Jess Johnson | Nov. 16th, 2021 | V350

Procedural Animation: Stair Automaton
Houdini v. 18.5.696

RENDERING STATS

Renderer	Mantra
Average Render Time	6 minutes per frame
Resolution	1280 x 720
Number of Lights	1 (Environment Light)

Sampling

Light Samples	2
Noise Value	0.01
Min Rays	4
Max Rays	16
Diffuse Quality	2
Diffuse Limit	2
Reflection	2
Stochastic	4

Geometry Complexity

Points	17,809
Primitives	14,393
Vertices	54,615
Polygons	14,390

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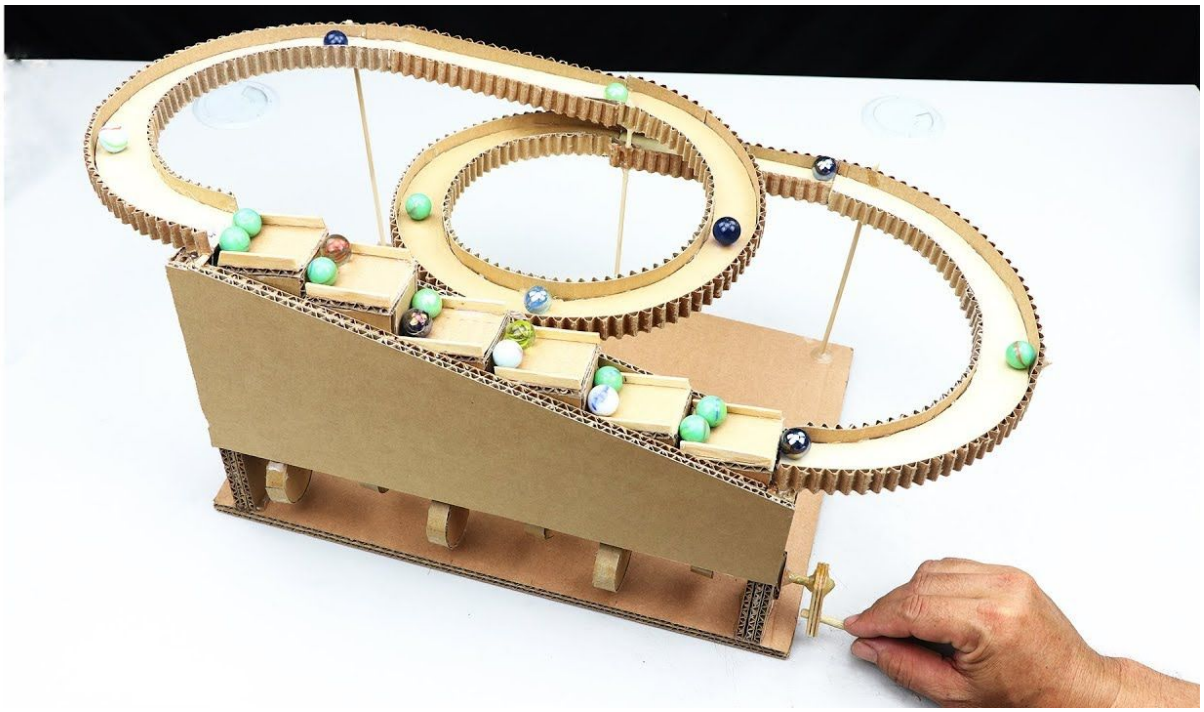
PROJECT DESCRIPTION

The goal of my project is to recreate a stair automaton that pushes marbles to the top of a spiral ramp and rolls them down to create an endless cycle of up and down.

The reference image I'm using for my project is…



A video of the automaton can be found here:

https://www.youtube.com/watch?v=2DSwobh5AvM

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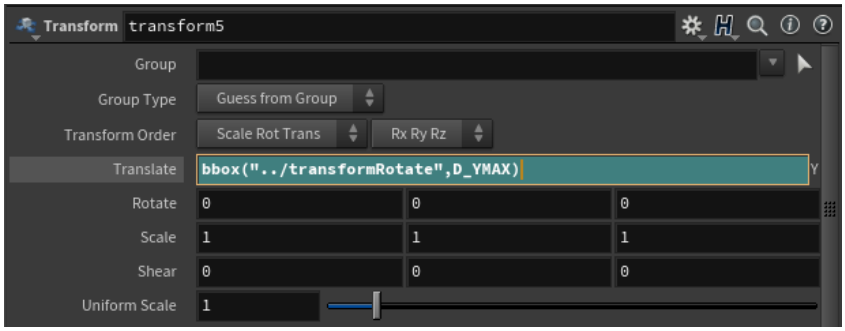
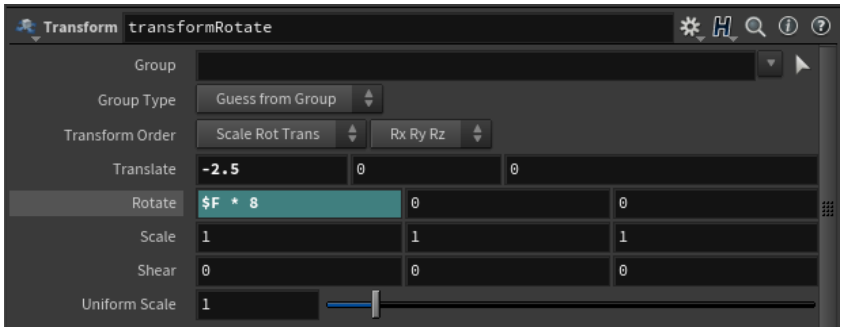
TECHNICAL GUIDE

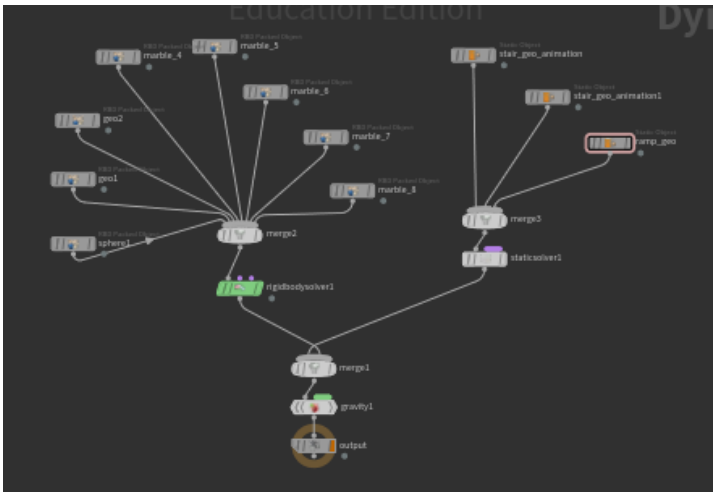
1 | Procedural Stair Animation

To create the procedural animation of the stairs, I used “bbox” on the stair geometry so that it would follow the rotation and maximum height of the wheel geometry to create the illusion that they are connected. I used the “bbox” on the odd stairs and then wrote the command out again on the even stairs to create the offset. On the wheels, I did a rotation by frame number and multiplied it by 8 to slow down the animation.





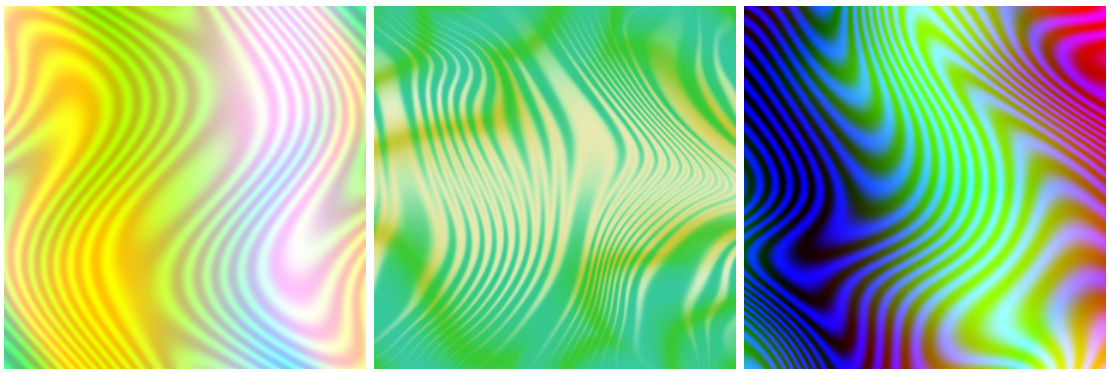
2 | Rolling Marbles

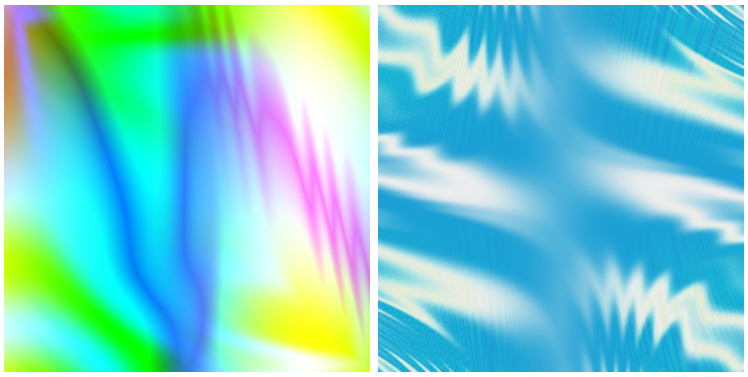


To create the animation of the rolling marbles, I used “RBDs.” By using RBDs, I was better able to capture the simulation of marbles rolling down a ramp. I created 8 different marbles and placed them at different spots in the scene to use as my RBD objects and then used the stair and ramp geometry as my collision objects.

3 | Marble Texture

To create a color map from the marbles, I used a random art generator in Python that I had created in a previous class. I adjusted the user inputs for the level of recursion and generated several images that had marble-like textures with bright colors. I adjusted the colors a little further in Photoshop and then used them as texture maps for the base color of my marble shader. I then lowered the opacity in the shader and enabled fake caustics to get the effect of glass.





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PROBLEMS ENCOUNTERED

1 | Cardboard Texture

The biggest issue I faced was making the model seem like it was constructed with cardboard. Creating a texture map to use as a color map and creating the shader was easy, but I struggled with creating the crinkled, inside texture of the cardboard. I ended up using an attribute wrangle on a grid to create a sin curve and then inserted it into the sides of my model but I was not able to use this technique for the sides of the ramp.