

PROCEDURAL ANIMATION

WHALE AUTOMATON

Monica Chavez Trochez | VSFX 721 | Project 3 | Spring 2022
06/01/2022 | Houdini version: 19.0.383

IMPORTANT STATISTICS

Render

- **Renderer:** Mantra
- **Average render time:** 9 min per frame
- **Image resolution:** 1920x1080
- **Number of lights** 5 (4 area lights and 1 environment light)

Sampling

- **Noise level:** 0.01
- **Min/ max ray samples:** 1 - 9
- **Global quality:** 3
- **Diffuse quality:** 2
- **SSS quality:** 1
- **Reflection quality:** 2
- **Refraction quality:** 2
- **Volume quality:** 1

Geometry complexity

- **Primitives:** 3,847
- **Points:** 3,997
- **Objects:** 14

ABSTRACT

- This is the third project for the VFX 721 class (Procedural modeling and animation) using procedural methods to model and animate geometry, using expressions to generate motion that relates to real world objects.
- This animation recreates the motion of a whale automaton made of wood through the motion of a wire.

INSPIRATION AND REFERENCE

- Inspired by Sylvain Gautier's wooden automaton sculptures, where he recreates the motion of animals with the use of simple mechanisms.
- On th reference video, Gautier shows the whole process of how he created the automaton, from the sculpting to the final result. It can be found here: <https://www.youtube.com/watch?v=c3BNWls2EzE>



Screenshot taken from reference video.

COMPARISON

- For the look development of my project, I decided to use a picture found on Gautier's instagram account where he places the whale on a more designed environment.



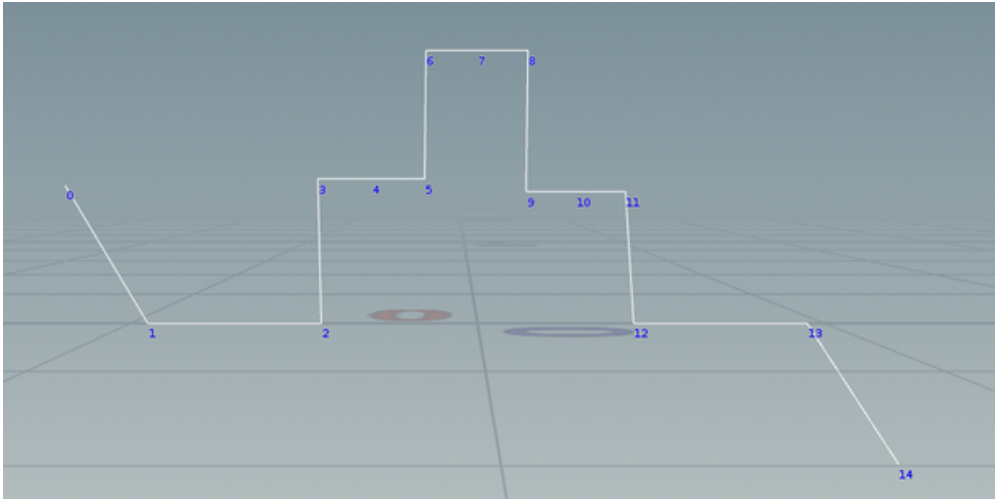
Image from @syl.gautier on Instagram



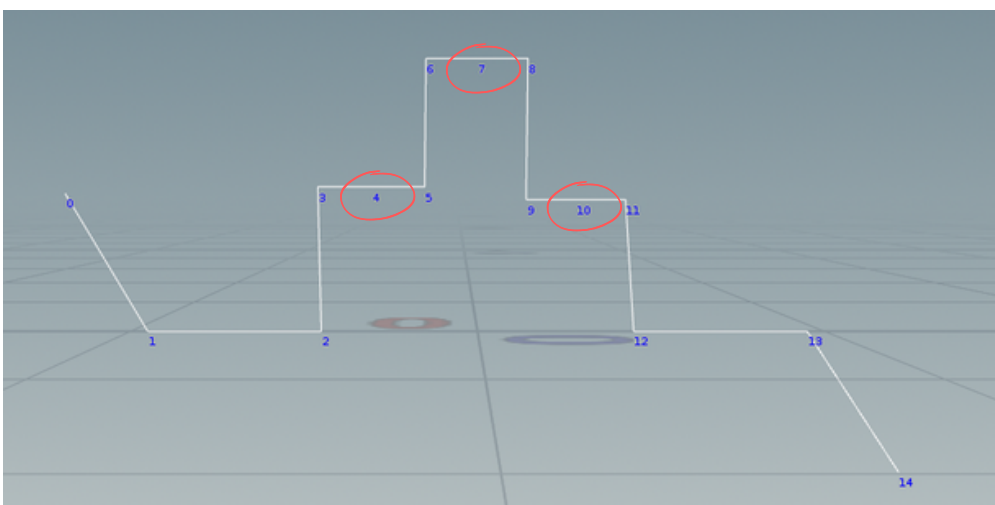
Final result

MECHANISM

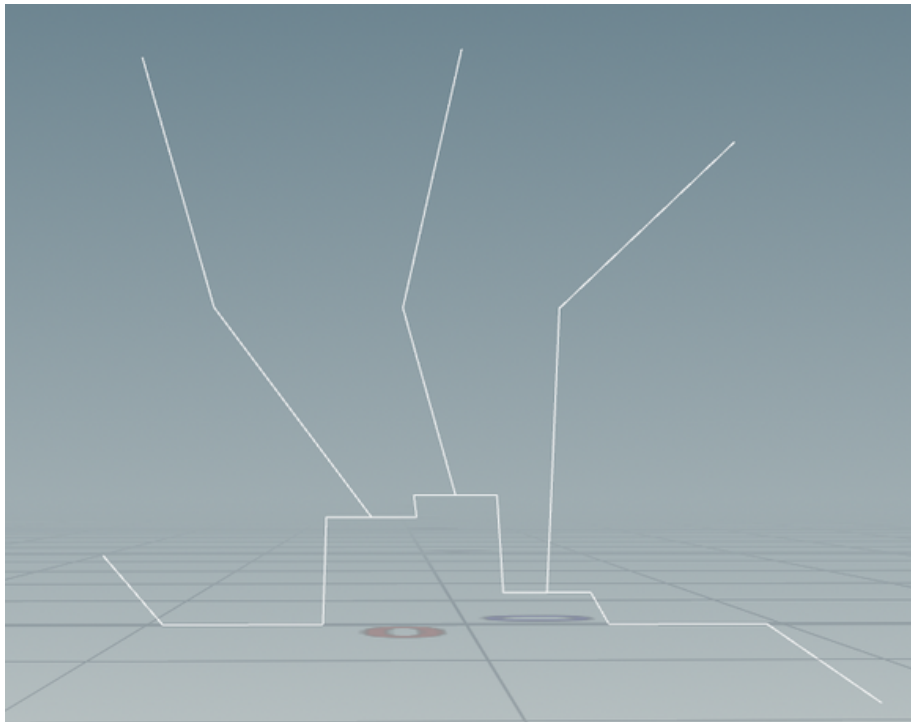
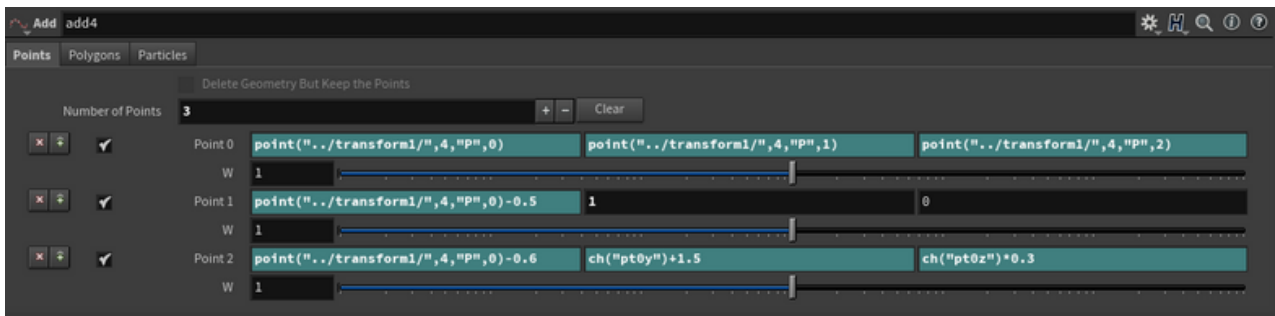
- The first step was to create the wire rig that controls the movement of the whale. In order to do that I placed some points trying to create a shape relatively similar to the reference and joining them creating a polygon. Then, I created an expression for the rotation of the wire, according to the frames.



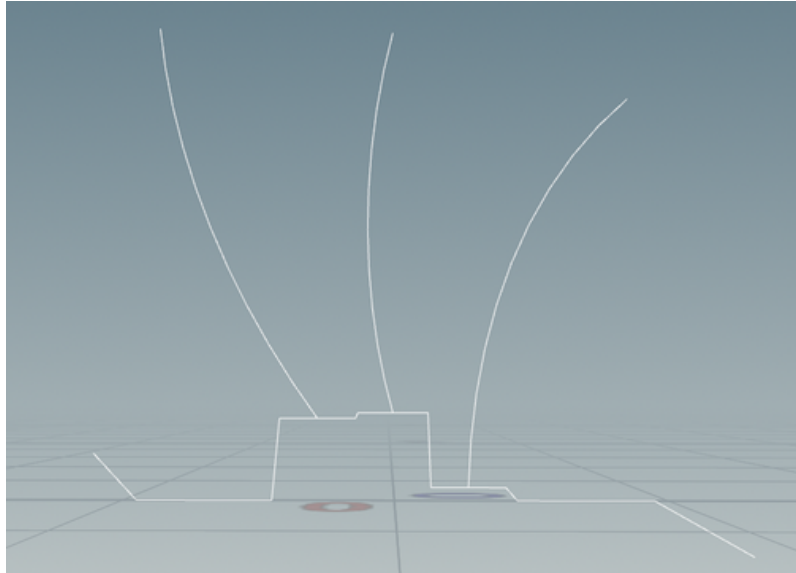
- It was important to add the points in the middle of each "section" because I would be joining the wires connecting the whale to those points.



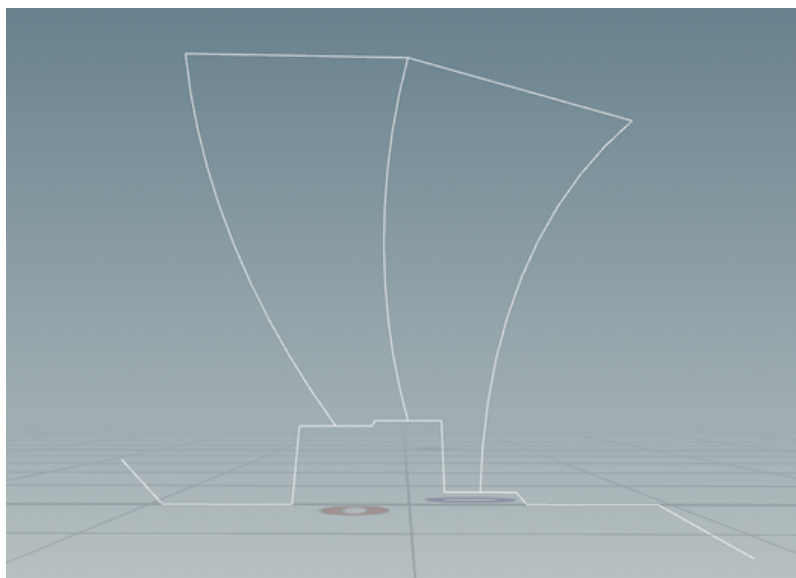
- Then I created the wires connecting the whale to the mechanism. Each wire had 3 points. The first point copied the exact position of the respective middle point previously created on the base wire on every axis. The second point only copied the position on the x axis with a "controlled random" offset and it had a constant value on the y axis (this is where the base would be located). For the last point, the x value is similar to the second point by copying the position and adding an offset, the y value is copying the y position of the first point and also adding an offset, and lastly for the z value it is also copying the z position of the first value but it is decreasing the amount of movement by multiplying it to a small factor (this is to create an illusion of a horizontal movement of the whale).



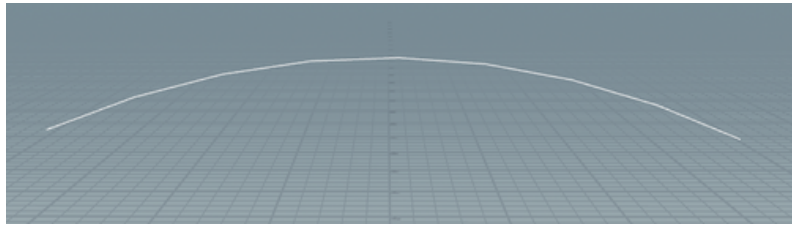
- When the three wires were correctly created, I added a polyspline node with a "Degree 2 Bezier" type and with 10 divisions, to smooth the wires and making them seem like they are bending. I also added a point node on each wire to add normals to their points.



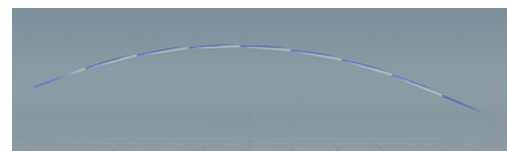
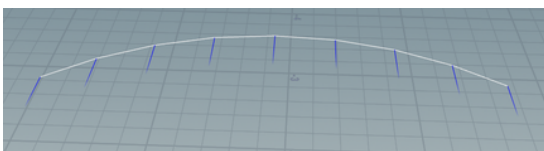
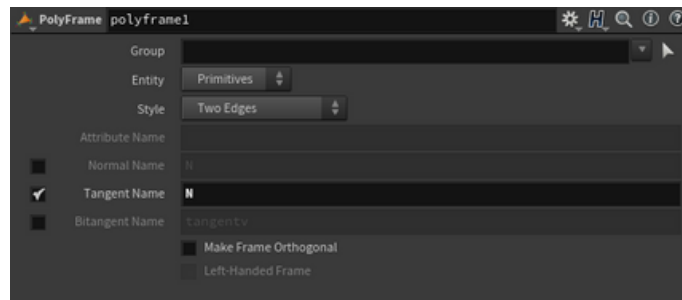
- Then I joined the last three points of each wire where the whale is going to be located, by creating a new polygon with an add node, referencing the position of each point.



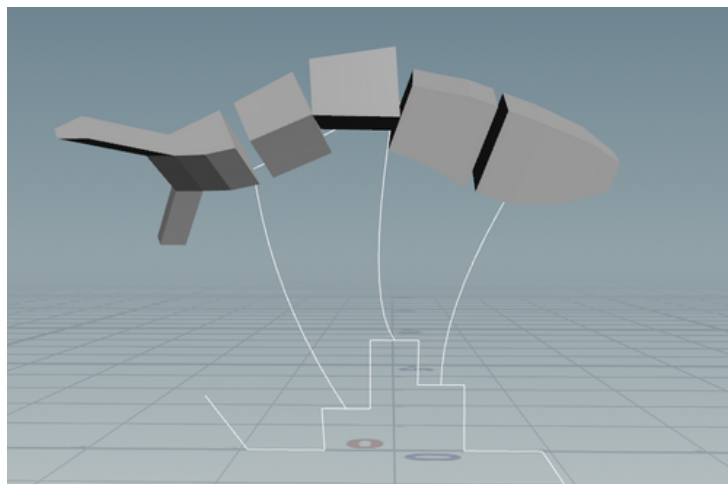
- Just like I did with the wires, I created a polyspline so it had a more organic shape, this time with 8 divisions only, keeping in mind that there will be five parts of the whale that I would need to attach to certain points of that curve.



- Then I added normals to each point but they were facing a direction that was not beneficial for the desired movement of the whale, so I added a polyframe node so that the normal were facing the same direction as the curve.

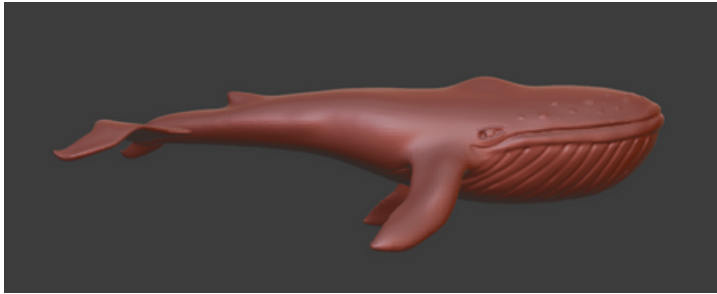


- For the last part of the mechanics, I added some test geometry similar to the shape of a whale to test how the movement was working and to change the "controlled random" position of the points if needed, as well as the speed of the movement.

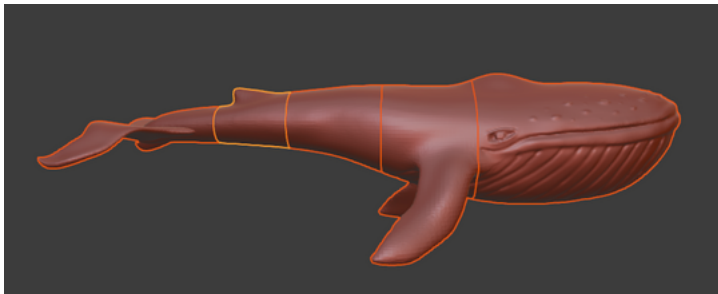


DESIGN

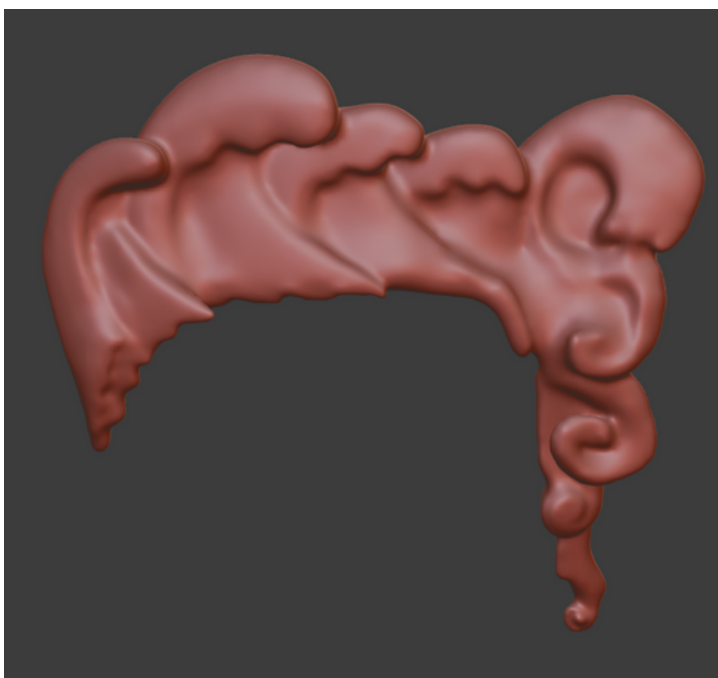
- I used Blender to sculpt the whale and the waves. For the whale I divided the mesh into five parts and I created their UVs inside Blender as well, then I exported the objects to Substance Painter to create the textures there.



Whale sculpted model.

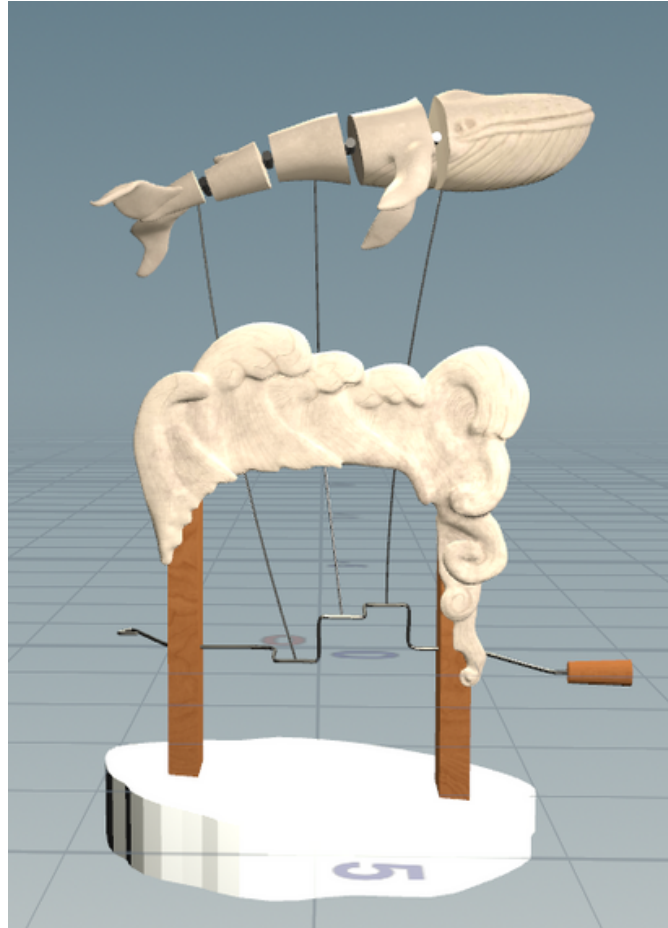


Geometry split in five parts.

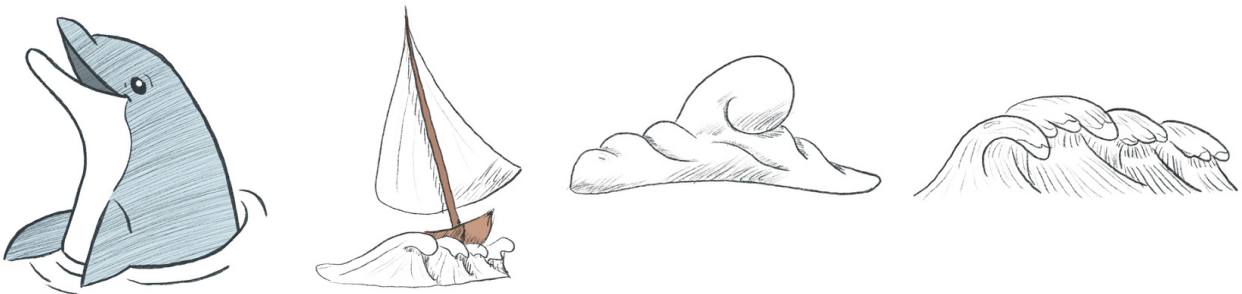


Waves sculpted model.

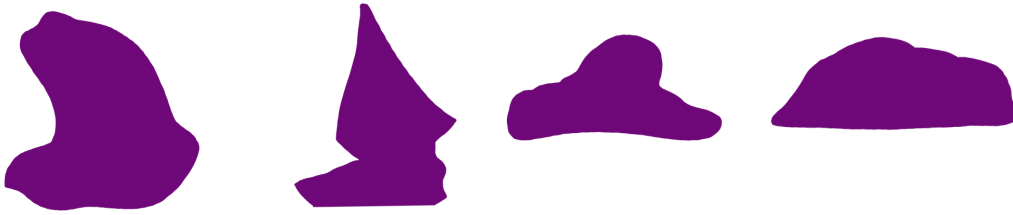
- Then I imported the mesh into Houdini and for the whale I replace the base model I had for reference with the high poly sculpt. I also modified the position of the points according to the length of the whale and I added the cylinders attaching one part to the other.



- Using Procreate I created other textures, such as the sky, the water and the drawings that are shown on the scene.



- I also painted some rough shapes similar to the drawings and then used them with the trace node to create the geometry.



- To create the movement of the hanging clouds, I modified the rotation on both the y and z axis. On the y axis, I just multiplied a small amount with the frame number. For the rotation on the z axis, I used a damped sine wave so the movement decreased with time, using the following formula:

$$\text{amplitude} * (e^{0.001t} \sin(t)) + \text{offset}$$

- Lastly, I used a three point lighting set up with some added lights for detail.

LOOK DEVELOPMENT PROCESS

- The process of getting the right look for the scene took various iterations. First, I created the textures for the whale and the base of wood using different tools like Substance Painter, Procreate and stock images, and I imported those into Houdini. I just used a simple background with some basic lights to see if the materials were looking good.



- Then, I created the texture for the background keeping in mind the reference.



- More lights were added and some materials were modified seeing how they reacted with the new lighting set.



- After, I placed more objects present on the scene to match the reference, textured them and added a few more lights as needed.



- Lastly, I exported the render to Nuke and did a bit of color correction and added some defocus using the Z depth channel.



* For the final version, I modified the reflectivity of the wires that were creating some type of flickering due to their interaction with light.

BIBLIOGRAPY AND REFERENCES

- www.deborahfowler.com
- Making a mechanical whale - Extended version. <https://www.youtube.com/watch?v=c3BNWIs2EzE>
- Align Normals Along a Curve. <https://www.sidefx.com/tutorials/align-normals-along-a-curve/>
- @sylgautier on Instagram.