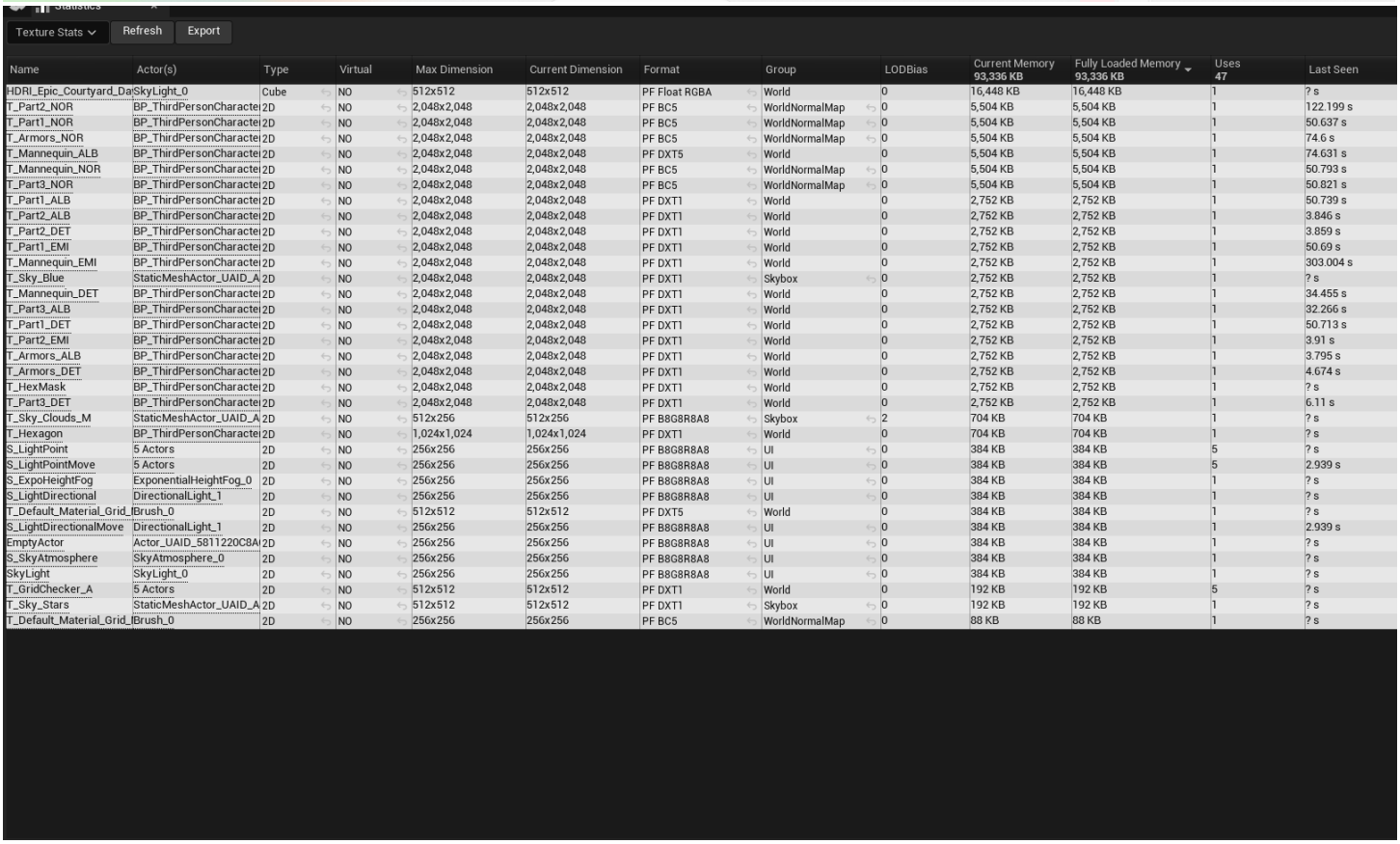
2. Fixed timeline of trigger explosive animation

Previously the explosive animation is too slow to show up, and now it will appear earlier.

I optimized those 4K textures and making them 2K which improved the performance a lot.

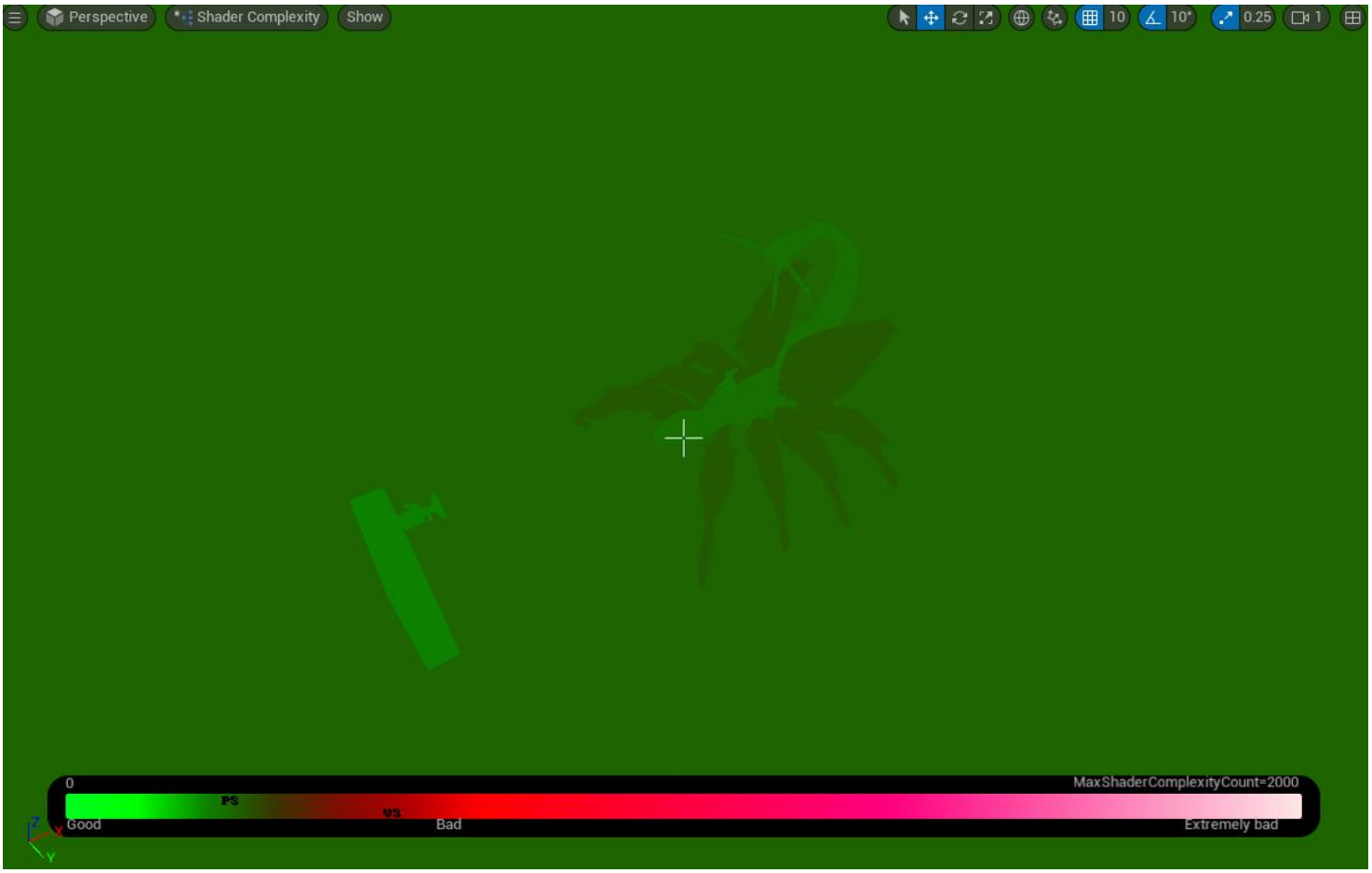


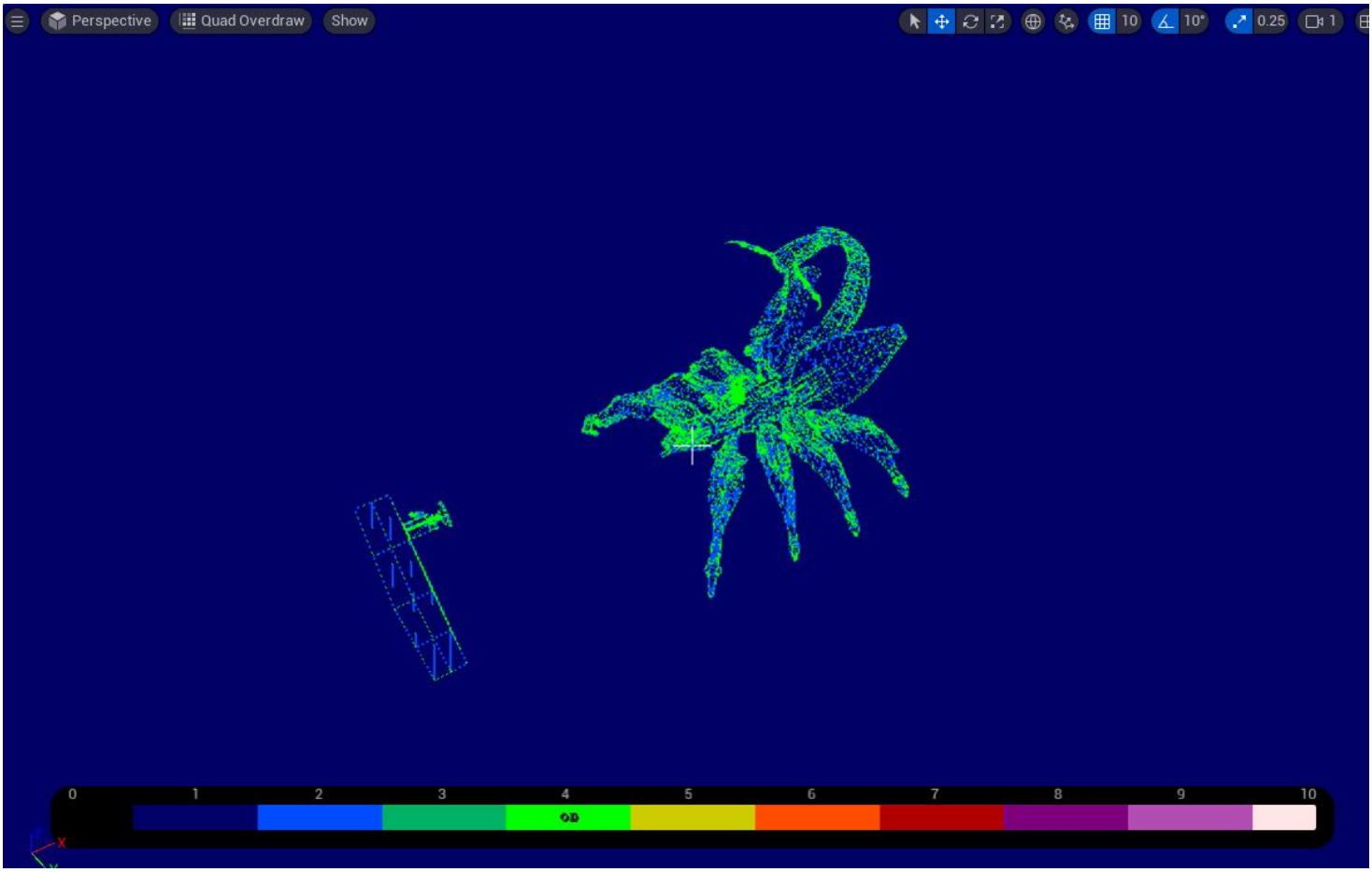
Name	Actor(s)	Type	Virtual	Max Dimension	Current Dimension	Format	Group	LODBias	Current Memory 191,640 KB	Fully Loaded Memory 191,640 KB	Uses 47	Last Seen
T_Mannequin_ALB	BP_ThirdPersonCharacte	2D	NO	4,096x4,096	4,096x4,096	PF DXT5	World	0	21,888 KB	21,888 KB	1	70.479 s
T_Armors_NOR	BP_ThirdPersonCharacte	2D	NO	4,096x4,096	4,096x4,096	PF BC5	WorldNormalMap	0	21,888 KB	21,888 KB	1	70.479 s
T_Mannequin_NOR	BP_ThirdPersonCharacte	2D	NO	4,096x4,096	4,096x4,096	PF BC5	WorldNormalMap	0	21,888 KB	21,888 KB	1	70.479 s
HDRI_Epic_Courtyard_Da	SkyLight_0	Cube	NO	512x512	512x512	PF Float RGBA	World	0	16,448 KB	16,448 KB	1	? s
T_Part1_EMI	BP_ThirdPersonCharacte	2D	NO	4,096x4,096	4,096x4,096	PF DXT1	World	0	10,944 KB	10,944 KB	1	70.479 s
T_Mannequin_DET	BP_ThirdPersonCharacte	2D	NO	4,096x4,096	4,096x4,096	PF DXT1	World	0	10,944 KB	10,944 KB	1	70.479 s
T_Armors_ALB	BP_ThirdPersonCharacte	2D	NO	4,096x4,096	4,096x4,096	PF DXT1	World	0	10,944 KB	10,944 KB	1	70.479 s
T_Part3_DET	BP_ThirdPersonCharacte	2D	NO	4,096x4,096	4,096x4,096	PF DXT1	World	0	10,944 KB	10,944 KB	1	70.479 s
T_Armors_DET	BP_ThirdPersonCharacte	2D	NO	4,096x4,096	4,096x4,096	PF DXT1	World	0	10,944 KB	10,944 KB	1	70.479 s
T_Mannequin_EMI	BP_ThirdPersonCharacte	2D	NO	4,096x4,096	4,096x4,096	PF DXT1	World	0	10,944 KB	10,944 KB	1	70.479 s
T_Part2_NOR	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF BC5	WorldNormalMap	0	5,504 KB	5,504 KB	1	70.479 s
T_Part3_NOR	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF BC5	WorldNormalMap	0	5,504 KB	5,504 KB	1	70.479 s
T_Part1_NOR	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF BC5	WorldNormalMap	0	5,504 KB	5,504 KB	1	70.479 s
T_Part1_ALB	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	70.479 s
T_Part2_EMI	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	70.479 s
T_Part3_ALB	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	70.479 s
T_Part2_DET	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	70.479 s
T_Sky_Blue	StaticMeshActor_UAID_A	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	Skybox	0	2,752 KB	2,752 KB	1	? s
T_Part1_DET	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	70.479 s
T_Part2_ALB	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	70.479 s
T_HexMask	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	? s
T_Sky_Clouds_M	StaticMeshActor_UAID_A	2D	NO	512x256	512x256	PF B8G8R8A8	Skybox	2	704 KB	704 KB	1	? s
T_Hexagon	BP_ThirdPersonCharacte	2D	NO	1,024x1,024	1,024x1,024	PF DXT1	World	0	704 KB	704 KB	1	? s
T_Default_Material_Grid_I	Brush_0	2D	NO	512x512	512x512	PF DXT5	World	0	384 KB	384 KB	1	? s
S_LightDirectionalMove	DirectionalLight_1	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	1	863.004 s
S_ExpoHeightFog	ExponentialHeightFog_0	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	1	? s
SkyLight	SkyLight_0	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	1	? s
S_LightPointMove	5 Actors	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	5	863.004 s
S_LightPoint	5 Actors	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	5	? s
S_LightDirectional	DirectionalLight_1	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	1	? s
S_SkyAtmosphere	SkyAtmosphere_0	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	1	? s
EmptyActor	Actor_UAID_5811220C8A	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	1	? s
T_GridChecker_A	5 Actors	2D	NO	512x512	512x512	PF DXT1	World	0	192 KB	192 KB	5	? s
T_Sky_Stars	StaticMeshActor_UAID_A	2D	NO	512x512	512x512	PF DXT1	Skybox	0	192 KB	192 KB	1	? s
T_Default_Material_Grid_I	Brush_0	2D	NO	256x256	256x256	PF BC5	WorldNormalMap	0	88 KB	88 KB	1	? s



Name	Actor(s)	Type	Virtual	Max Dimension	Current Dimension	Format	Group	LODBias	Current Memory 93,336 KB	Fully Loaded Memory 93,336 KB	Uses 47	Last Seen
HDRI_Epic_Courtyard_Da	SkyLight_0	Cube	NO	512x512	512x512	PF Float RGBA	World	0	16,448 KB	16,448 KB	1	? s
T_Part2_NOR	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF BC5	WorldNormalMap	0	5,504 KB	5,504 KB	1	122.199 s
T_Part1_NOR	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF BC5	WorldNormalMap	0	5,504 KB	5,504 KB	1	50.637 s
T_Armors_NOR	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF BC5	WorldNormalMap	0	5,504 KB	5,504 KB	1	74.6 s
T_Mannequin_ALB	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT5	World	0	5,504 KB	5,504 KB	1	74.631 s
T_Mannequin_NOR	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF BC5	WorldNormalMap	0	5,504 KB	5,504 KB	1	50.793 s
T_Part3_NOR	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF BC5	WorldNormalMap	0	5,504 KB	5,504 KB	1	50.821 s
T_Part1_ALB	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	50.739 s
T_Part2_ALB	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	3.846 s
T_Part2_DET	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	3.859 s
T_Part1_EMI	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	50.69 s
T_Mannequin_EMI	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	303.004 s
T_Sky_Blue	StaticMeshActor_UAID_A	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	Skybox	0	2,752 KB	2,752 KB	1	? s
T_Mannequin_DET	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	34.455 s
T_Part3_ALB	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	32.266 s
T_Part1_DET	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	50.713 s
T_Part2_EMI	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	3.91 s
T_Armors_ALB	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	3.795 s
T_Armors_DET	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	4.674 s
T_HexMask	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	? s
T_Part3_DET	BP_ThirdPersonCharacte	2D	NO	2,048x2,048	2,048x2,048	PF DXT1	World	0	2,752 KB	2,752 KB	1	6.11 s
T_Sky_Clouds_M	StaticMeshActor_UAID_A	2D	NO	512x256	512x256	PF B8G8R8A8	Skybox	2	704 KB	704 KB	1	? s
T_Hexagon	BP_ThirdPersonCharacte	2D	NO	1,024x1,024	1,024x1,024	PF DXT1	World	0	704 KB	704 KB	1	? s
S_LightPoint	5 Actors	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	5	? s
S_LightPointMove	5 Actors	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	5	2.939 s
S_ExpoHeightFog	ExponentialHeightFog_0	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	1	? s
S_LightDirectional	DirectionalLight_1	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	1	? s
T_Default_Material_Grid_I	Brush_0	2D	NO	512x512	512x512	PF DXT5	World	0	384 KB	384 KB	1	? s
S_LightDirectionalMove	DirectionalLight_1	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	1	2.939 s
EmptyActor	Actor_UAID_5811220C8A	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	1	? s
S_SkyAtmosphere	SkyAtmosphere_0	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	1	? s
SkyLight	SkyLight_0	2D	NO	256x256	256x256	PF B8G8R8A8	UI	0	384 KB	384 KB	1	? s
T_GridChecker_A	5 Actors	2D	NO	512x512	512x512	PF DXT1	World	0	192 KB	192 KB	5	? s
T_Sky_Stars	StaticMeshActor_UAID_A	2D	NO	512x512	512x512	PF DXT1	Skybox	0	192 KB	192 KB	1	? s
T_Default_Material_Grid_I	Brush_0	2D	NO	256x256	256x256	PF BC5	WorldNormalMap	0	88 KB	88 KB	1	? s

My shader complexity and quad overdraw performance well.


Perspective
Shader Complexity
Show
10
10°
0.25
1
0
MaxShaderComplexityCount=2000
PS
VS
Good
Bad
Extremely bad


Perspective
Quad Overdraw
Show
10
10°
0.25
1
0
1
2
3
4
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6
7
8
9
10
OD

CONCLUSION

MASTERY PILLAR 1 - RETROSPECTIVE

What Went Well

I successfully navigated the pipeline of character concept creation, which significantly enhanced my ability to develop character concepts.
The coloration of the character was effectively executed.
The rendering of the front art achieved my highest quality to date.
The composition of the concept sheet was well-executed.

What Went Wrong

The mechanical structure of the character was not entirely logical.
The armor transformation process was not demonstrated clearly.

What Was Learned and Even Better If…

Conceptualizing a sci-fi character for the first time provided valuable experience.
I improved my skills in color and shape composition.
Future projects could benefit from a complete rendering of the armor transformation process to enhance the quality of the concept sheet.

MASTERY PILLAR 2 - RETROSPECTIVE

What Went Well

I discovered an effective method for rigging complex characters in two parts.
I identified a solution for merging two parts of characters seamlessly.

What Went Wrong

Excessive time spent on modeling reduced the time available for addressing combination issues and refining animations.
I need to consult with experts more frequently to discover time-efficient solutions for troubleshooting.

What Was Learned and Even Better If…

I acquired numerous valuable techniques for advanced rigging, including setting key drives and adding attributes.

A professional rigging artist should maintain an organized and properly named rigging layer in software to prevent import issues into game engines.

Identifying issues earlier would allow more time for polishing animations.

MASTERY PILLAR 3 - RETROSPECTIVE

What Went Well

I resolved all VFX issues based on feedback.
The VFX results appropriately reflected the characteristics of the sci-fi character.

What Went Wrong

A feature was removed from the VFX plan due to changes in presentation strategy.

What Was Learned and Even Better If…

Learning the Niagara system was extremely beneficial for acquiring Unreal experience.
Achieving the omitted impact feature could have enhanced the representational quality.

ARTIFACT - RETROSPECTIVE

What Went Well

The overall quality of the final output was satisfactory.
Most of the planned functions were successfully implemented.

What Went Wrong

The project timeline was poorly managed, particularly at the Alpha milestone.

It was regrettable that a planned feature was cancelled.

What Was Learned and Even Better If…

I gained invaluable experience as a character artist.
Better time management could lead to a more refined final product.

WHY IS THIS MASTERY

This project illustrates my mastery in several key areas of interactive art development. Firstly, I've demonstrated mastery in concept design by creating a multi-limbed character with fully transformable armor, showcasing my ability to merge complexity with functionality. Secondly, my skills in rigging are evident in the intricate setup of a Sci-Fi character's transformable armor and multiple limbs, highlighting my technical proficiency in handling complex structures. Lastly, I have shown mastery in visual effects by developing VFX that seamlessly align with the character's unique traits, enhancing the overall aesthetic and narrative coherence.

Throughout this thesis, I have navigated the comprehensive process of character development, gaining crucial insights into both successes and missteps. The key lessons learned from the errors encountered during production have become invaluable, equipping me with the knowledge to circumvent similar issues in my future endeavors in the field.

PERSONAL GROWTH

Throughout my journey as an Interactive Art Developer, I've seen significant improvement in technical skills, creativity, and project management.

Technical Proficiency and Creative Expansion

I have honed my technical abilities by working on complex character concepts and learning advanced rendering and color composition. Designing sci-fi characters pushed my creative boundaries, enhancing both my technical skills and artistic vision.

Problem-Solving and Innovation

Handling mechanical structures and armor transformations has improved my problem-solving skills. Each project introduced new challenges, pushing me to think critically and creatively to find effective solutions.

Professionalism and Project Management

Managing project timelines and resources has been a key area of growth. Experiences with scheduling conflicts and feature cancellations have taught me the importance of effective project management to ensure smoother execution and higher quality outcomes.

Continuous Learning and Future Aspirations

My role has been a continuous learning experience, from mastering the Niagara system in Unreal to advanced rigging techniques. I aim to use these skills to tackle more complex projects and elevate the quality of my work in the future.

ADDITIONAL DOCUMENTS

Thesis "Egyptian Spider Character" - Asset Development List

	Date Added	Priority	Prototype - Proxies	Vertical Slice	Alpha	Beta - Optimization	RTM - Final
Priority One Assets							
Character Modeling							
Proxy of character's mannequin	9.2023	1	✓				
Proxy of character's spider body	9.2023	1	✓				
Proxy of character's Armor	8.2023	1	✓				
Mannequin highpoly of character	1.2024	1			✓		
Spider body highpoly of character	1.2024	1			✓		
Armor highpoly of character	10.2023	1		✓			
Mannequin lowpoly of character	2.2024	1			✓		
Spider body lowpoly of character	2.2024	1			✓		
Armor lowpoly of character	11.2023	1		✓			
Uwarped UV	11.2023	1		✓			
Character Concepting		1	✓				
Thumbnail sheet of character	7.2023	1		✓			
Front concet picture of character	8.2023	1		✓			
Line draft of transformation process of the character's armor	9.2023	1					
Advanced Rigging							
Skeleton system of character's body	9.2023	1			✓		
Skeleton system of character's armor	10.2023	1		✓			
Skined Lowpoly	11.2023	1		✓			
Dynamic VFX							
VFX proxy	9.2023	1		✓			
VFX material	10.2023	1		✓			
Refined VFX		1			✓		
Priority Two Assets							
Character Modeling		2					
Armor materials	11.2023	2		✓			
Body materials of character	2.2024	2			✓		
Textures	11.2023	2		✓			
Character Concepting		2					
Back view of character concept	9.23	2	✓				
Advanced Rigging		2					
Controllors for character's armor	10.2023			✓			
Controllors for character's body	10.2023	2			✓		
		2					
		2					
		2					

Legend
✓
n/a
x
?

Priority 3							
Character Concepting		3					
Facial expressions' concept sheet	9.2023	3	✓				
		3					
		3					
Advanced Rigging							
Morph target for character's face	1.2024	3			✓		
		3					
		3					
		3					
Priority 4							
Character Concepting							
Composition of the character sheet.	3.2024	4				✓	
Sky							
Display stage for the final rendereing	2.2024	4			✓		
		4					
Portfolio							
Renders							
Concept comaprison shot	3.2024					✓	
Proof of modulairty shot	3.2024					✓	
Beauty Shots	3.2024					✓	
* Breakdown / method shot → only show if asked by a high end company	3.2024					✓	
Video / Exe.							
Website							

THESIS I PRE-PRODUCTION – SCHEDULE

WEEK	TASKS / HOURS / JOURNAL
1	This is where your detailed entries and images go. Remember to credit the images and references in line. Mock proposal, collecting references. -2 hours Summary My own ability of mastery. – 12 hours Re –enter here per chosen mastery. Character concept. Hard surface modeling. Character modeling Character animation
2	Re –enter here per chosen mastery. Character concept Hard surface modeling Advanced rigging Character animation Environment concept Hyper modularity Creature rigging/animation. Realism character

	Create slides of art crafts. -12 hours
3	Re –enter here per chosen mastery. Character concept Advanced rigging Transformation Environment concept Hyper modularity VFX Static materials Static atmosphere Write journals. 12hour
4	MIDTERM PRESENTATION Re –enter here per chosen mastery. Character concept Transformation VFX Create final decided slide and summarizing mastery topics. - 12 hours
5	All new continuing research and development from here forward. Summarize methods I am going to use in the artifact. – 12 hours
6	Collect tutorial videos for transformation and VFX. Summarize concept workflows of different artists. – 6 hours Summarize methods I am going to use in the artifact. – 2 hours
7	Constructing world view and colleting references, making concept prototype. - 8 hours Watch tutorials of VFX and start to make proxy VFX- 6 hours Writing journals. – 3 hours Creating armor proxy models. – 2 hours
8	Keep making proxy of thumbnails and VFX. 10 hours Fix issues of journal. – 4 hours Writing ADL. – 2 hours

9	FINAL THESIS I MASTERY ARTIFACT PLAN AND SCHEDULE PRESENTATION

THESIS II PRODUCTION - SCHEDULE

WEEK	TASKS / HOURS / JOURNAL
1	Fix issues of the front view original art of character with advisor's feedback. - 12 hours Start to build transform armor's proxy. – 6 hours Creating iterations based on previous silhouette. – 3 hours Exploring new silhouettes based on one new draft. – 3 hours Refine details of origin art. – 8 hours Refine armor pieces draft. – 6 hours
2	Fix issues of the front view original art of character with advisor's feedback. - 12 hours Keep on building transform armor's proxy. – 6 hours Keeping refined origin art details, focusing on spider mech. -8 hours Keeping refined armor and mannequin details, both front and back views. – 8 hours Researching how armors goanna transform. – 2 hours
3	Fix issues of the front view original art of character with advisor's feedback. - 12 hours Keep on building transform armor's proxy. – 6 hours Refine line draft of concept of transform armor. -6 hours Refine transform process concept. – 2 hours Refine original art of character. -6 hours Create mannequin mesh. - 5 hours Create torso armor proxy. – 2 hours
4	Finishing the front view original art of character. - 4 hours Refine the back view draft line of the character and color it. - 4 hours Refine the line draft of transformation process of the character's armor. – 8 hours Finishing facial expressions' concept sheet. 4 hours Creating gray scale for origin art of character. - 8 hours Create different color schemes for investigation. – 6 hours
5	Start to build proxy of the character's body. – 6 hours Build basic skeleton for the character's body. –4 hours

	Making VFX proxy. – 12 hours Creating gray scale for origin art of character. - 6 hours Create different color schemes for investigation. – 6 hours Rigging the fan blades on character's arm. – 4 hours
6	Rigging the transform armor proxy. – 12 hours Apply VFX to the proxy – 4 hours. Research for rigging tutorials. – 4 hours Rigging the headset of character. – 4 hours Rigging the rib armor of character. – 6 hours Rigging the plastron armors of character. – 1 hours Rigging the big pieces armor of character. – 1 hours
7	Prototype - MIDTERM PRESENTATION – TBD Fix issues according to feedback. - 16 hours Fix rigging issues. - 2 hours Analyze data from color scheme research and choose the best scheme. - 4 hours Refine color scheme and summarize idea of color. - 8 hours
8	Refine the skeleton of character's bust armor. – 18 hours Build spider mech proxy (main body) – 6 hours. Build spider mech proxy (Legs) – 4 hours. Build spider mech proxy (Tail part) – 2 hours. Refine gray scale and color scheme of character. - 8 hours
9	Start to build high res of character's armor. 18 hours Learning and trying to build a bullet blueprint that can recognize different surfaces. - 8 hours. Making a circle impact material and making it to a Niagara VFX. – 2 hours Making a black hole material that can be changed in instance panel. (For attacking VFX). - 1 hour. Build a flipbook VFX of electricity. - 3 hours. Apply VFXs to bullet impact blueprint. – 1 hour
10	Keep on building high- res of character's armor. 18 hours Build helmet mid poly model. -8 hours. Build spine mid poly model. - 2 hours.

	Build hand mid poly model. - 4 hours. Build armor pieces mid poly model. - 2 hours.
11	State of the Vertical Slice Start to make game res for the character's armor – 21 hours. Start to build interior mannequin. - 10 hours Explore method of making hard surface objects in ZBrush and Topo gun. -10 hours
12	Rigging the game-res armor and adding controller to it. – 16 hours Refine the VFX of the armor- 6 hours. Refine interior mannequin. - 12 hours Build tail skeleton and controllers. – 5 hours Build blackhole beam in UE5.- 6 hours
13	Critical Reviews Fix issues according to feedback. – 5 hours Creating basic materials to the character's armor by substance painter. - 10 hours Build low poly mesh in topo gun. – 12 hours Bake test for low mesh. 2- hours Build skeleton for spider mech. 5 hours. Constraint skeleton to spider mech mesh. - 5 hours
14	Refine Skeleton system of armor. – 10 hours Refine VFX system of armor. – 10 hours Unwarping and packing UVs of mannequin. - 4 hours Bake high poly mesh of mannequin to low poly mesh. – 10 hours Making materials to low poly mesh of mannequin. - 6 hours
15	Refine materials of the armor. – 10 hours Create a showcase level and animation to present the armor. 10 hours Using Advanced Skeleton to build mannequin skeleton and skin tit to mannequin mesh. - 12 hours Import bones from armor prototype and adjust them to low poly armor. – 8 hours Combine bones and controllers of armors and mannequin together and fix issues. – 6 hours Making demo animations for my character. - 4 hours Fixing issues in Unreal. – 6 hours

	Writing documents. – 4 hours.
16	Vertical Slice - FINAL – PRESENTATION Fix issues according to feedback from vertical slice. – 16 hours

THESIS III PRODUCTION - SCHEDULE

WEEK	TASKS / HOURS / JOURNAL
1	Refine the front art of character. – 6 hours Build template for the front art. – 3 hours Start to making high-ploy of spider mech.- 6 hours Start to making smash ground VFX. - 4 hours Organizing documentation, writing documentations. – 2 hours Refine the front art of character. – 6 hours Build template for the front art. – 3 hours Start to making high-ploy of spider mech.- 6 hours
2	Refine the template for the front art. – 3 hours Keep making high-ploy of spider mech.-10 hours Refining smash ground VFX. - 4 hours Refine the template for the front art. – 8 hours Keep making high-ploy of spider mech.-10 hours
3	Coloring the concept art of mannequin. – 4 hours. Keep making high-ploy of spider mech.-10 hours Start to build VFX blueprint. - 8 hours Keep making high-ploy of spider mech.-16 hours
4	Keep making high-ploy of spider mech.-8 hours Re-topo the mech. - 8 hours Keep building VFX blueprint. - 8 hours Keep making high-ploy of spider mech.-8 hours Re-topo the mech. - 8 hours
5	Unwarp the whole spider mech. – 10 hours Making textures for the mech. – 10 hours

	Unwarp the whole spider mech. – 10 hours Making textures for the mech. – 10 hours
6	Finishing textures. – 6 hours Apply proxy bones to the low poly mesh. – 6 hours Matching proxy rigging with new ploy mesh. - 10 hours Finishing textures. – 6 hours
7	Writing PPT for Alpha presentation. - 6 hours Organizing documentation, writing documentations. – 6 hours Attaching mannequin with mech rig. - 18 hours
8	ALPHA - MIDTERM PRESENTATION – TBD Fix issues according to feedback. – 16 hours Rerig mannequin and attach it with mech and test it in unreal. – 16 hours Making new blueprint of blackhole VFX. - 10 hours
9	Organizing documentation, writing documentations. – 6 hours Making portfolio render pieces of the project. - 4 hours Fix issues of concepting according to feedback. – 6 hours Rerigging mannequin parts. – 8 hours Rerigging mech parts. – 8 hours Polish materials. - 8 hours
10	Organizing documentation, writing documentations. – 6 hours Making portfolio render pieces of the project. - 4 hours Fix issues of rigging according to feedback. – 6 hours Rerigging mannequin parts. – 8 hours Rerigging mech parts. – 8 hours Build VFX system of black hole from charging to launch and attach it to default gun for demo. – 8 hours. – 8 hours
11	Organizing documentation, writing documentations. – 6 hours Making portfolio render pieces of the project. - 4 hours Fix issues of VFX according to feedback. – 6 hours
12	Organizing documentation, writing documentations. – 6 hours Making portfolio render pieces of the project. - 4 hours

	Fix issues according to feedback. – 6 hours Making 3 animations for character. – 8 hours Build blueprint to trigger animations and VFX. -12 hours
13	Evaluation for Defense Make old walking animation to new rigging model. – 8 hours Making new unreal present scene. – 4 hours Import walking animation in unreal. – 1 hour Adjusting VFX timeline. – 1 hour Making material instance and adding its variation to character animation BP.- 2 hours
14	*RTM - PRESENTATION
15	DEFENSES CAN BEGIN
16	

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