HOW TO TOON SHADER

by Sunshine Nguyen

First let's get to know the Toon shader in Maya Autodesk. 🙂

The AiToon Shader, or Toon Shader, is an Arnold-based shader designed to render 3D objects with a flat, ramped, or illustrated aesthetic. This shader is ideally suited for achieving a cartoon, 2D, anime, or illustration-based visual style. The Toon Shader is also recognized for its edge detection capability, which provides a stylized outline to objects.

“I was using Aitoon Shader for my Sit Stand character Valentina. It is a blast to play with. I found a way to render the object and the outline separately so it is easier to composite in Nuke.”

Turn around video of Sit Stand character: LINK





PROS and CONS of AiToon Shader

PROS:

- Rendering take less time in the renderfarm (No SSS, Specular, Transmission)
- Also Render will have less noise to deal with.
- Illustration/ stylized/ texture friendly.
- **ONLY need 2 maps hooking up from Substance Painter to Maya : Base Color, Normal.**
- Highly customizable shader to play with.
- Giving a custom outline of the subject.

CONS

- May need a good understanding of color theory and acknowledge how light bounces on the subject, especially on living things' skin.
- **Always have two rig models for animation with AiStandardSurface and AiToon Shader side by side. AiToon shader needs an Arnold renderer to show the textures compared to regular AiStandardSurface shader while working in Maya file. (not good while animating)**
- Too many customized buttons to go through.
- **It needs to render twice for render layers as well as comping in Nuke. (Maybe)**
- There is no SSS (sub surface scattering) physically on the shader, so we have to fake it by using aiRampRGB or custom rim light.

Texturing tips and tricks for Photoshop and Substance painter

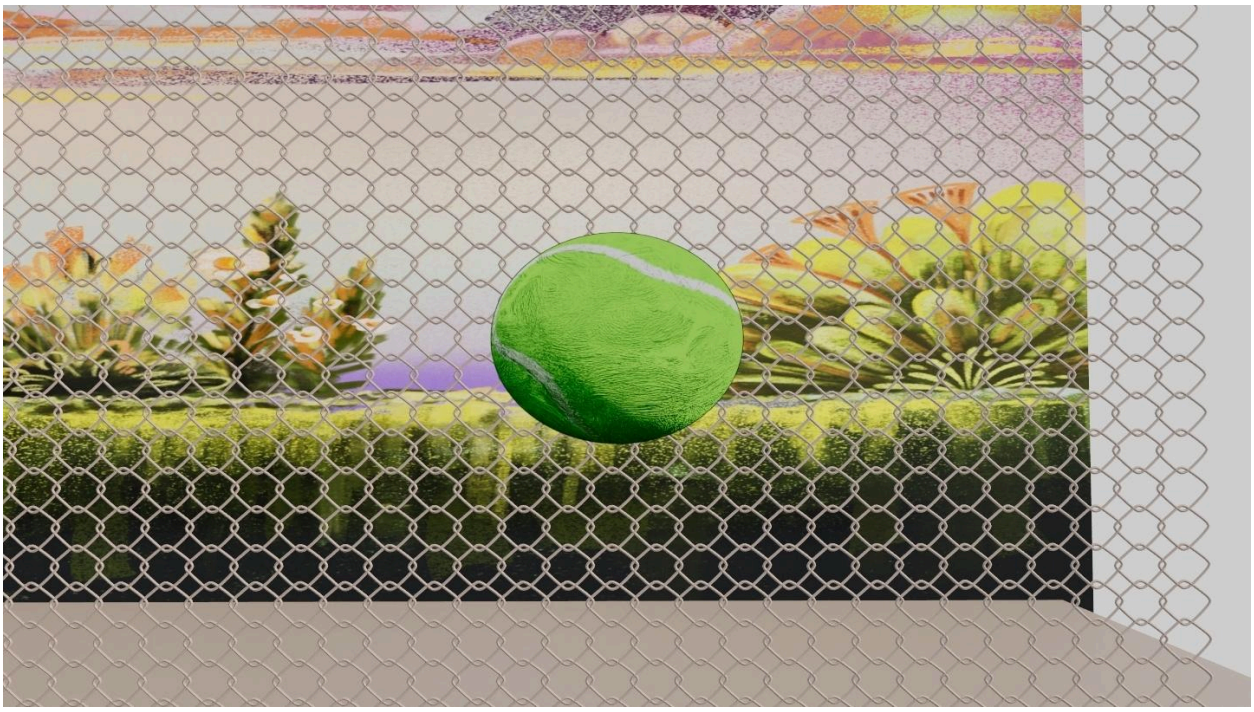
Photoshop:

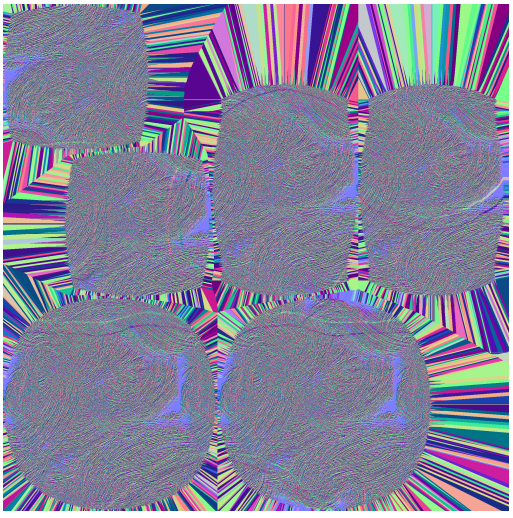
- After export UVs tiles out to texture from Maya, make sure the file is either under PNG or TIFF so that the textures have higher resolution on the 3D model.
- When painting in Photoshop, try to keep track of the color placement while painting because it is way harder to mirror texture in Photoshop.
- Limit using low resolution brushes or faded textured brushes because AiToon Shader will have a hard time showing the color if it is too faded.
- Photoshop is awesome with completely flat textures but not great with bumps/height details without normal maps baking in.
- In Photoshop, I highly recommend painting in the highlight as well as the shadow of the object, so when plug back into Maya the AiRampRGB will help bring out the color more lively.

Substance:

- Before importing the FBX file into Substance Painter, make sure the UVs lay out nice and flat with relatively good size tiles for important areas on the 3D model.
- Always great to turn on the mirror so you don't have to take too much time on texturing.
- Bake the model, I highly recommend having Ambient Inclusion, Normal, Height Map turned on so we can use it for nice textures.
- Sunshine's tip for good texturing without much work for a slight hint of shadow that always creates a fill layer on the top, drag and drop Ambient Inclusion into Base Color. Then turn the layer into Multiply, then adjust opacity accordingly to your likings.
- If you want your character to look a little bit more lively, I highly suggest putting heavy blushes on these areas: face cheeks, tip of the nose, chin, elbows, knees, fingers knuckles and tips, toes too, and the glutes.

- If you want textures that look physical to touch, texturing with Height map then exporting it out as a Normal map NOT as Height map.



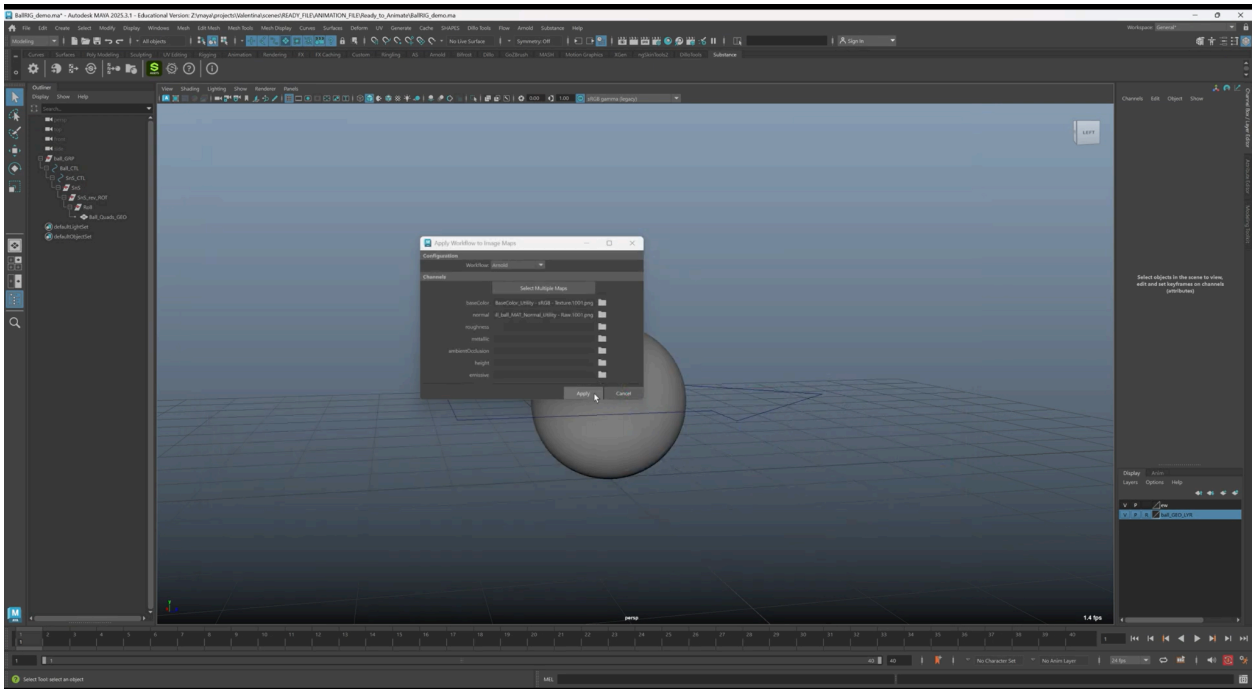


Normal Map *Base Color Map*

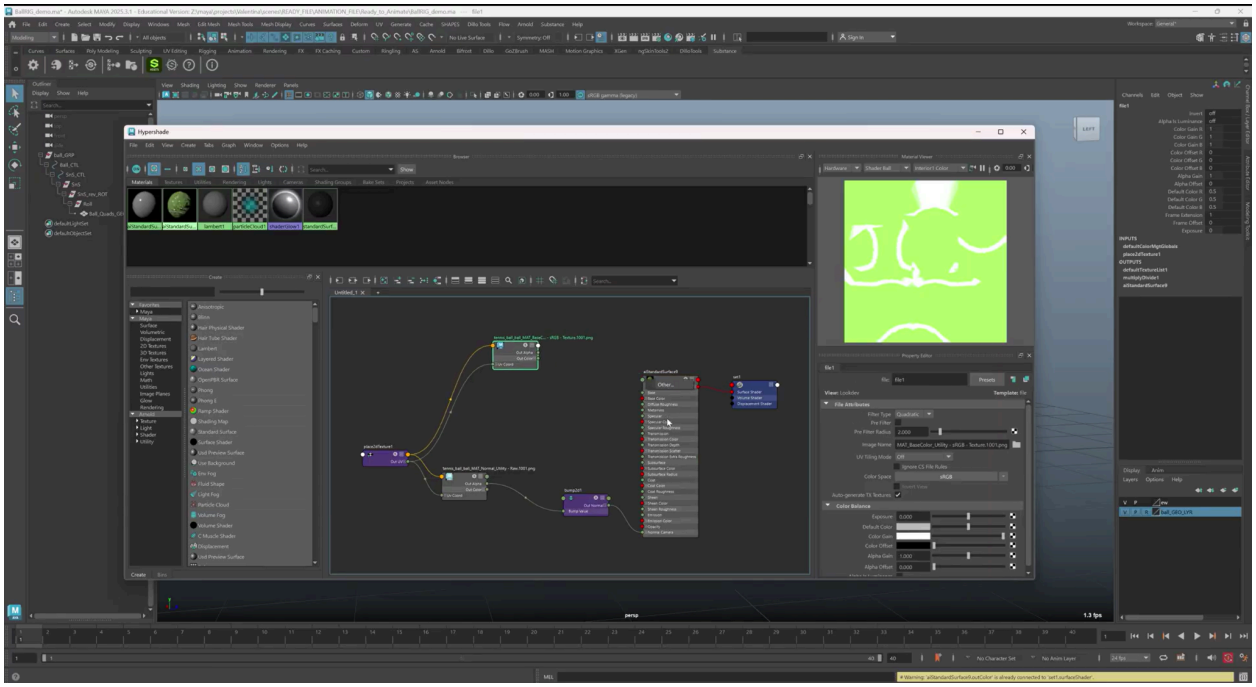
“That is my tennis ball with only Base Color and Normal map inside Maya. It looks nice and crisp 🤗”

How to hooking up texture from Substance Painter

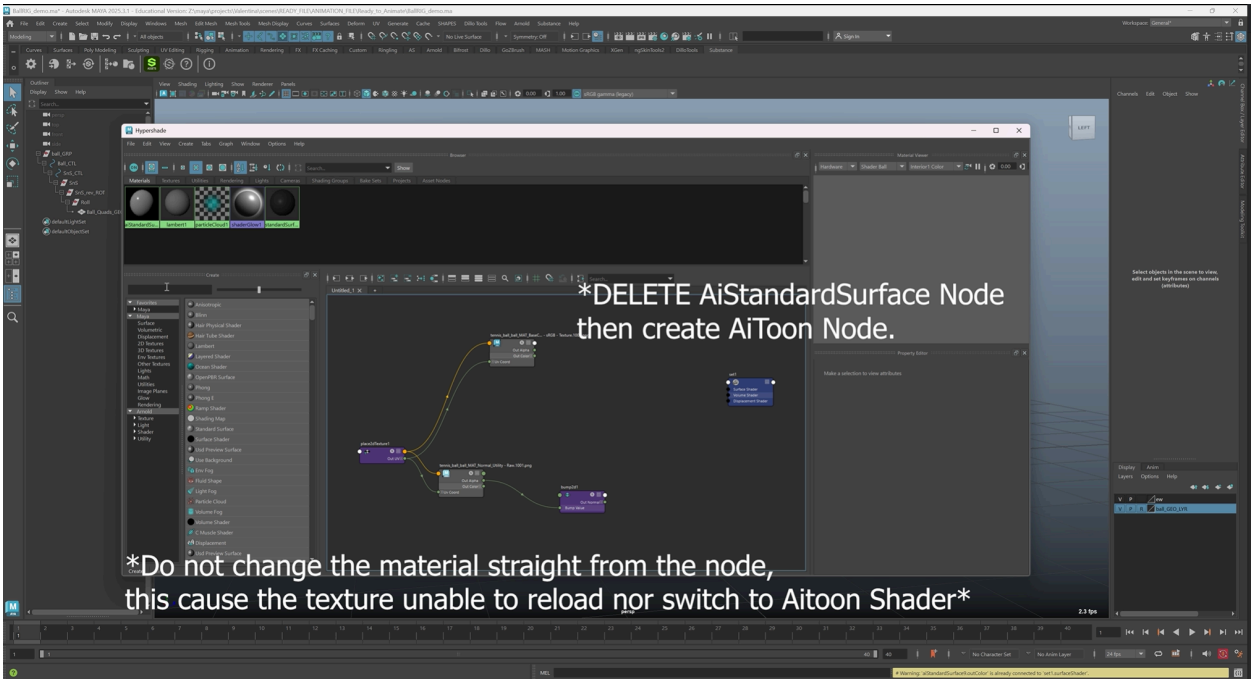
DEMO -> link to Demo video (not gonna lie, watch the video is faster)

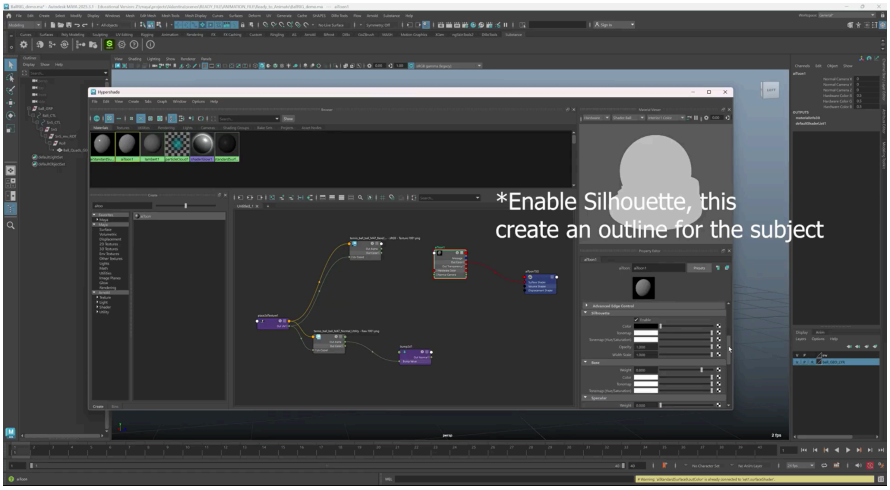


1. Batch import from Substance tab.
2. Select Substance texture maps, Base Color and Normal map.
3. It will come in as AiStandardSurface, so we need to change that.
4. Open Hypershade.



5. Delete AiStandardSurface Node then create AiToon shader by searching in the shader tab on the left side of the hypershade screen or CTRL + F.
(By doing this to ensure no shader confusion in Maya, Aitoon Shader is quite sensitive when switching from AiStandardSurface.)*

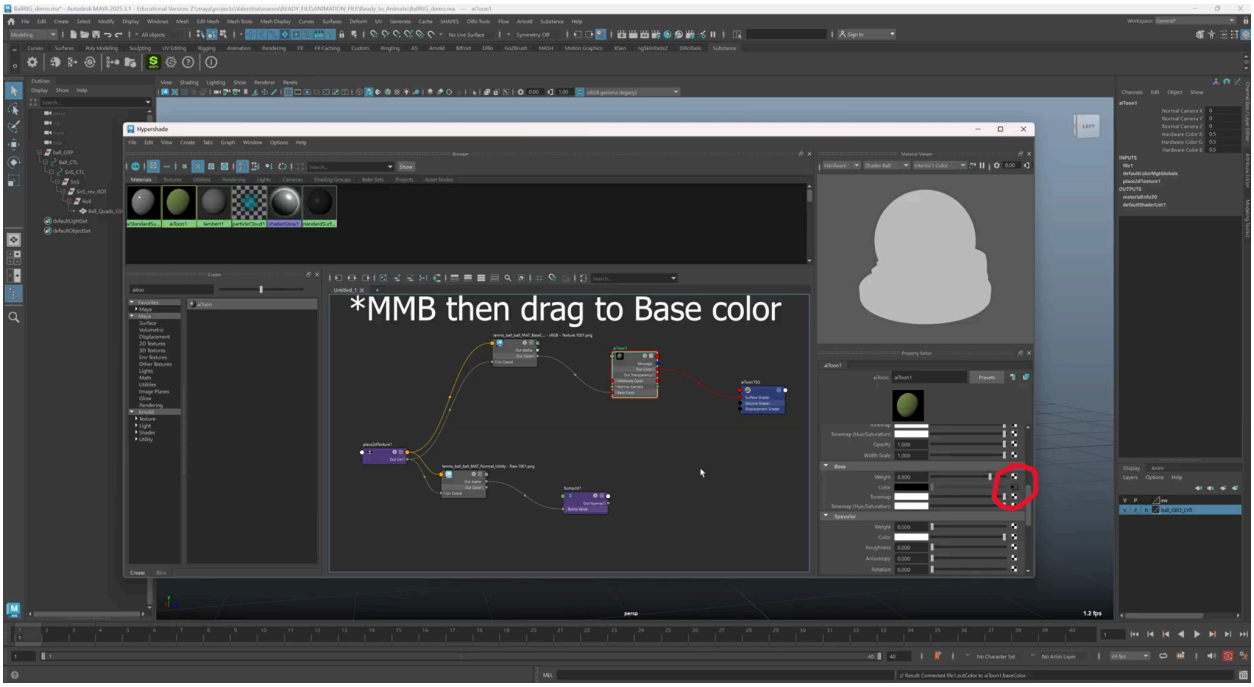




BONUS: If you want to have an outline for your mesh or object, enable silhouette in AiToon shader node or edge (requires contour filter)

6. Then we can start remapping the AiToon Shader node :)

7. Stay on AiToon shader, MMB imported base color and drag it to checker board of Color



8. Map the normal map back into Normal Camera.

9. Select the GEO, then Right mouse click assign material -> assign exist material -> choose the material.

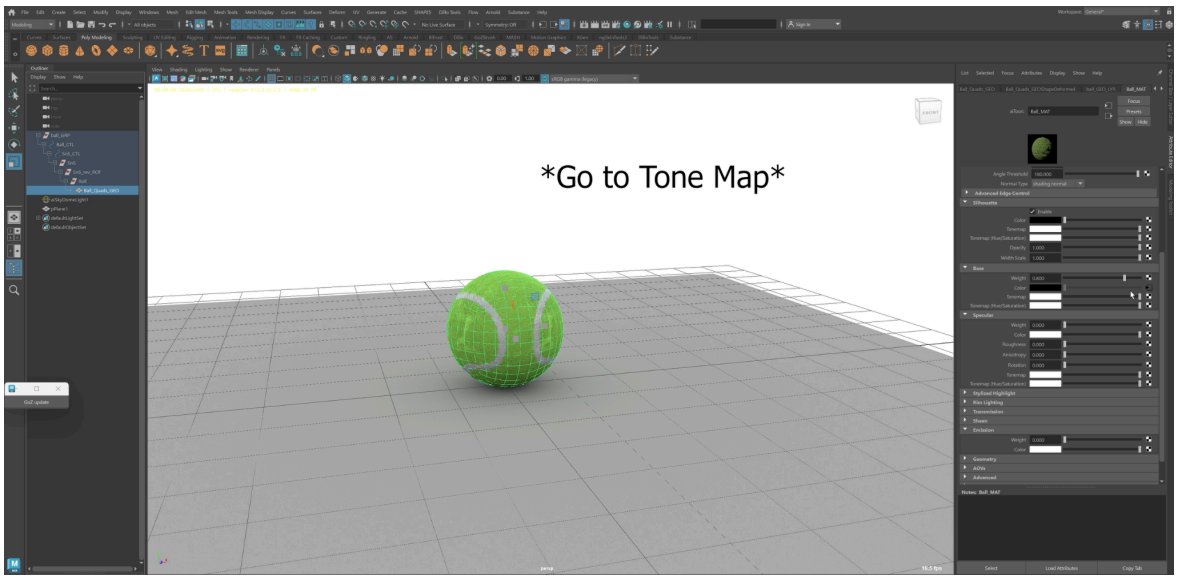
Important Notes: AIToon Shader textures will not show in Maya viewport, it will only show gray. You have to turn on Arnold render to see the textures. This is the reason why I suggest having an AiStandardSurface texture on the side so you can switch out during animation then switching back to AiToon Shader for rendering.

Custom Shadow in AiToon Shader

- *Since AiToon Shader doesn't have SSS, faking it is the only way.(applied to living things)*
- *AiRampRGB and custom rim light will help with this process.*

DEMO 2 - link to Demo video - Silhouette is another way to detect edge in Maya (not really need it, but I like it better for animation)

1. Create SkyDome Light, then reduce max bounces around 5 ~ 10
2. Turn on Arnold Renderer, you can choose between the clip board with an eye or under Renderer -> Arnold.
3. Make a ground Plane, this will help the light bounce as well as showing the custom Shadow better.



4. Go to Tone Map, click on the checker board.
5. Search AiRampRGB, it is under Utility.
6. From here, you can just have fun with the ramp itself. (Choose at least 2 to 3 colors)
7. Create an Area Light or Directional Light to see the shadow clearer.

LINEAR RAMP



** I usually like my ramp in Linear or None, combination of both works just fine**

NONE RAMP



Custom Edge/ Outline

DEMO 3 - link to Demo video (the demo will not show how to do gradient or un-uniform outline)

1. Turn on contour filter in render setting -> Arnold Renderer -> Filter -> Type -> Contour.
2. To adjust thickness of the contour line -> Width -> anything number you like (I usually go for 0.5 - 2).
3. You can adjust the color of the outline in the Material Attribute Editor under the Color of Edge tab or Silhouette tab - or just go to Hypershade.
4. If you want to turn off the edge or contour line for specific Mesh/ GEO -> Edge -> uncheck Edge (requires contour filter) or Silhouette.

*If you want a gradient or a fancier outline, there are multiple options to choose from, just know that the contour line will always correspond with your mesh/GEO UVs. *

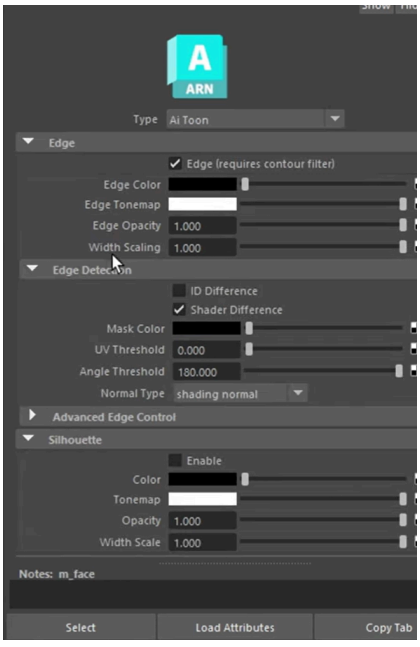
Gradient edge (heavily depend on your UVs)

My character has a custom gradient outline on her shirt as well as on her skirt

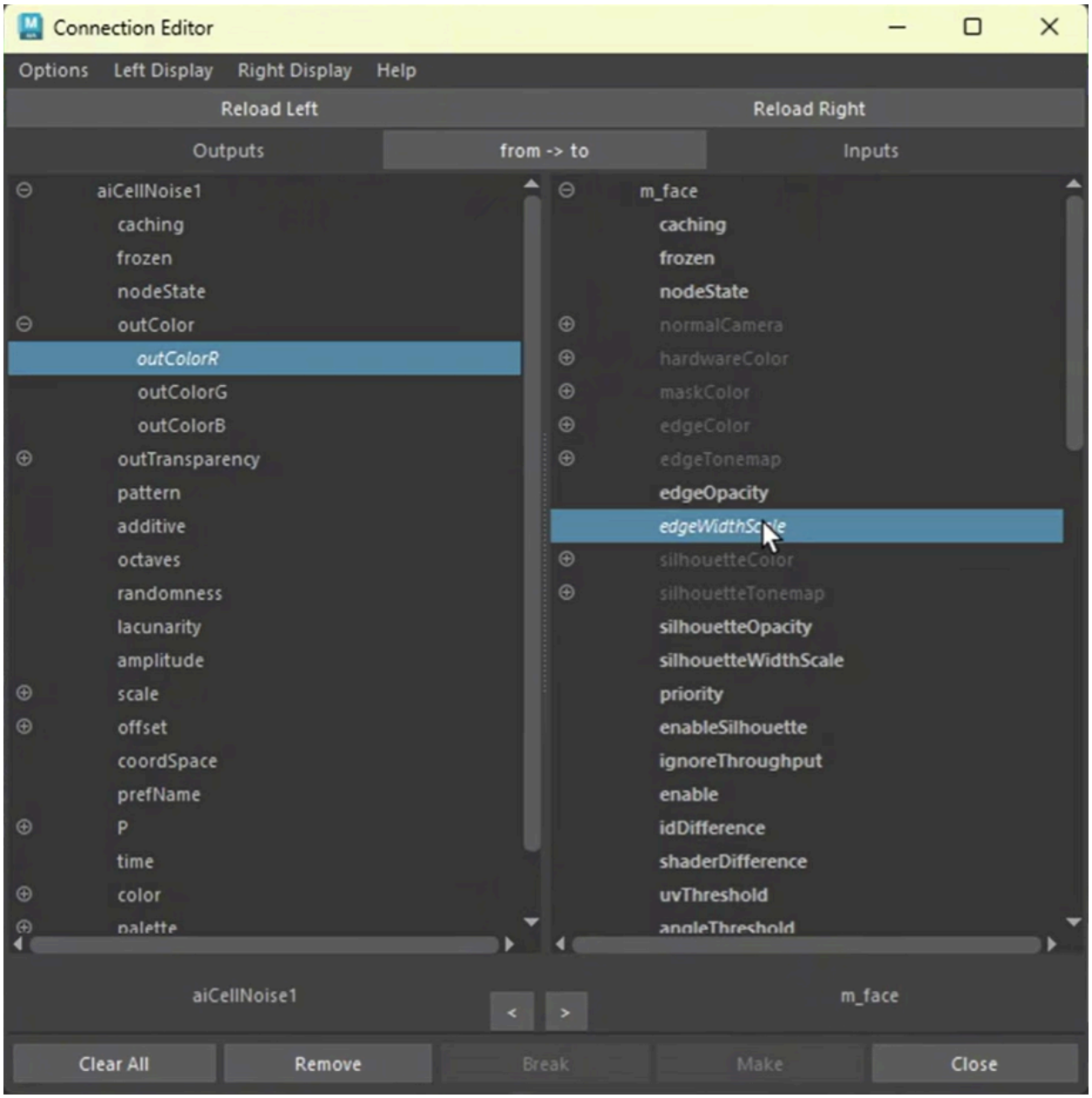


1. Go to Hypershade or Attribute Editor, select the material you want to adjust.
2. go to Edge color -> click on the checker board-> use either Ramp or AiRampRGB.
3. Then just have fun :) - don't over-complicate colors especially for rendering.

Un-uniform edge or hand drawn edge [advance] - (not the best showing up with contour filter 1 and down)



1. Go to Hypershade, select the material that you want to adjust.
2. Search for AiCellNoise, it will create a visible node for you next to your material.
3. MMB drag AiCellNoise node to the material you want to adjust under Width Scaling/Scaling under Edge tab.
4. There will be a table showing Outputs and Inputs or Connection Editor.
5. Go to Outputs side -> outColor -> OutColorR -> Inputs side -> EdgewidthScale
6. You can adjust and tweak the noise to fit with your likings.


Connection Editor
Options
Left Display
Right Display
Help
Reload Left
Reload Right
Outputs
from -> to
Inputs
aiCellNoise1
caching
frozen
nodeState
outColor
outColorR
outColorG
outColorB
outTransparency
pattern
additive
octaves
randomness
lacunarity
amplitude
scale
offset
coordSpace
prefName
P
time
color
palette
m_face
caching
frozen
nodeState
normalCamera
hardwareColor
maskColor
edgeColor
edgeTonemap
edgeOpacity
edgeWidthScale
silhouetteColor
silhouetteTonemap
silhouetteOpacity
silhouetteWidthScale
priority
enableSilhouette
ignoreThroughput
enable
idDifference
shaderDifference
uvThreshold
angleThreshold
aiCellNoise1
<
>
m_face
Clear All
Remove
Break
Make
Close

Rim Light

DEMO 4 - link to demo video (Skip ahead around 2:30 - I was testing Stylized highlight)

- *Rim Light is quite beneficial for rendering the character as well as the background. If your object or your character is moving in the scene, AiToon Shader is amazing at keeping the rim light on your character without casting lights on other objects.*

- *If you have a stand still object, then the rim light can be held in one area.*

- *If you have a moving object or character, parent the rim light with the control curve (CTL) with maintain offset - you could also parent to the GEO itself in the finish model file.*

1. Create an Area Light or Directional Light, lower the max bounces around 5 ~ 10.
2. Rename your light like ShirtRim_LGT, etc whatever you want within the Ringling pipeline of naming conventions.
3. Copy that name of the light, go to the attribute Editor then click on the material, scroll down to Rim Lighting
4. Paste the name of the light that you create into Light.
5. You can adjust anything with this light, go to Color (underneath the light blank space that you just paste the name of the rim lighting) -> Choose a color you want or use a ramp again for a subtle faded gradient look.
6. You can play with tint too, and width depends on your linkings.

The canopy on top of my character is using rim lightning, I fake the sunset light bounces off the material. The orange section is actually an area light mounted on top of the canopy; it was not painted in Substance.



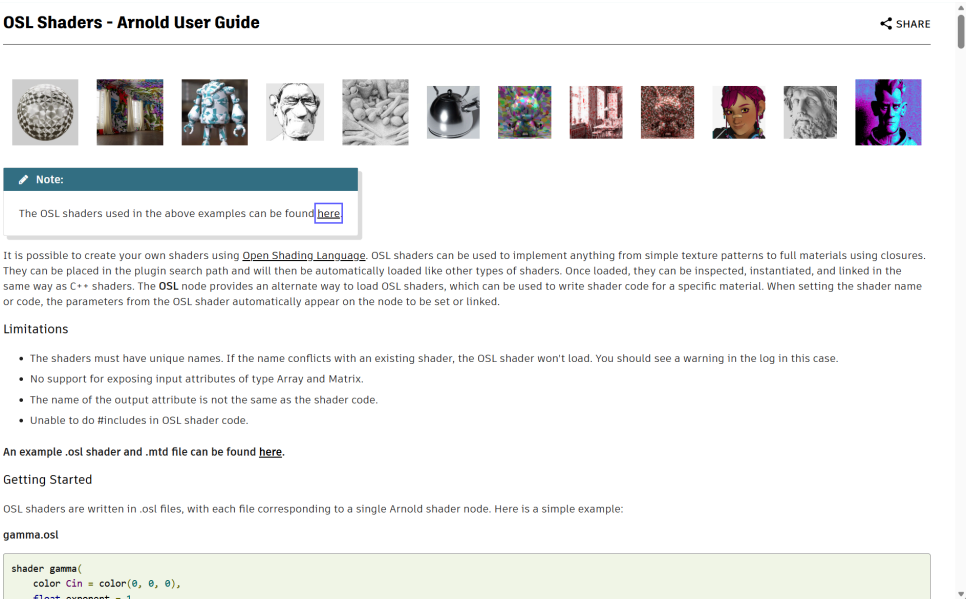
OSL coding - shader

DEMO 5 - link to demo video

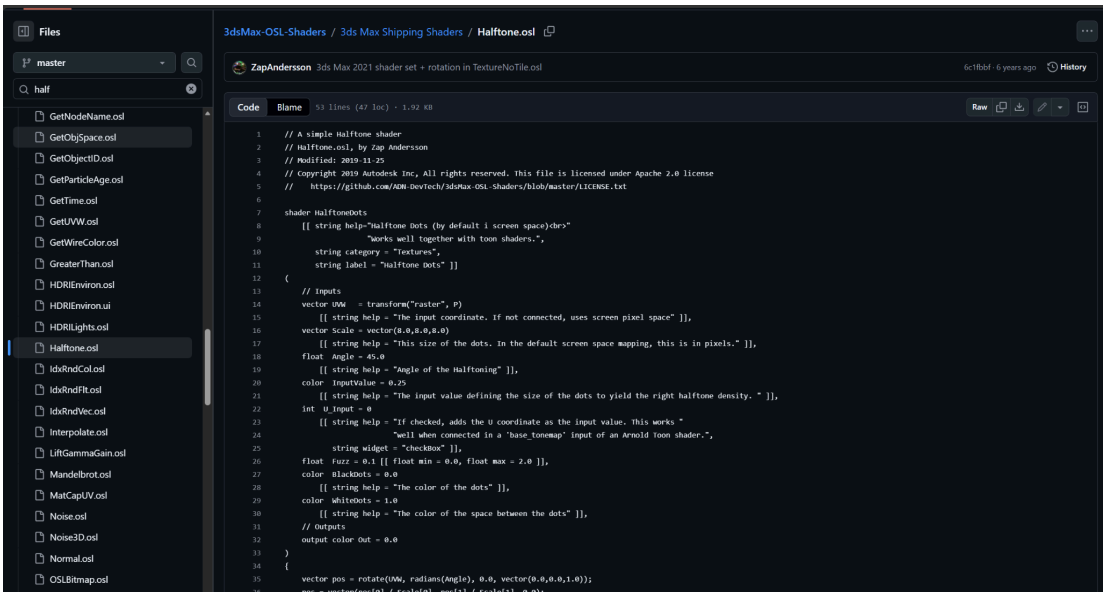
Osl coding is a series of codes that Maya Autodesk provided for everyone to use. There are countless varieties of looks that can be achieved through Osl codes, I was leaning towards Spider Man into Spider Verse look.

LINK TO OSL CODES FROM MAYA AUTODESK

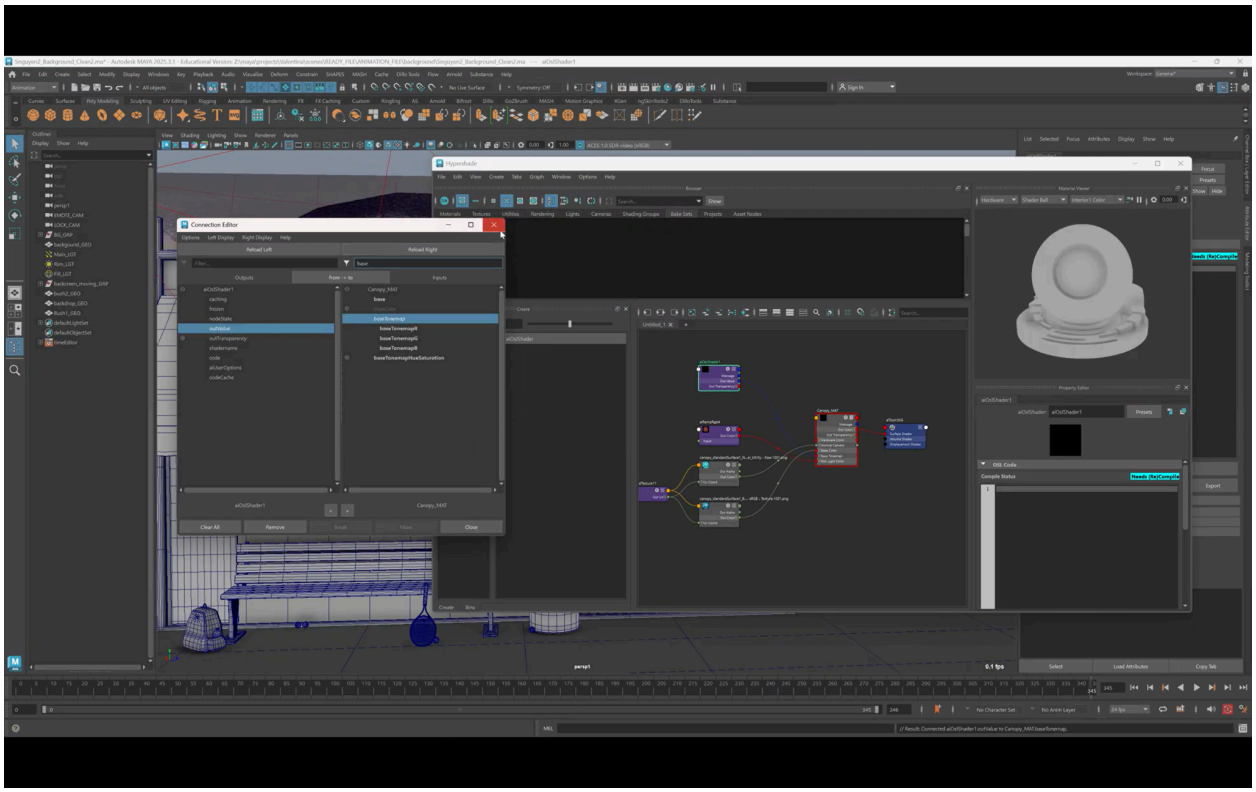
There are a lot of them, so I will only use one, Halftone, for this demonstration



1. Open the link, then click on here in the Note section
2. It will open up to Github, and there will be more codes ready to use.
3. Click on 3ds Max Shipping Shader
4. On the left screen, search for Half Tone Osl codes
5. Then click on copy, it is next to the word Raw on the right screen.



6. Then go back to Maya hypershade node
7. Go to Tone map under Base Color -> click on the checker board node -> search for aiOslShader (it is under Arnold)
8. A connection Editor will pop up with Outputs and Inputs
9. On the Outputs side click on outValue -> Inputs side click on base ToneMap



10. Look on the right side of the screen of hypershade, aiOslShader will pop up with a ginormous blank space and on top of it has the line says Needs (Re) Compile.
11. RMB on the blank space -> paste the Osl code -> scroll down -> Compile Osl code
12. There will be multiple adjustments like Scale, Angle, Input Value so there will be a lot to go through for customization.
13. If you have an aiRampRGB that already plugs into the Tone map, don't worry, you just need to unplug it from the material first -> MMB drag into Input Value.
14. If you don't have the aiRampRGB under Tone map, then you can go to InputValue -> click on the checker board -> search aiRampRGB
15. From here you can just do whatever you want with aiOslShader
    Some fun adjustments you can play with:
    - Scale: -> This will adjust how small or big the Osl shader gonna be
    - Angle: -> This will adjust the Osl shader rotation appear on your textures (recommend - 45 ° for hatch line look - demo video will show it)
    - Fuzz: -> This will adjust the flare of the dots inside the Osl shader

Rendering

No demo Video (due to pending on testing ground with HPC Omega and Deadline renderfarm)

RENDERING WITH AITOON SHADER IS QUITE COMPLICATE, SO THIS IS THE SUNSHINE'S RECOMMENDATION WAY TO GIVE OUT A SUCCESSFUL RENDERING.

AiToon Shader is sensitive, sometimes unpredictable, especially with noise, lighting, colors.

You have to split the render into two different AOVs set up so that it can give both the color and the contour line.

Recommendation: Copy final Maya file into 2 versions, this will drop AOVs confusion significantly in Deadline and HPC Omega as well as keeping your Maya files clean.

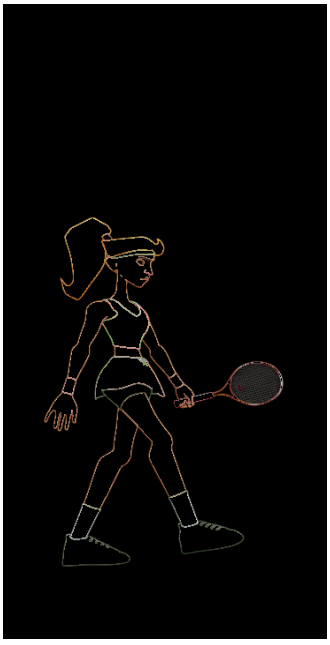
To significantly improve no noise for rendering, bump light samples up.

- Key LGT or LGT that moves with your character: Sample at 3 - 4
- Fill LGT: Sample at 2 - 3
- Rim LGT: Sample at 2 -3
- Other LGT: Sample at 1- 2

Gaussian Render

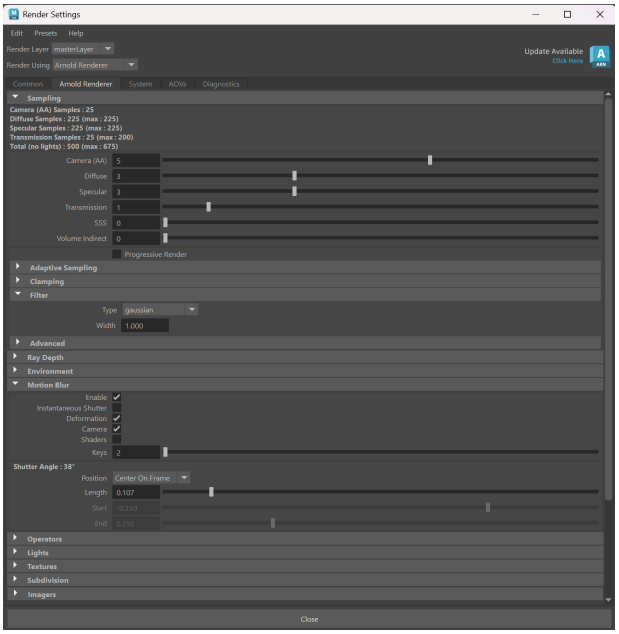


Contour render



1st Maya file: Keeping the classic Ringling default setting:

- Camera: bump up to 4 to 5 to get crisp render and helping keeping the noise away
- Diffuse: 3 - 4
- Specular: if your character have eye spec, 2 - 3
- Transmission: 1 - 2
- SSS: 0
- Volume Indirect:0



Filter: Gaussian (1 - 2)

If you want motion blur, go for it - but just knowing that contour lines can't handle very well, so bring it around 0.2 and down.

AOVs set up:

P, Z, N, Pref, Cryptomatte, Crypto_object, Eye_AOV (depending on professor)

Denoiser:

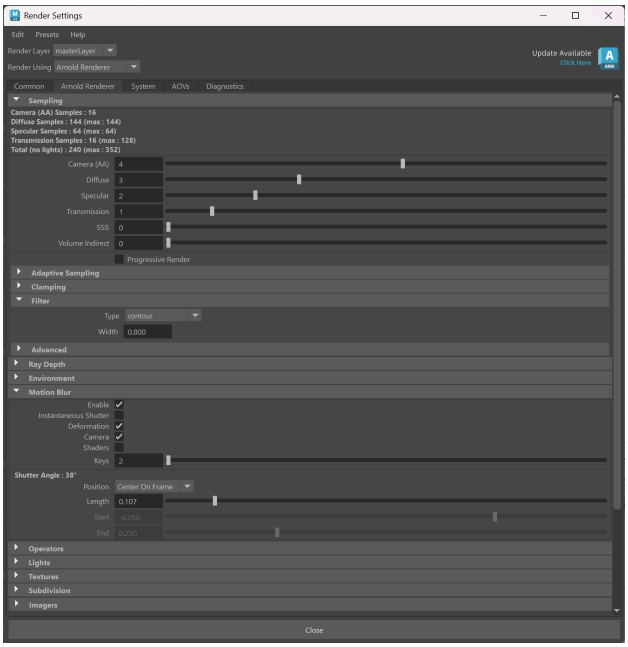
You can turn on Output Denoiser to reduce noise



↓CONTOUR LINE RENDER ↓

2nd Maya file: Contour line render

- Camera: 4~5
- Diffuse: 2 - 4
- Specular 1-2
- Transmission: 0-1
- SSS: 0
- Volume Indirect: 0



Filter: Contour (width is your outline thickness)

If you want motion blur, go for it - but just knowing that contour lines can't handle very well, so bring it around 0.2 and down.

AOVs set up:

N, RGBA

This has to be specific:

Under AOVs there is a section with name, driver, data, filter

RGBA pass

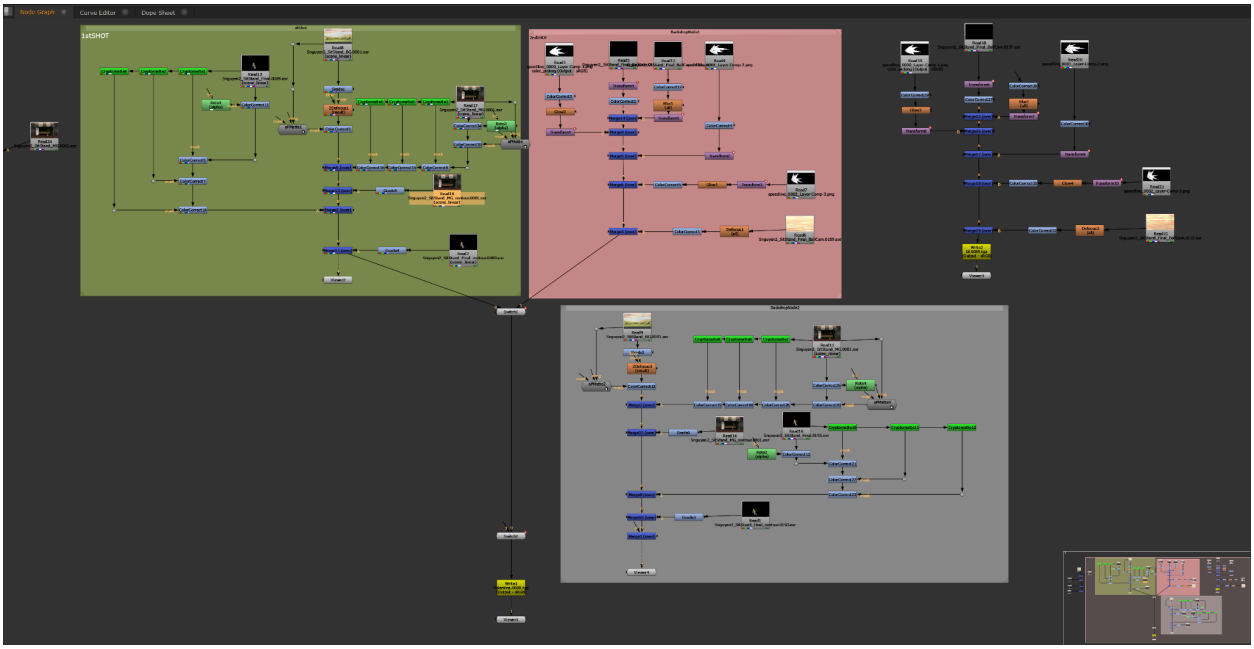
Data: rgb Driver: exr Filter: <contour>

Render layers is all depend on your scene, however, I encourage you to render non moving scene 1 frame only (if there is nothing going on in the background)



NUKE tree set up:

Example nuke tree - this is a video just to see the differences in comping



Just think as layers in Photoshop

To combine Contour render and Gaussian render, there are 2 options to choose from:

Option 1:

- If you like the look of the contour outline every single object on your character or set then put the contour render on top of Gaussian render. (It will look color faded out at first)
- Then use Grade node, plug it into the contour render
- Then play just with the Grade node :)

Option 2:

- If you like the look of the contour be only outside of your character or objects then put the contour render underneath the Gaussian render.

MATERIALS AND SOURCES FOR AI TOON SHADER

From Maya Autodesk:
OSL codes link
Autodesk Community 1
Autodesk Community 2

YouTube:
Arnold Renderer (One of best AiToon shader demos channel)
ToPhungAnh
AOVs Render

Book (recommended from Sunshine):

- Genshin Impact Artbook (super good for toon shader)
- Spider Man into Spider Verse Artbook (my inspiration to use toon shader)

- Rise of the Guardian Artbook
- Pixar Ratatouille Artbook
- Kubo and the Two Strings Artbook
- War of Warcraft Artbook
- Kim Jung Gi Artbook
- Henri Martisse artworks
- Any comic books available in Goldstein Library