Kyle Lin, March 10, 2022
Houdini Version 19.0.383 – Python 3

Project 3 – Procedural Animation Breakdown

Reference: **Coin Sorter**
https://www.youtube.com/watch?v=ykvUE8Ad8Ls&t=34s

Important statistics

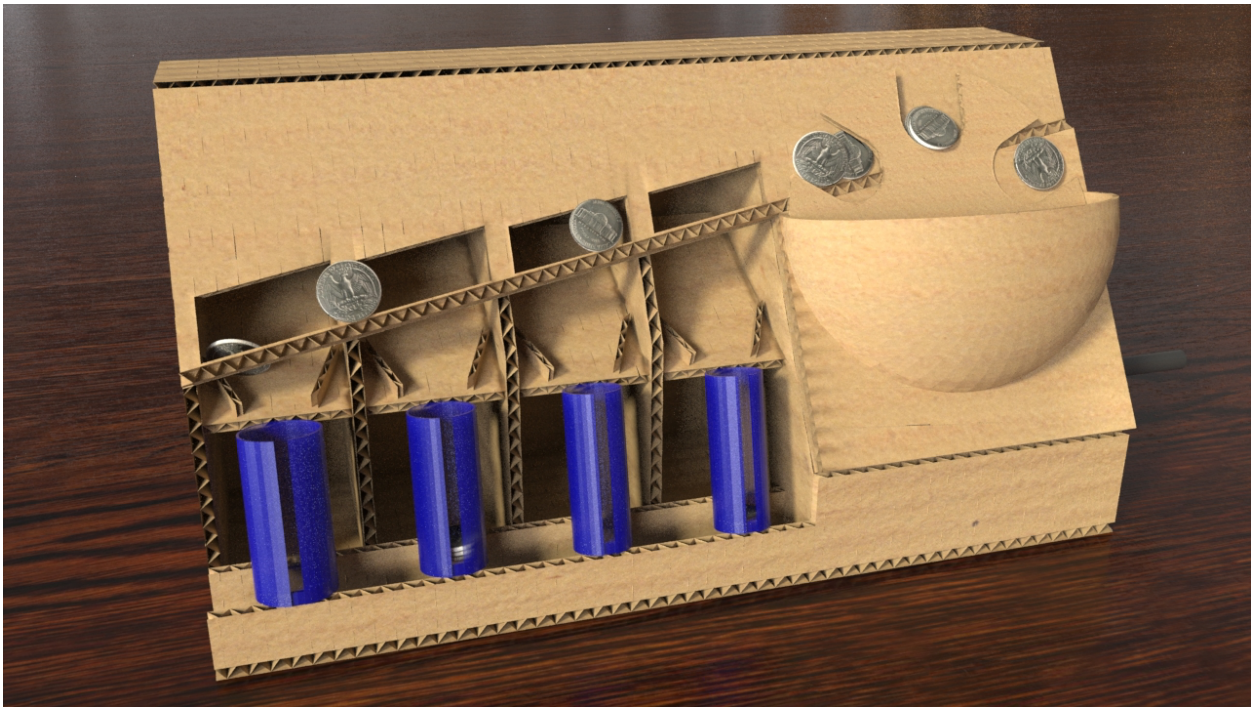
Renderer	: Mantra
Resolution	: 1280 * 720
Average Render Time	: 28 min 18 secs
Number of Lights	: 2 (Sunlight, Skylight)
Complexity of Geometry	: Packed Poly – 37,236 polygons
	Poly Counts – 132,401 polygons

Sample

Pixel Sample	: 6 / 6	Stochastic Samples	: 6
Min Ray Samples	: 4	Refraction Quality	: 2
Max Ray Samples	: 16	Diffuse Quality	: 6

(Other samples are set as default.)

About the Project



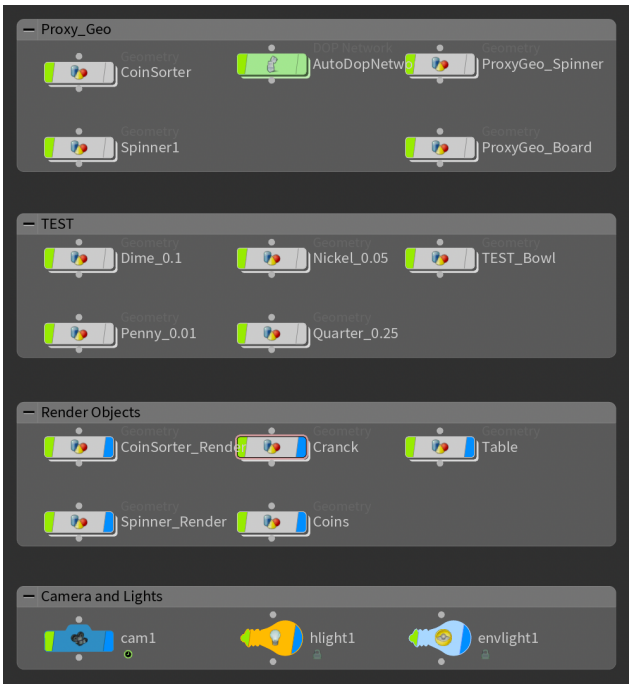
For this project, I recreate a cardboard coin sorter from a YouTube tutorial by using RBD simulation. Coins were dropped into the bowl and lifted up to the slope with the spinning circle. As coins roll down the slope, coins would fall into the hole from smaller to bigger coins, and then drop into the blue tube.

Technical Guide / Problem Encountered

To start off the project, I started by blocking out the geometry with the dimension as the YouTube tutorial of how to make the coin sorter with cardboard. After the box is blocked out, I started dropping coins in and play the RBD simulation.

RBD Simulation Scale Issue

As I was thinking it was too easy, I realized that I was using the wrong scale. I didn't realize that the default scale in Houdini is meter instead of centimeter. Consequently, the coins were moving very slow, so I had to scale everything down 10 times to match the real-world scale, and this was where the nightmare happened. Since everything is in real-world scale, and the coins are very thin, the solver just couldn't solve it properly. The coins would be jumping around, flying everywhere or get squeezed into the spinner or inside the box. I tried to adjust the collision padding, angular threshold, geometry representation and physics to get a better result, but things still didn't get better. Therefore, I change everything back the scale I had and adjust the gravity instead. I multiplied the gravity by 10 to get a better result of the speed.



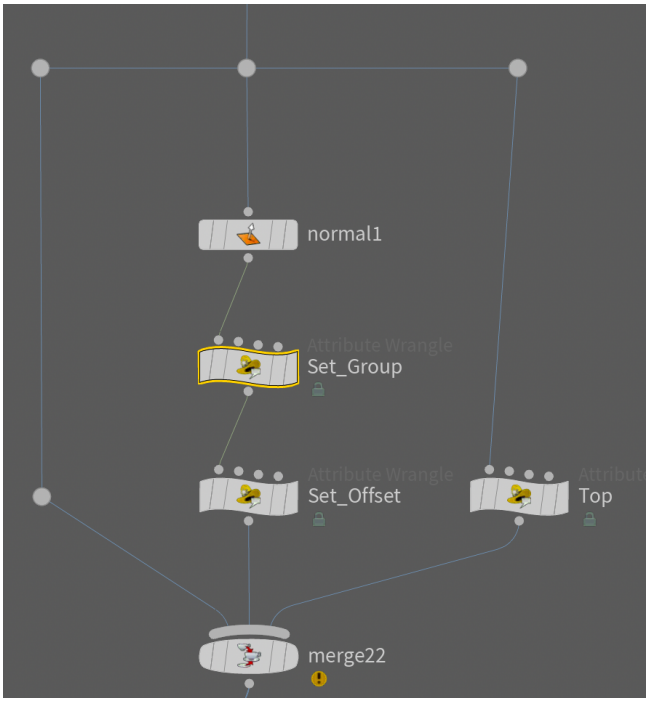
Texture

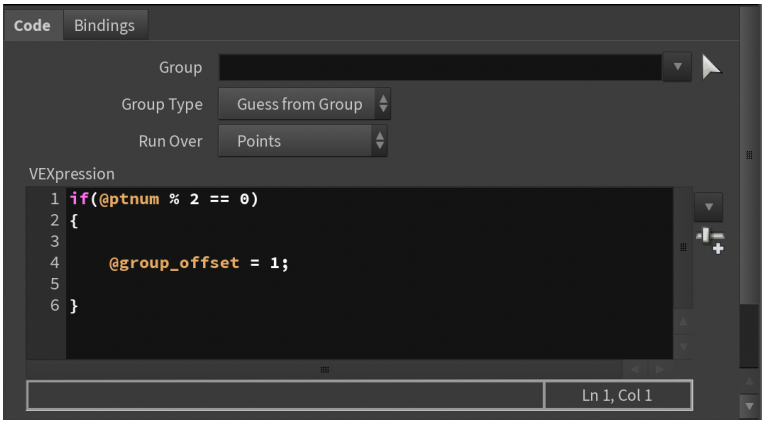
After solving the RBD issue, I started to texture the coins and the box. Surprisingly, I couldn't find any free texture of the US coins on any website, so I had to use a projection mapping to fake the texture.

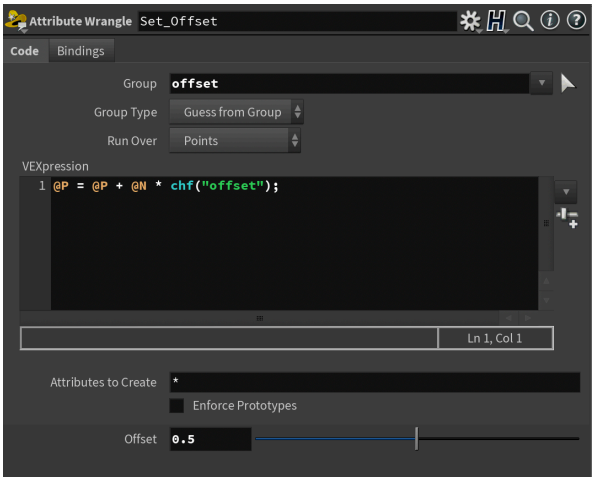
Another issue with the texture is the cardboard since one side of it is flat, but the sides are hallow. I thought about this issue when I was planning, and I found this tutorial on how to make a cardboard onto geometry in Houdini.

https://www.youtube.com/watch?v=0Didrf8yLuY

To achieve the cardboard affect, I duplicate the original objects that I had for the simulation and make the pieces that the side is visible into grids instead of boxes. Second step is to use a normal node and add normal to points. Third step is to use point wrangle node to create a group that contains every other point of the grid. Last step is to offset the group of points by multiply it by the normal direction and the offset parameter. After that just copy the offset node for the top layer of the cardboard and merge three layers together.

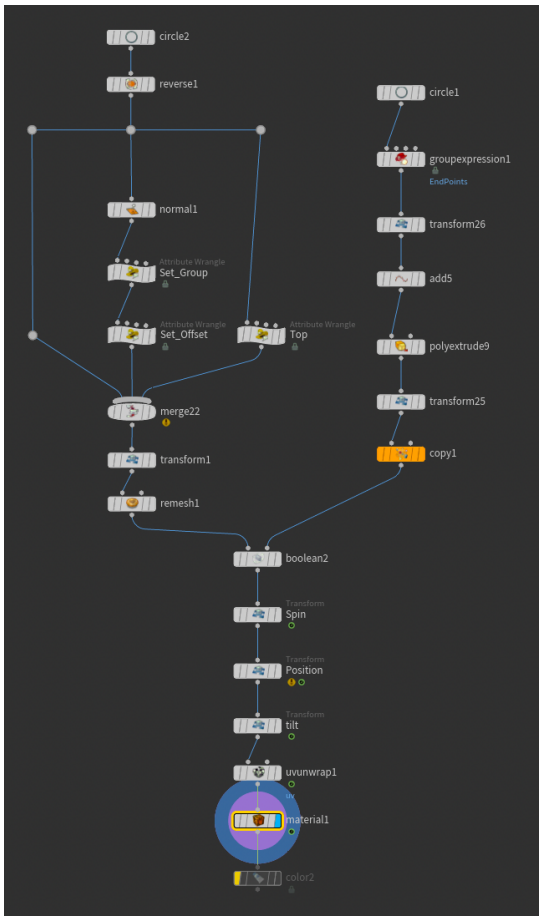






After the basic structure is done, I can just copy and use that for all the planes that need it.

In order to adjust how dense the pattern of the cardboard is, I adjust the division of the visible side to the wide divided by the gap parameter, so I can adjust it at any time if needed.



Since this method is only usable when the object input has a lot of divisions or the point on the edge is lined up properly, I have to change the way I used to make the box for the simulation. For the original proxy objects, I used add nodes to make the face which there's only two points at each end of an edge. Therefore, I had to use grid and then use Boolean to cut out the right surface afterward. This method also works with circle since the points on the edge are lined up very well as lone as the division is an even number. Also, I had to add a remesh node before the Boolean to get it more points on the face for the Boolean to work.

After the cardboard geometry is done, I just need to fix how the cardboard texture map is mapped on it to match the shape.