

Project 2: Procedural Modeling – Complex Scene

Flying Termites | Project Breakdown

Rendering Statistics

- Renderer : Mantra
- Avg. Render Time : 12 min / frame (resubmit: 14.3 min / frame)
- Image Resolution : 1280 x 720
- Number of Lights : 3 (Point, Environment, and Sphere Lights)
- Geometry Complexity : 13,078 Polygons

Sampling

- Noise Value : 0.01
- Min / Max Rays : 1 / 9
- Diffuse : 2
- Reflection : 2
- Global Quality : 2

Project Description

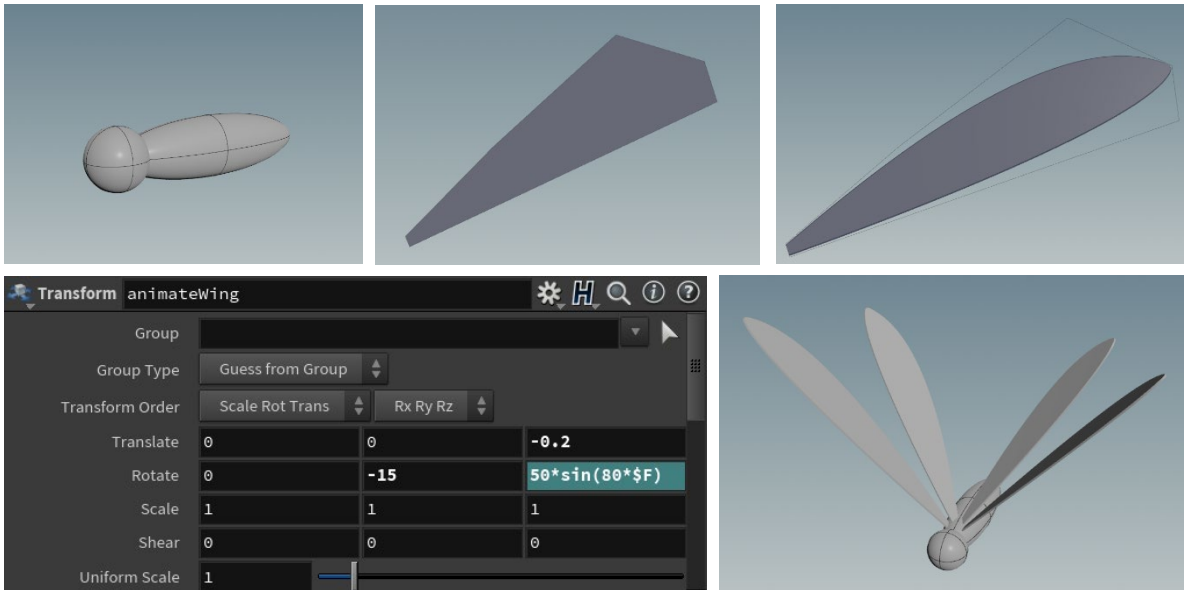
After learning the particles system in Houdini, I was inspired to recreate flying termites swarming around a streetlight. I recalled seeing this phenomenon very often back in Indonesia at nighttime. As I walked pass by a streetlight, there is almost always a swarm of flying termites! I then found a reference video that brought me back to reminisce those days and was determined to execute replicating this scene for this project. My focus is on exploring the particles system and lighting in Houdini, both of which are not my strongest areas. What I knew for sure was that I wanted my complex scene to have some sort of animation in it!



Process

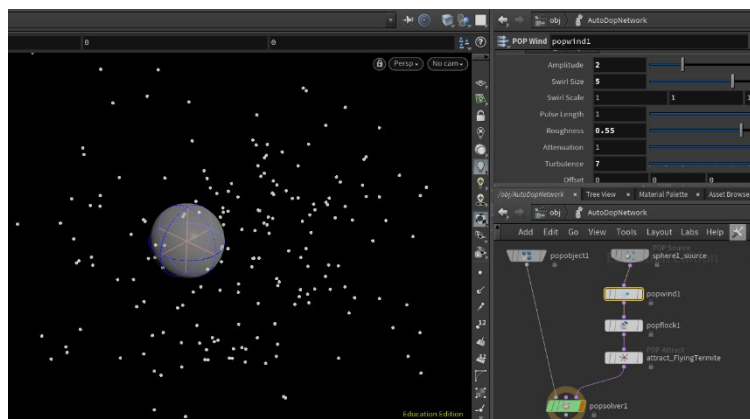
1. Modeling & animating a termite

I started with a couple of spheres to model the termite's body and head. Since I know there would be hundreds of instances of them and they're all going to be small in the frame, I made sure to model them as low-poly as possible. I used the *add* node to shape the wings and used a sin-based function in the z-rotation to animate the flapping movement.



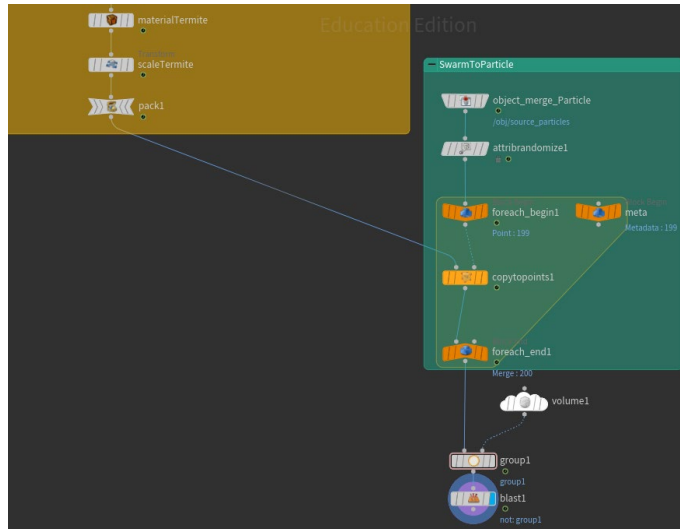
2. Particle system

My next step was to experiment with Houdini's particle system, which was the essence of my project. The first setting I tweaked from the default setup was to bypass the gravity node such that I have particles floating around instead of falling. With some more tweaks and additional nodes (POP Wind, POP Flock, and POP Attract), I was able to emulate flying termites that are chaotic, yet harmoniously swarming around a central object, which in my case the streetlight.



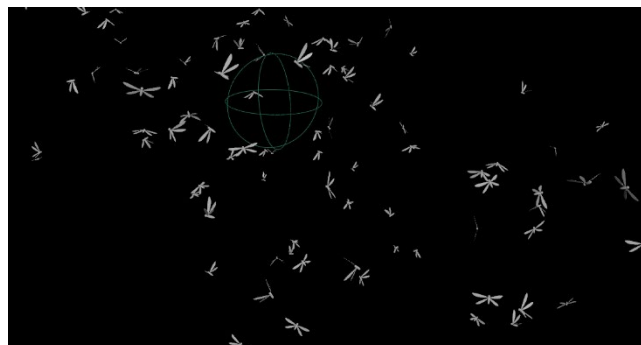
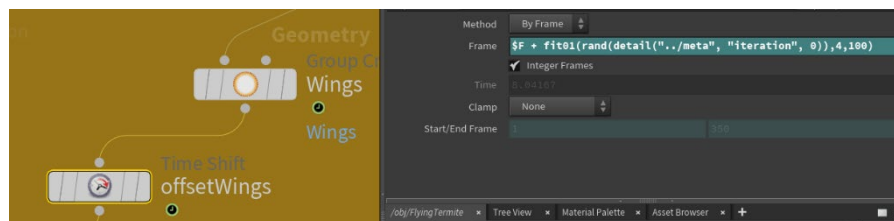
3. Instancing and culling the termite

Once I have the particle system setup, I merged in the source particle into my termite's geometry network. I added an attribute randomize for the scale of the points before plugging it into a for-each node such that I have some variations on the termites' size. I also cull the termites' geometry by camera's frustum using the volume node. This way, anything outside the camera view pane gets blasted and wouldn't be calculated, reducing the overall poly-count and hopefully, render time.



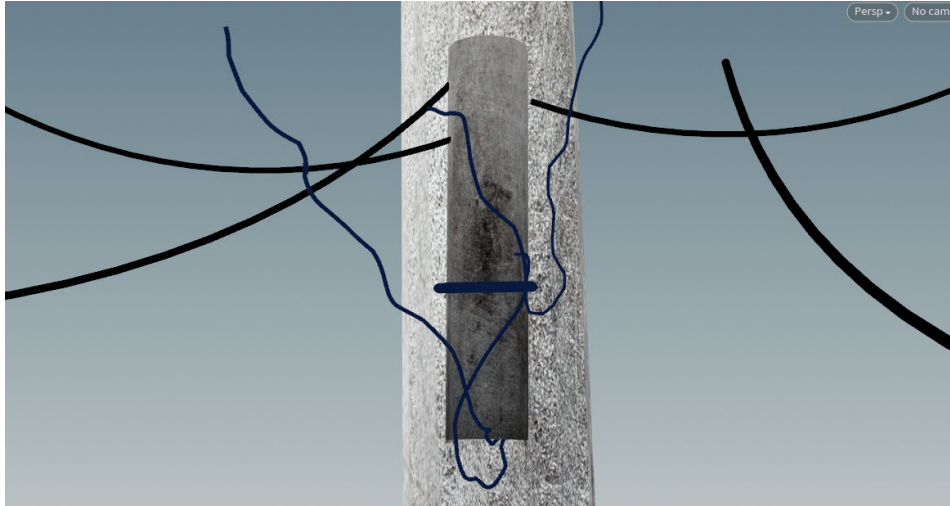
4. Adding offset to wing animation

My last step in creating a natural-looking swarms of termites is to offset some of the wings' animation, so they don't all flap in unison. I learned several methods to achieve this, and ultimately used the Time Shift node. The result: pleasantly chaotic!



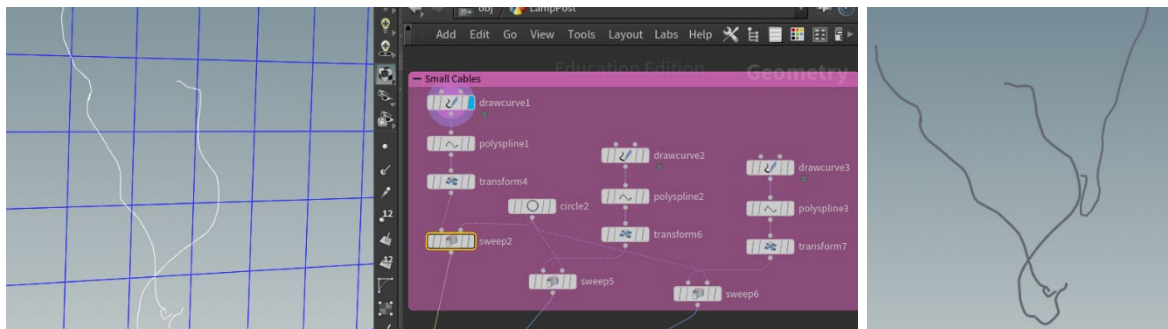
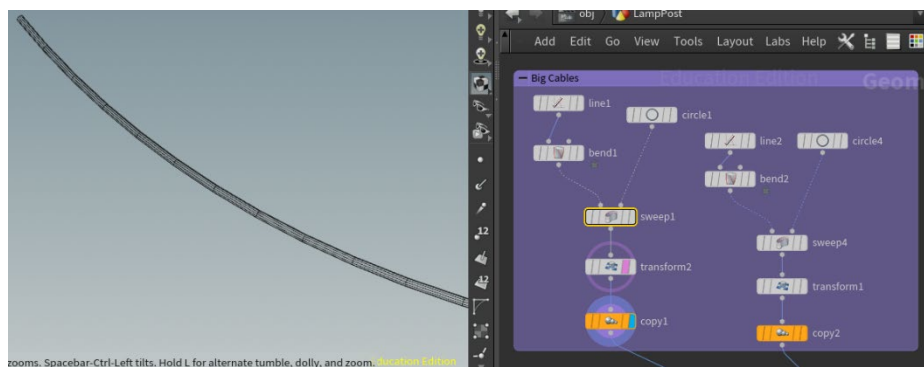
5. Modeling the environment

What I like from my reference video is that there isn't much environment on screen, but it serves the purpose well of creating a quiet atmosphere. Modeling in Houdini has been a challenge for me, but I tried to implement the tools that are available.



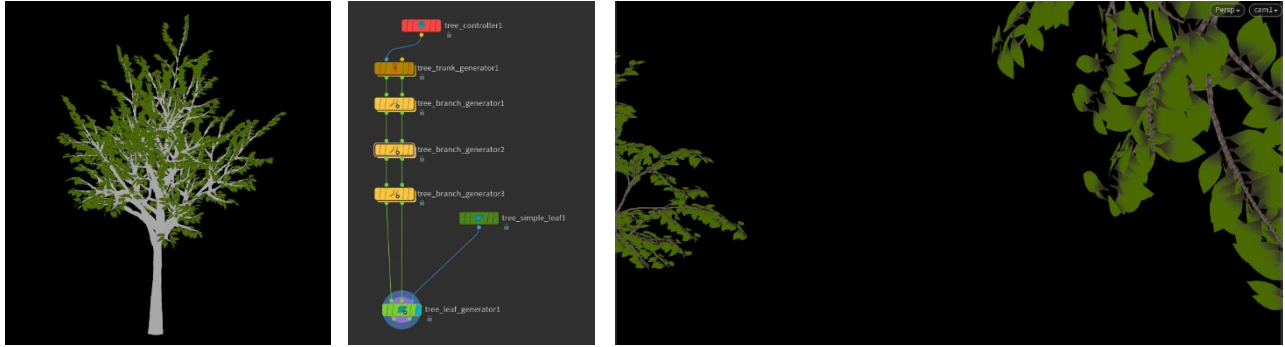
- The Cables

For the cables, I used 2 different methods. I used the Draw Curve tool to organically shape the thinner cables in the center, which gives a free-hand drawing look. For the bigger cables around the sides, I used the Line and Bend node to quickly shape an arc. Both approaches are topped off with a sweep and a circle node to give the thickness dimension.

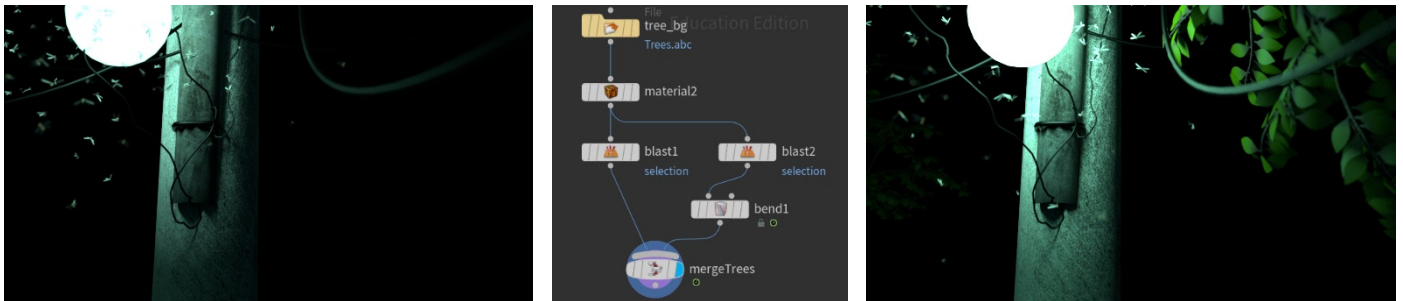


- The Trees

I wanted to capture the bits of leaves that are visible in the corner of my reference video. With the aid of SideFX Labs Tree Trunk, Branch, and Leaf Generator, I was able to quickly and procedurally create a tree!

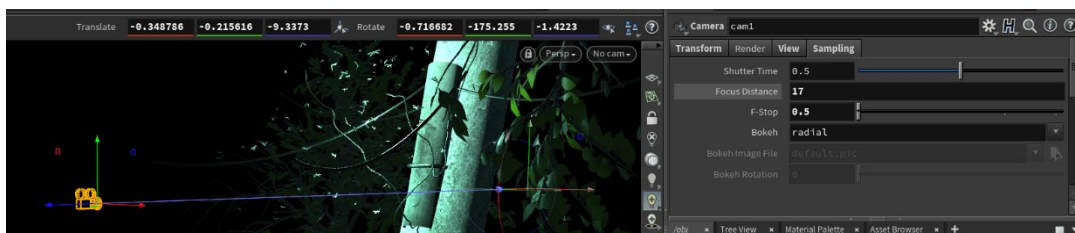


I learned soon enough, that when put in the render farm, the trees went missing. I presume it was due to the SideFX Labs tool that requires updates on each machine, so I exported and re-imported them as alembics, blasted the leaves that are off-screen, and used a Bend node to add some animation to the tree, emulating some wind.



6. Texturing, lighting, and camera setup

Finally, I gave my streetlight pole a metal texture and my tree trunk and branch a bark texture. In my reference video, there is only one source of light coming from that bright streetlight. I used sphere and geo lights while tweaking the colors, intensity, and exposure to get the bright oval shape streetlight. I added an environment light as a subtle fill light. My final touch is using my camera's depth of field to bring the focus to the swarming termites.



Final Render



Evaluation

I learned a lot more about Houdini throughout this project. Achieving the exact lighting that I wanted is still very challenging, but I'm slowly getting more comfortable with lighting in general after experimenting with all the different types of light and manipulating the settings. I learned to be creative with the tools, such as when creating the organic-shaped cables. Checking one or two frames from the render farm while it's still rendering is a good practice to ensure things are working. The trees were there when I test-render it locally, but it was gone when using the render farm. Troubleshooting is also a key skill in this field that I value. All in all, I hope you enjoy the calming scene of this swarming termites!

Resubmit

- Add leaf texture to trees
- Increase number of particles/termites
- Scale down the termites
- Modify the lamp post model slightly