Procedural Animation: Cello with Gears

Name: Andrea Rosado
Date: 11/16/2023
Houdini Version: 19.5.640
Professor: Deborah Fowler

Important Statistics: Redshift Statistics

Average Render Time; 1min Frame
Resolution 1280x720
Quality: High
Light Count: 1x Skydome, 1x direct sun light (backlight) 1x arealight

Project Description:

My goal for this project is to recreate violin movement in addition to gear movement. I explore procedural approaches for the gear movement and sin expressions for the bow to follow the natural movement of a cello. In addition to this, I also expanded my modeling skills within a non-destructive node-based workflow.

Reference:

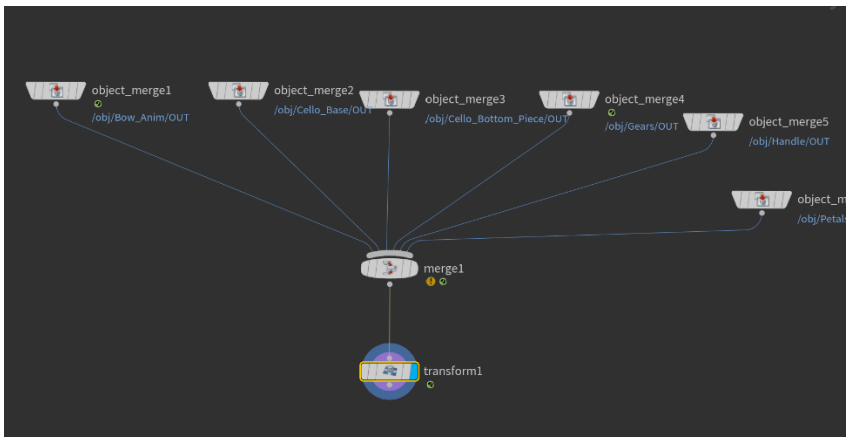
Render:

Technical Guide:

Modeling:

To make my workflow easier, I split the modeling process in different pieces at the object level: -
- Animated assets which included the moving parts of the cello.
- Static Assets which included the remaining parts of the cello that do not move.
-Environment included the additional parts of my scene

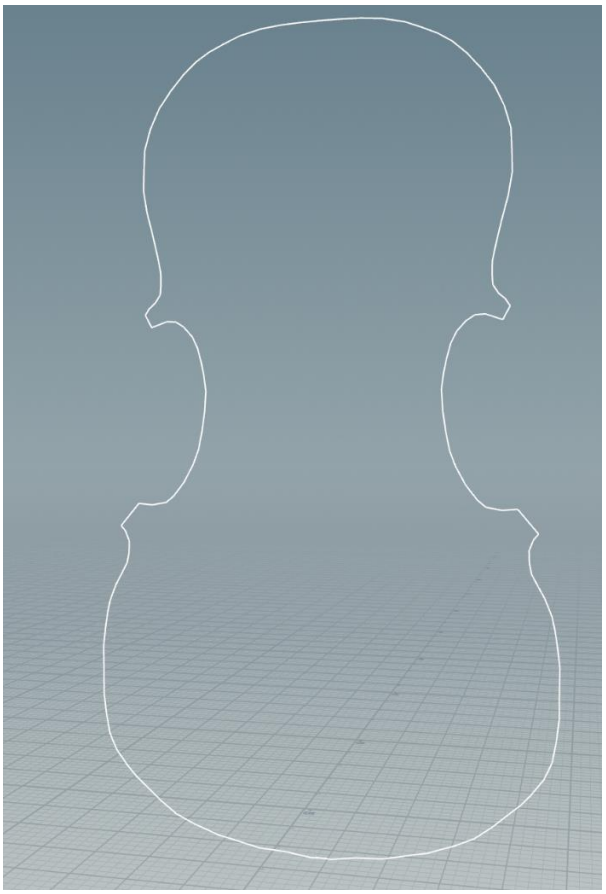
Then, I object merged all the pieces together in a Geometry node to control the position of the model based on the composition within my scene.

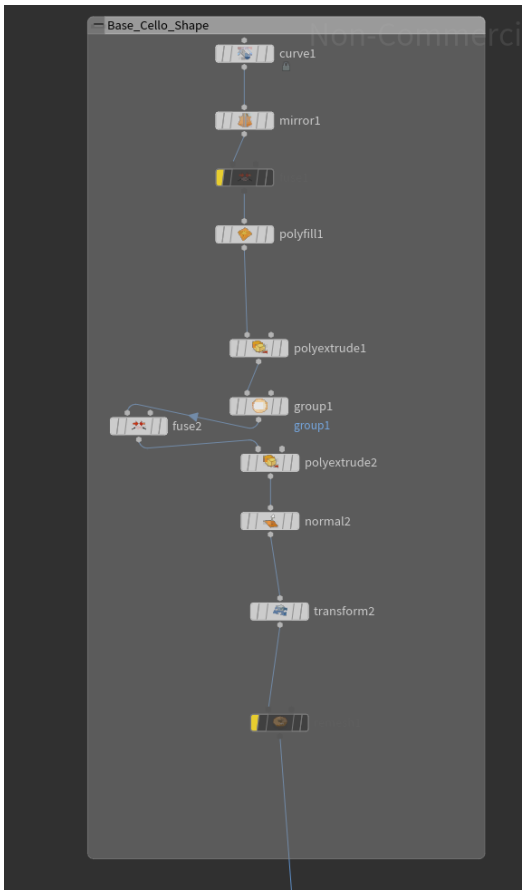


Pieces:

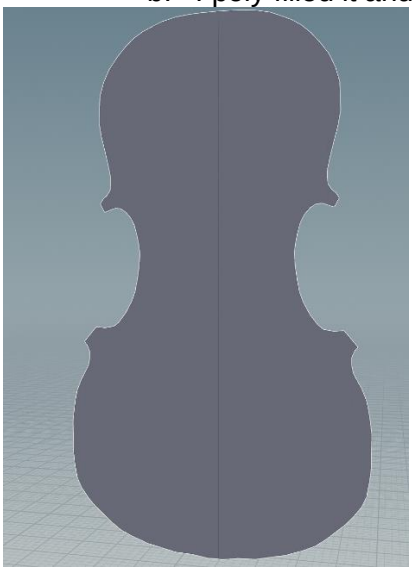
1. Cello Base:

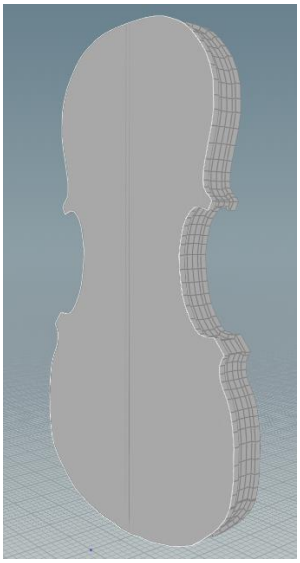
a. For the main base I created a curve following the basic shape of the cello



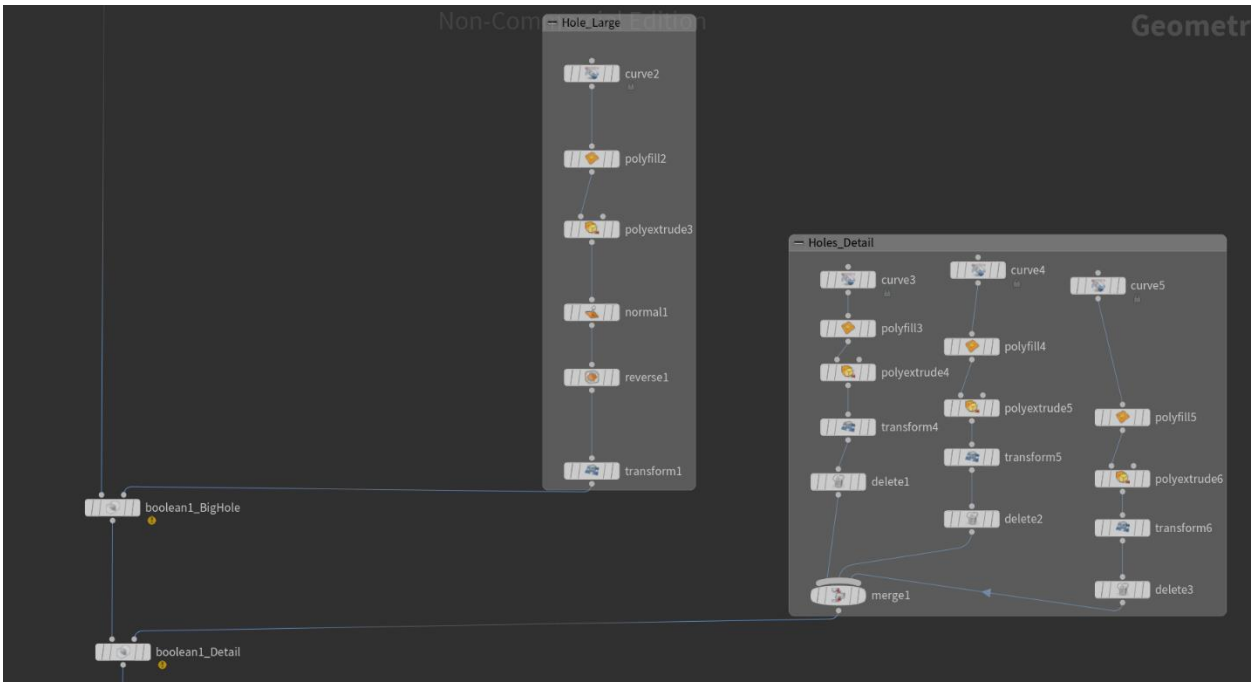


b. I poly filled it and extruded it twice to create the shape following my reference.

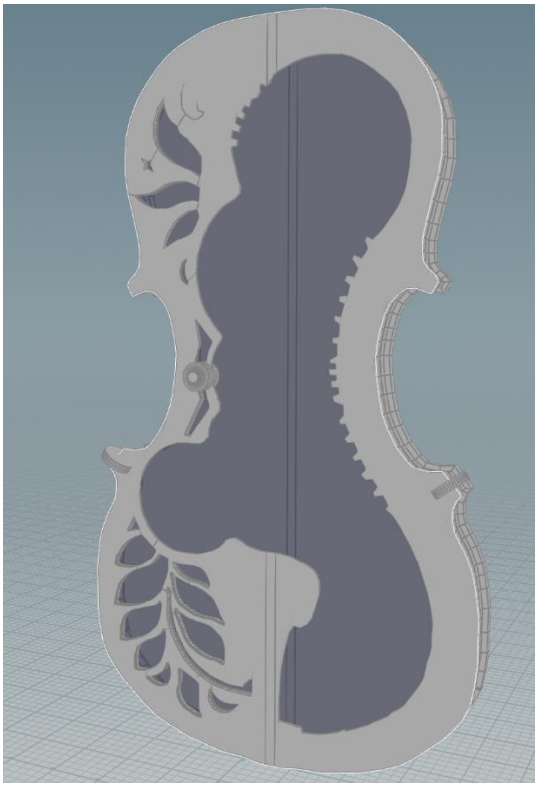




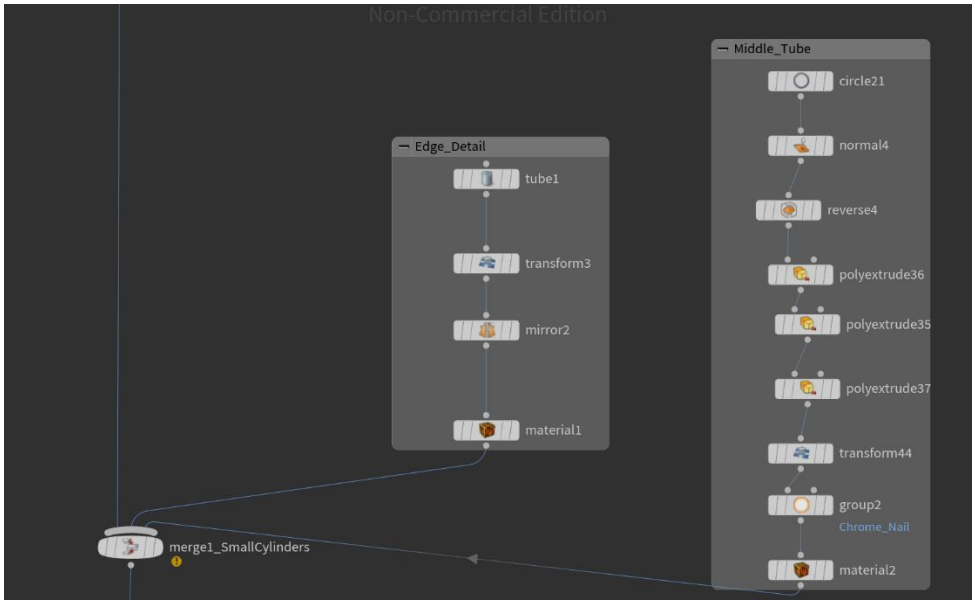
c. To create the detailed holes, I followed the same approach as the cello base by using a curve to create a shape for the negative space, then poly filled it and extruded it.



d. Then I proceeded to connect the shape of the negative space to a boolean to cut the holes on my cello.

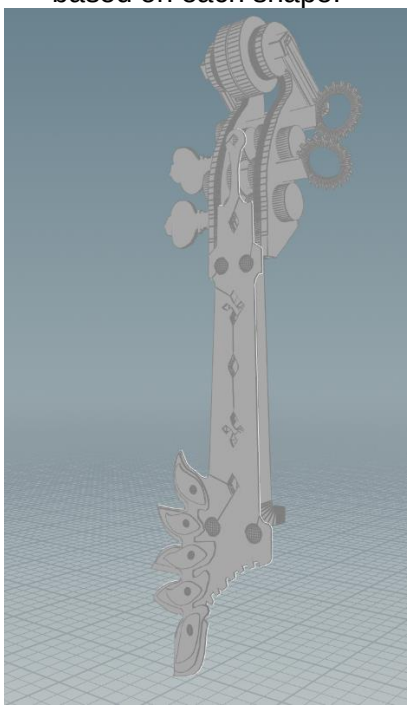


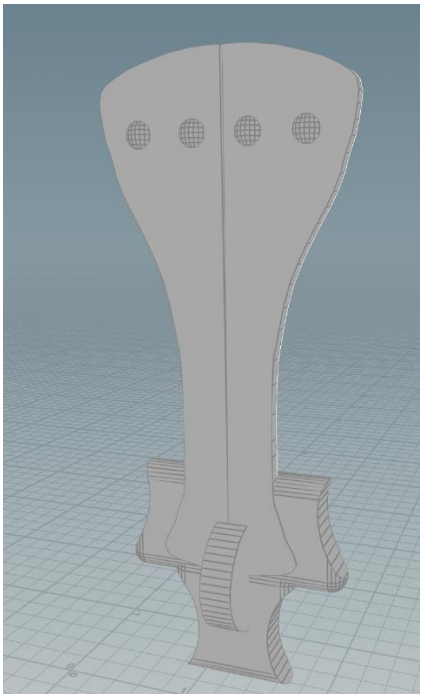
e. I also added some basic geometric shapes for some minor detail within my model.



Handles/Petals/Bottom of Cello:

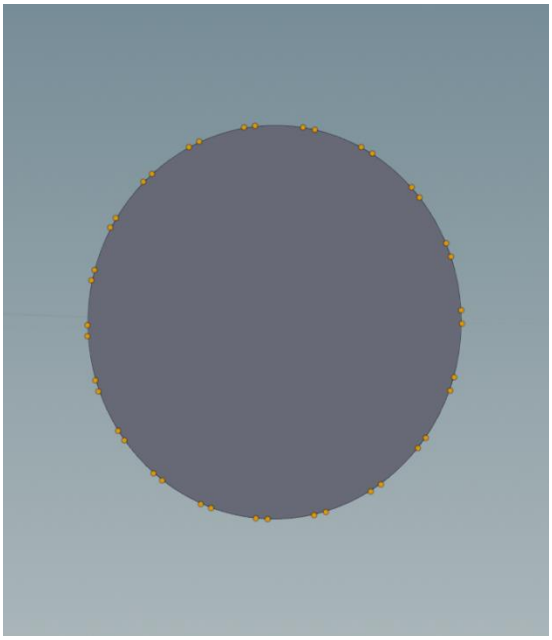
- For these parts of the cello, I followed the same approach as the base but tweaked them based on each shape.



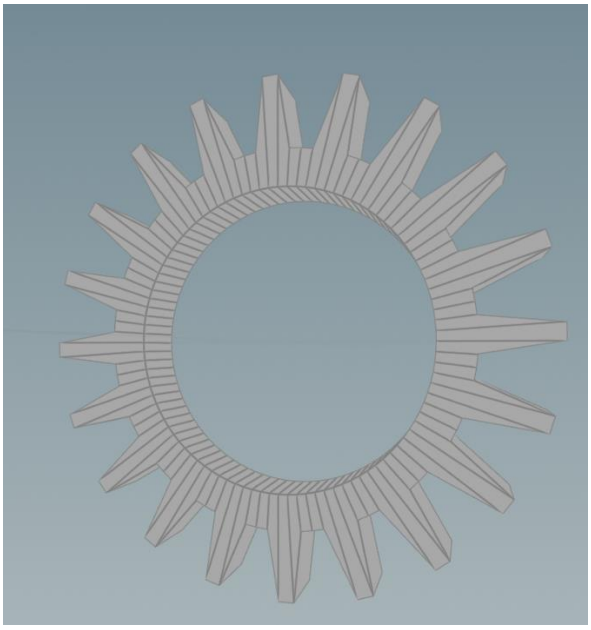


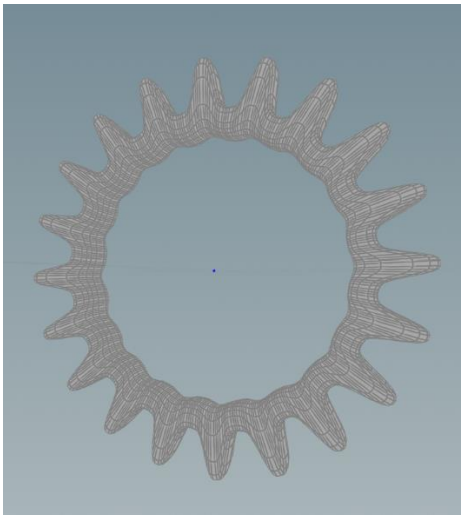
2. Gears/Flower

a) All the gears started with a circle and a group range that split the amount of dents each gear would have.

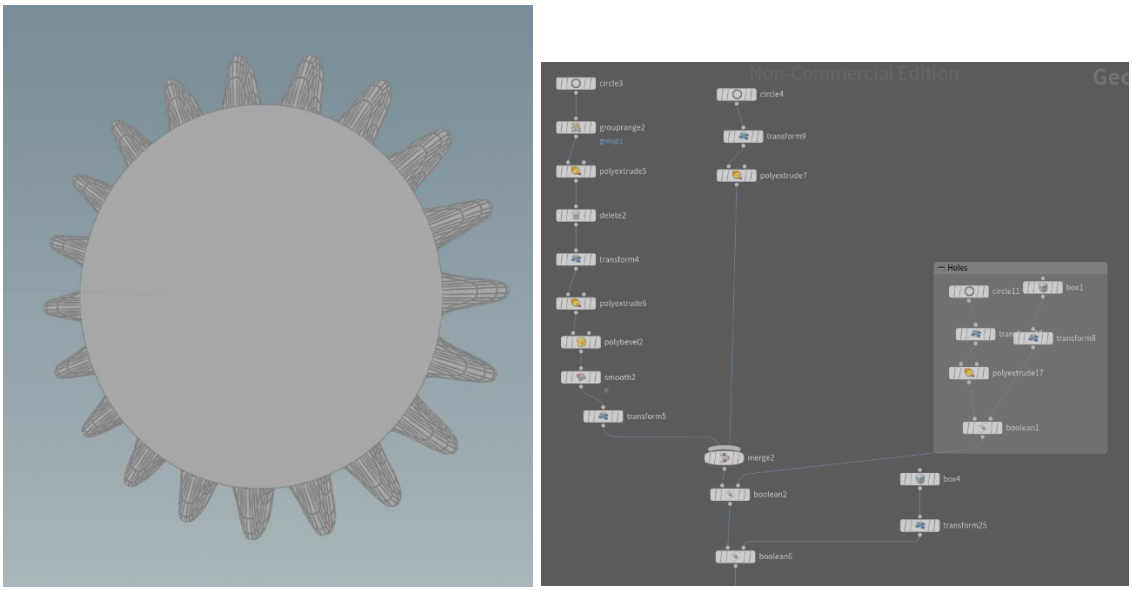


b) Then, I extruded the group range to create the dents. And extruded the gear as a whole to create the desired thickness. And smoothed the edges for the dents to match better by reference.

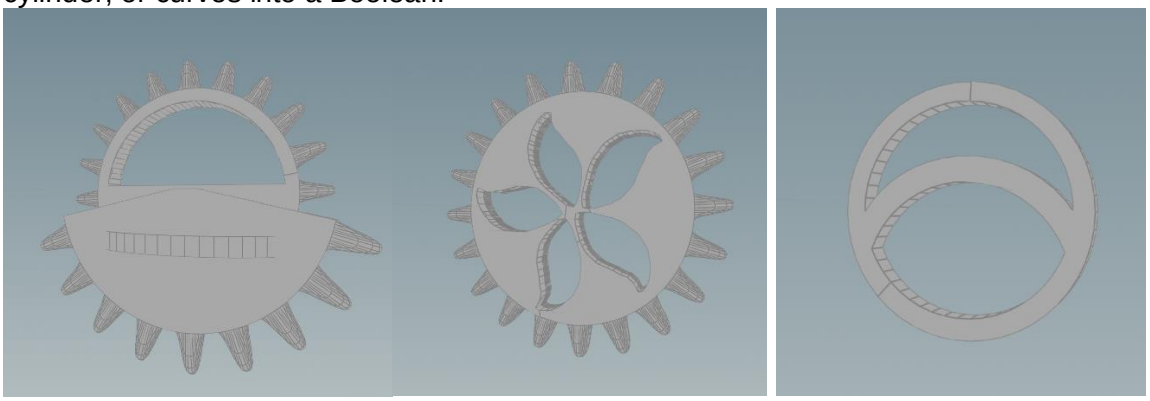




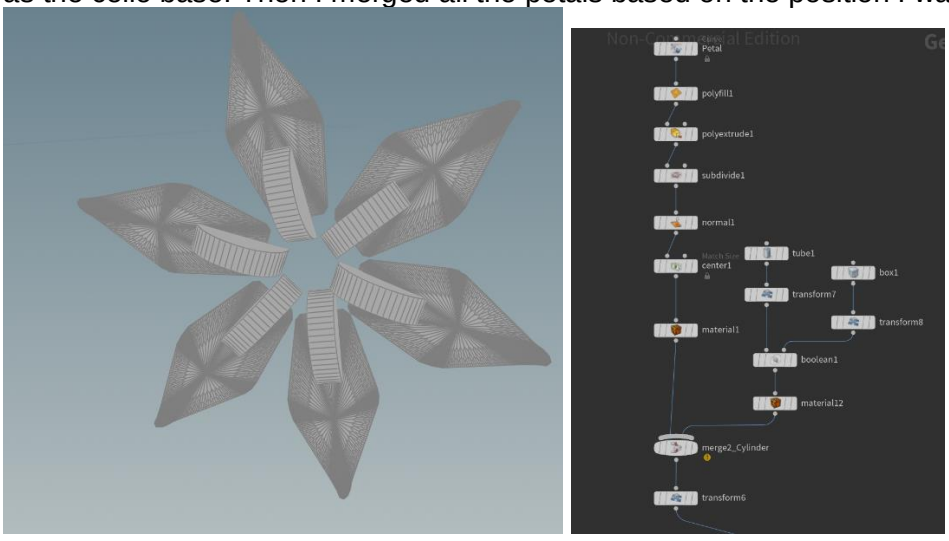
c) I deleted the middle part of all the gears to create a separate one with a circle and have more control of the holes.



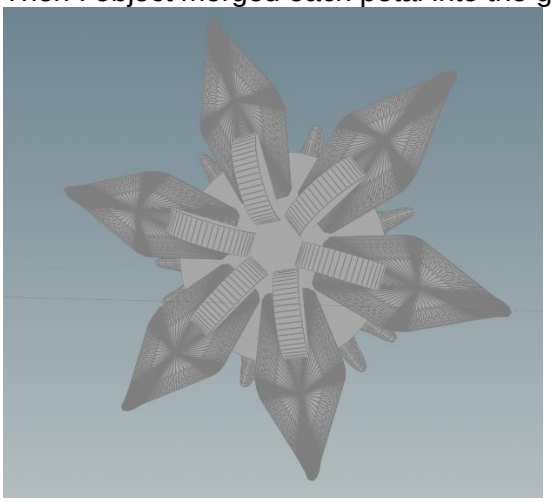
d) Some gears had unique holes in the middle which were created by connecting a box, cylinder, or curves into a Boolean.



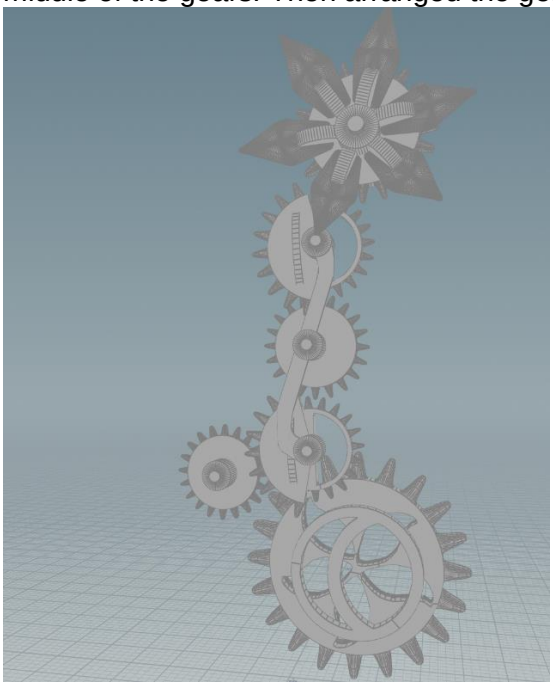
e) For the flower, I created the petals in a separate network node with the same approach as the cello base. Then I merged all the petals based on the position I wanted it to be.



f) Then I object merged each petal into the gear that they belong to.



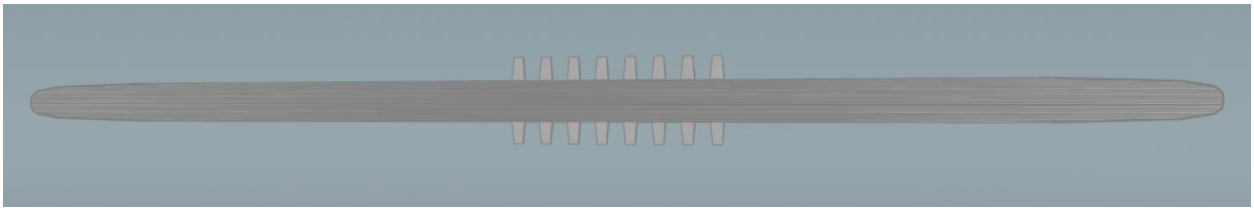
g) Lastly, I created some basic geometry with curves, cylinder and circles to include in the middle of the gears. Then arranged the gears based on my reference.

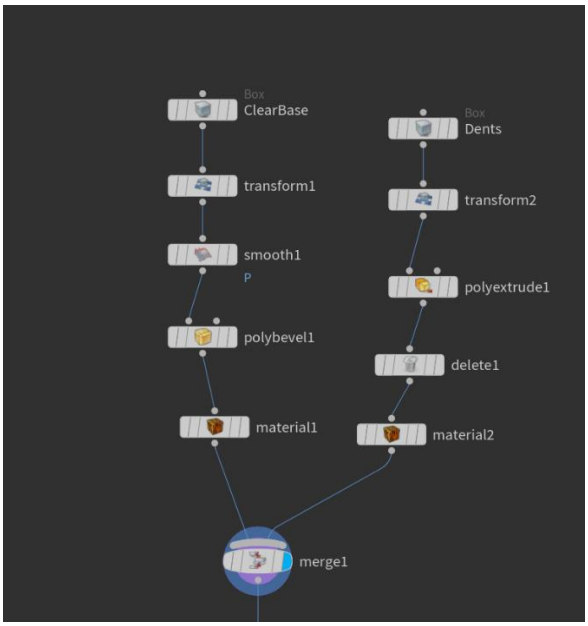


3. <u>Bow:</u>

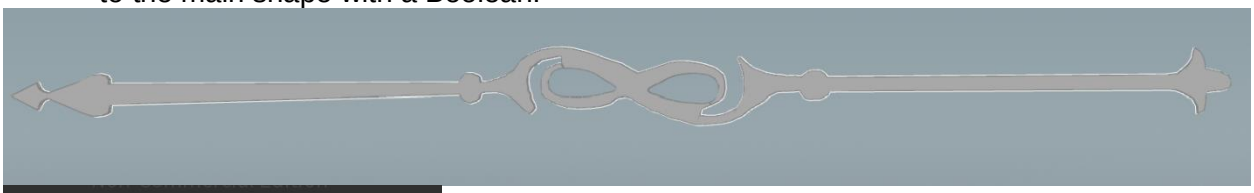
a) The bow consists of two pieces: the clear/dented part and the shaded/curved part

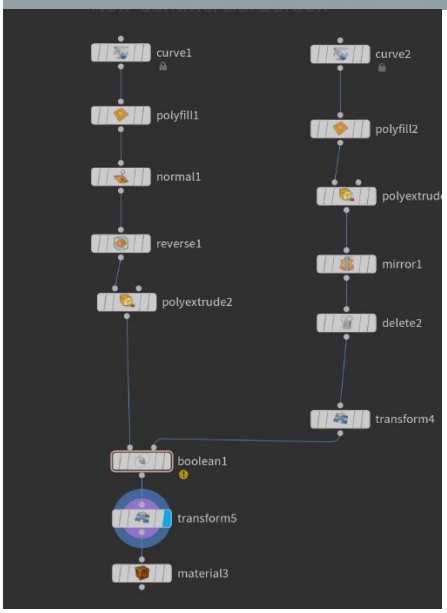
b) I made the clear part with a smoothed/beveled box. For the dents I extruded the subdivisions of a box.





c) For the shaded part, I made it with the same approach as the base of my cello. Extruded a curve to make the overall shape and then created the negative space and connected it to the main shape with a Boolean.

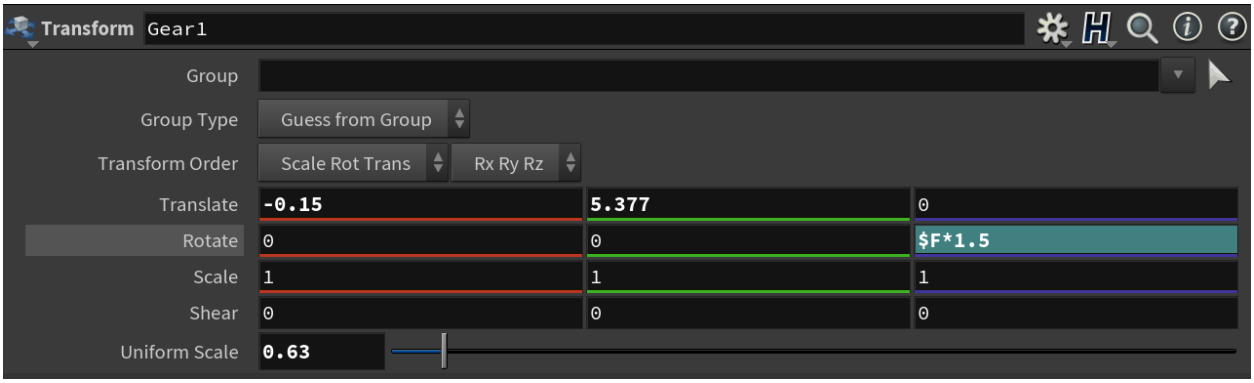




Animation:

1) Gears

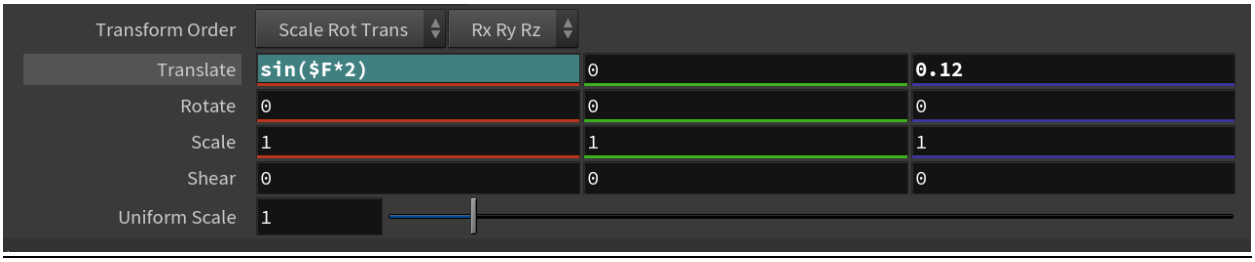
- 1st gear: Multiplied each frame by 1.5 for the speed to match my reference.



- Remaining Gears: , I added an expression in the z axis within a transform based on the rotation of the previous gear.

2) Bow

- For the bow animation I multiplied a sin wave within the x axis of a transform so the speed would match my reference

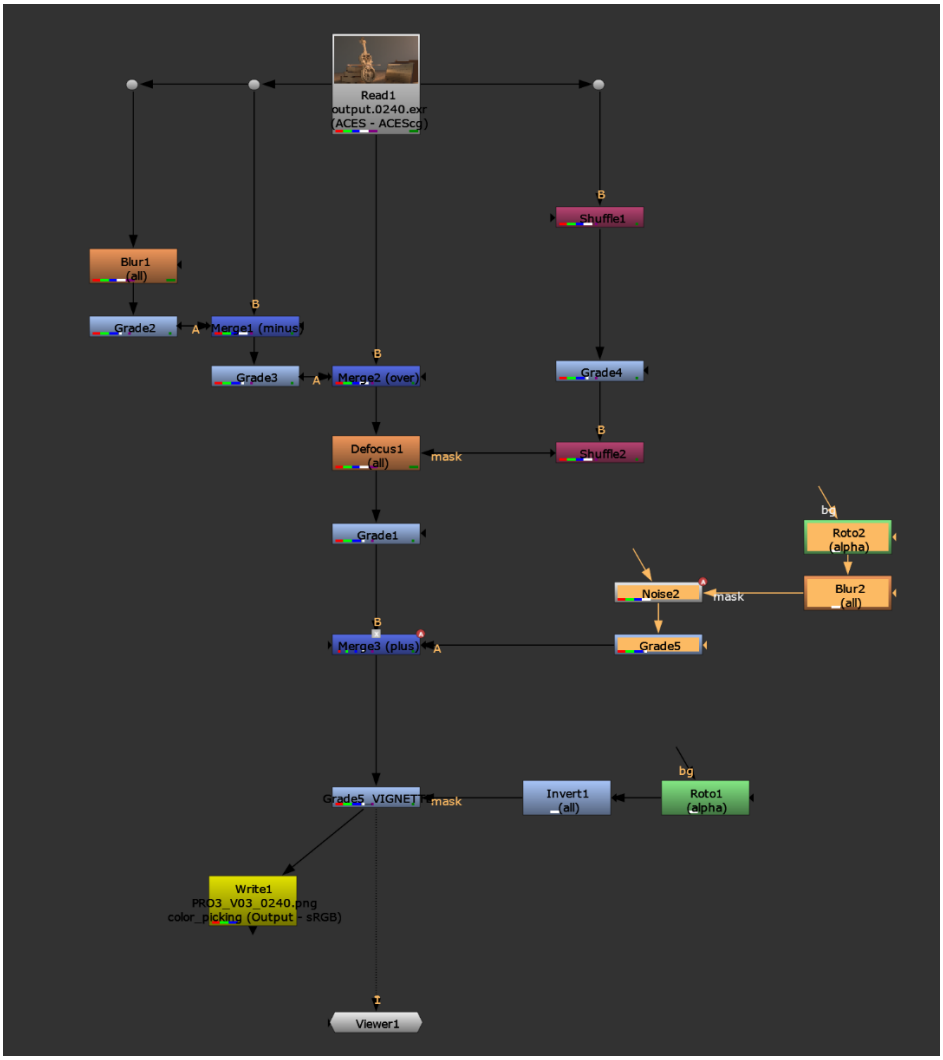


Nuke Workflow:

To push forward the render, I added some minor details in comp.

- Vignette
- Color grading
- Depth of Field
- Bloom Effect
- A little bit of volumetric/atmosphere with noise

Nuke Script:



Houdini Render

Nuke Render