

Bartlett RC11 2023-2024

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1 Houdini Fundamentals

This session covers the Houdini fundamentals. For the exercise, the following is expected:

- Alter 2 of the example setups we covered during class. This means, add/remove a minimum of 2 nodes to a setup. Changing the parameters is not enough. Adding a Null SOP or adding unconnected nodes does not count.
- Describe in detail what exactly your setup is doing. Some important keywords and terminology are *node*, *parameter*, *procedural*, *datatype*, *attribute*, *class*, *geometry*, *point*, *primitive*, *vertex*, etc.. Obviously, the example below cannot be used.

An example of such a description could be:

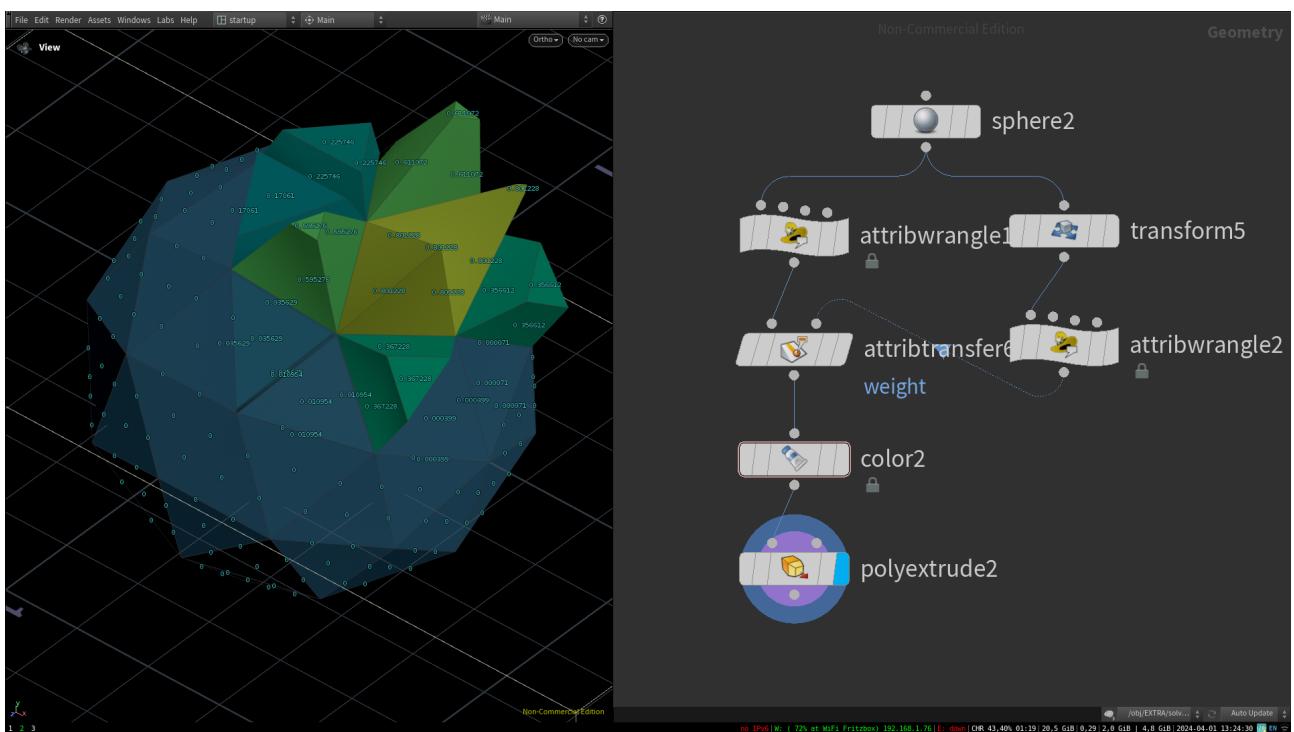
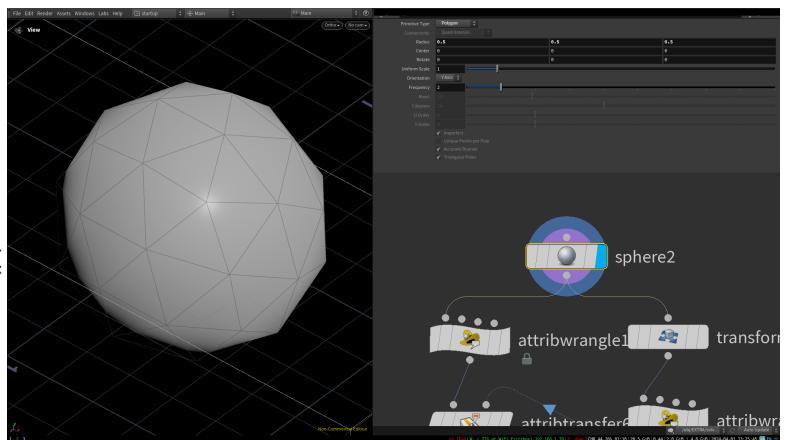


Figure 1: Houdini Fundamentals: Setup 1 Overview

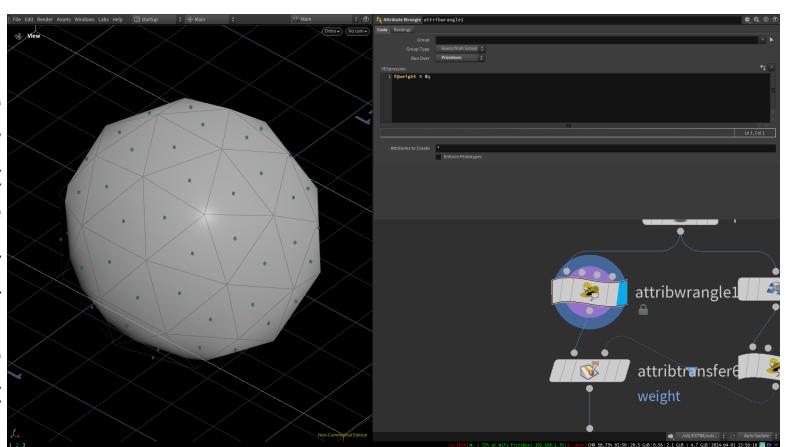
1: Sphere SOP

The "sphere" is of primitive type: polygon. One of the basic geometric data types that contains points, primitives of type polygon, and vertices.



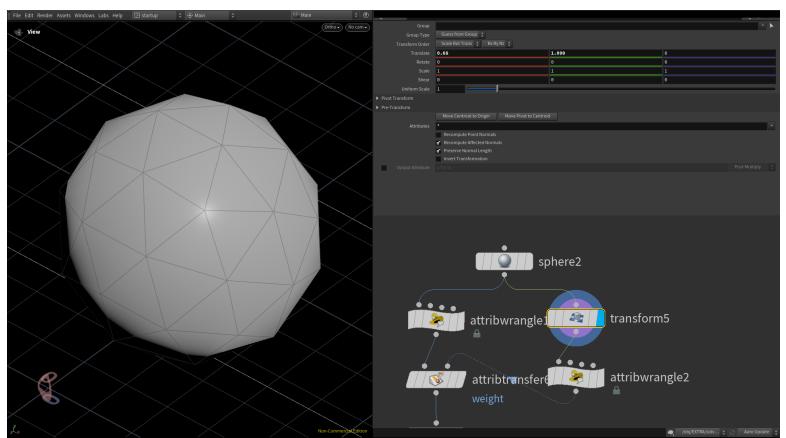
2: Attribute Wrangle SOP

We create an "Attribute Wrangle" SOP, where we make a "weight" attribute. The attribute is of type float as described by the "f@" declaration. The attribute is set to run over primitives. This is because later in the node setup, we will use a PolyExtrude node where we will need a primitive attribute to drive the extrusion value. The value is set to 0 (which will be interpreted as 0.0 because of the float declaration) because later, we can interpolate between 0 and 1.



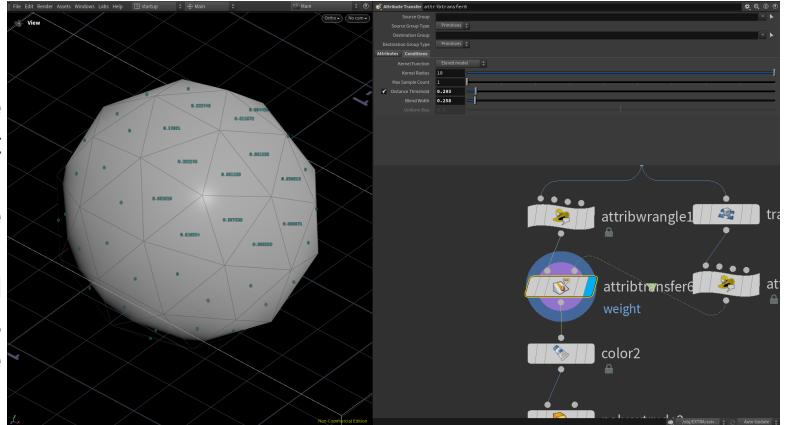
3: Transform SOP

Then, we lay down a "Transform" SOP. This will be the attractor; it is just a duplicate of the original sphere. The distance between this duplicate (attractor) and the original sphere will dictate the final extrusion value.



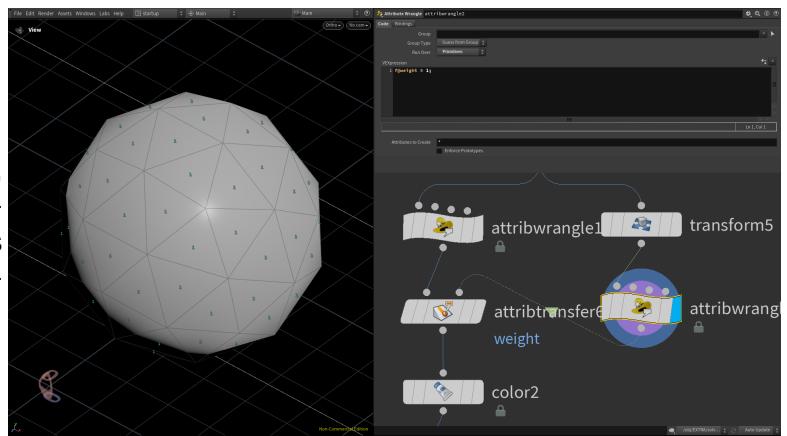
4: Attribute Transfer SOP

The "Attribute Transfer" SOP uses the "weight" primitive attribute to write out the distance value between the original sphere and the attractor. By setting the original 'weight' attribute as float, we can have value interpolations between 0 and 1. If we had set the weight attributes to integers, we could not interpolate; the output values would be binary (0 or 1).



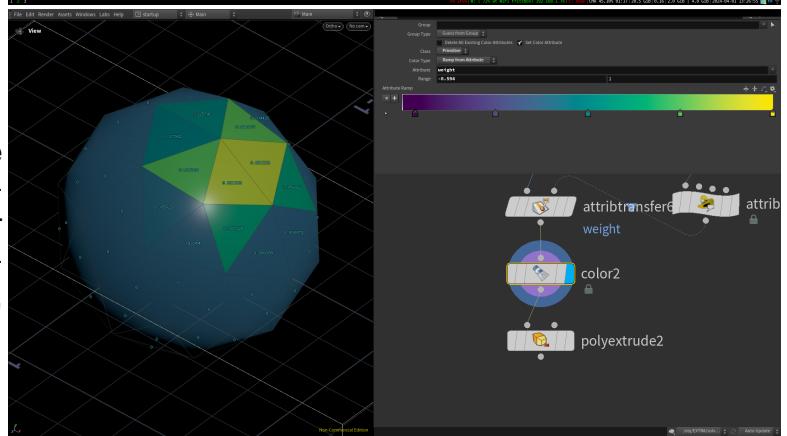
5: Attribute Wrangle SOP

The same as the previous Wrangle SOP, only with the opposite value. The reason we interpolate between 0 and 1 is because it is easier to work with normalized values than arbitrary values.



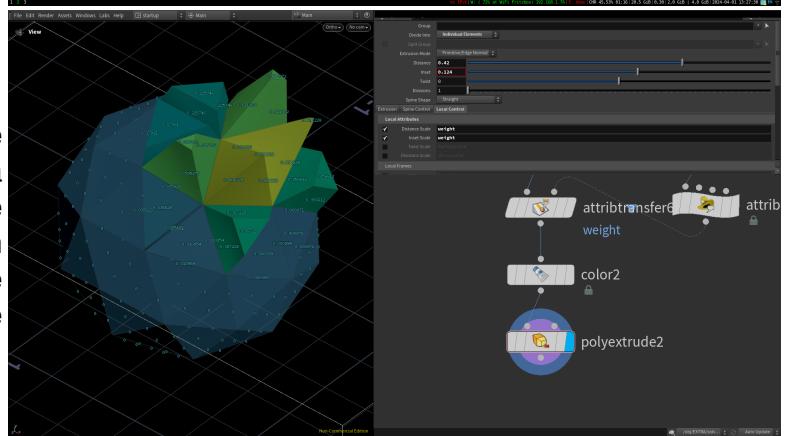
6: color SOP

A visualisation of the "weight" primitive attribute according to the "viridis" colorscheme. Because we normalized our values between 0 and 1, it is more stable if we would ever change distances, or geometry inputs.



6: PolyExtrude SOP

Using the "weight" value in "distance scale", we use the weight value as a multiplier of the extrusion value. If we set the distance value to 0, the extrusion is 0 ($0 \times \text{weight}$). If we set the distance value to 1, we get the full weight value as extrusion ($1 \times \text{weight}$)

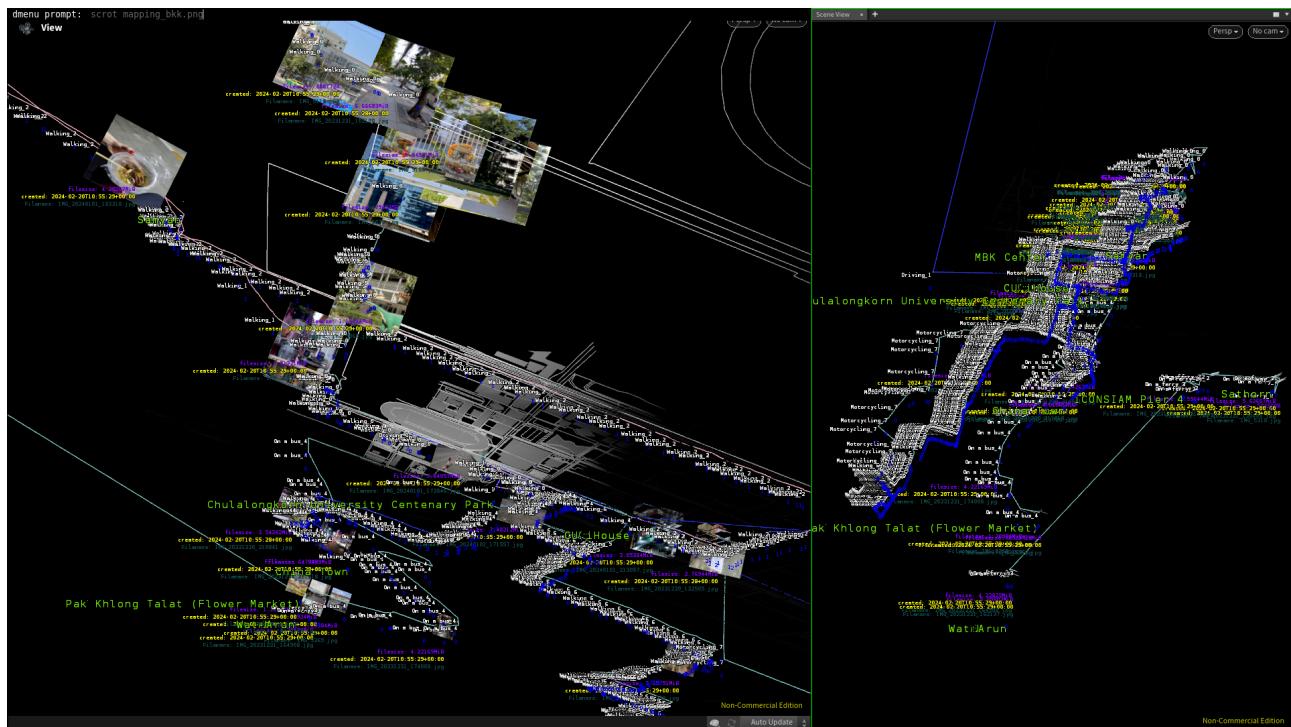


2 Visualizing GPS and Image Metadata

This session covers how to overlay your Google Maps trajectories with images in Houdini. For the assignment, the following is expected:

- Load in your own images and GPS data.
- Generate a series of images depicting your travels.
- A short description of the procedure.

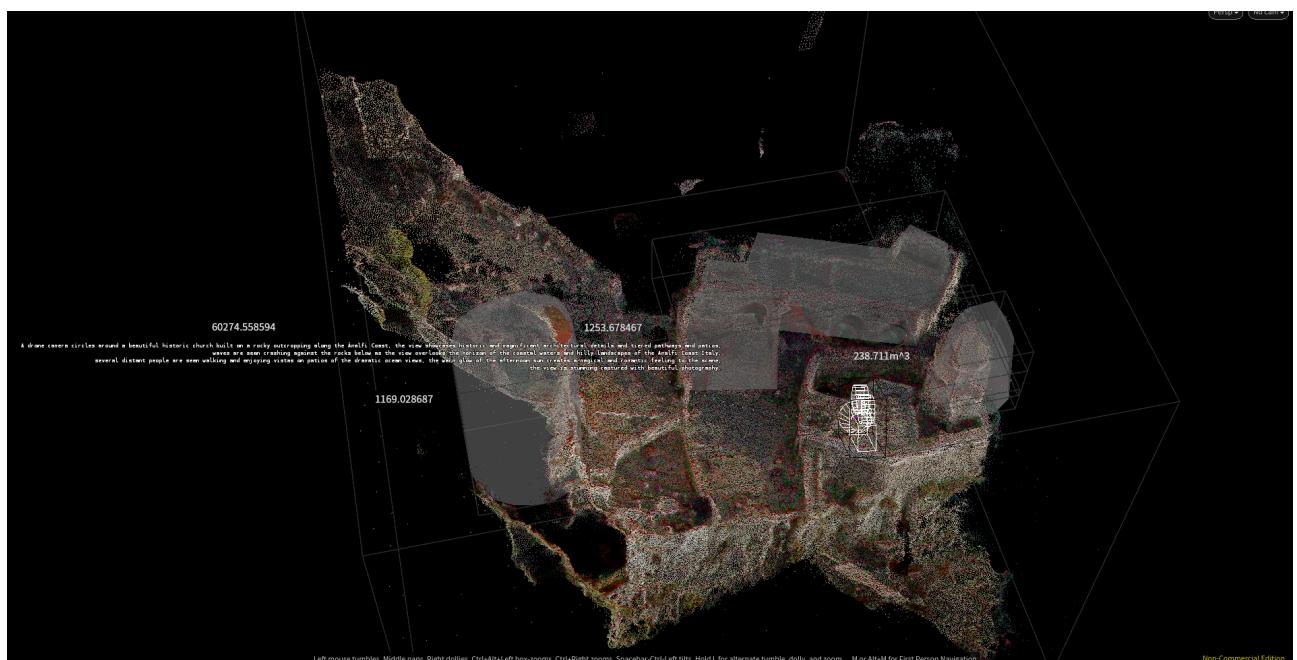
An example of such a description would be :



3 video to 3D Model

In this workshop, we covered how to generate a 3D model from a video of a subject. In this case, this was the Sora AI video published from OpenAI. For the assignment, the following is expected.

- Generate one or more photogrammetry models from a video/livestream/webscraped/Google Images/YouTube. Take footage related to your projects.
- Reconstruct your camera path.
- Find a way of adding information to the subject. (Volume speculation, curvature, segmentation, etc.)
- Visualize your model as a collection of images/renders.
- A short description of the procedure.



4 Visualizing JSON in Houdini

In this workshop, we covered how to generate a JSON file that can be read and processed in Houdini. This is useful if you are constructing a .pickle or JSON file and want to know how this can be visualized in Houdini. The following is expected for the assignment.

- Based on your project and other workshops, visualize and produce a JSON file. This can take many forms. It is up to you how to showcase this in the best way. Please also include a snippet of your JSON file.



The image shows the Houdini Viewport interface. On the left, there is a code editor window displaying a JSON snippet. On the right, the 3D view shows several 3D text elements floating in space, each containing a different quote from the movie Dune. The quotes are:
1. "Kis, secrets are buried deep beneath the surface."
2. "In the sands of Arrakis, the fate of ci
3. "in:blood and sand, survival and redemption echo across the vast expanse of desert."
4. "A struggle for power and survival unfol
5. "s beneath the relentless suns of Arrakis."
6. "The mysterious spice Melange holds the
7. "sterious spice Melange holds the key to control and prosperity."
The text is rendered in a stylized font, some with shadows and highlights, and is positioned at various heights and depths within the 3D space.

```
1 [ {  
2   "folder": [  
3     {  
4       "paragraph": "iDistributed by\nNIPPON HERALD & OFFICE",  
5       "filmID": "Dune.mp4",  
6       "image_name": "frame",  
7       "model_path": "model.obj",  
8       "image_n": 25,  
9       "time": 100,  
10      "film_path": "Dune Part Two Official Trailer 3.mp4"  
11    },  
12    {  
13      "paragraph": "In the sands of Arrakis, the fate of ci",  
14      "filmID": "Dune.mp4",  
15      "image_name": "frame",  
16      "model_path": "",  
17      "image_n": 15,  
18      "time": 100,  
19      "film_path": "Dune Part Two Official Trailer 3.mp4"  
20    },  
21    {  
22      "paragraph": "A struggle for power and survival unfol",  
23      "filmID": "Dune.mp4",  
24      "image_name": "frame",  
25      "model_path": "",  
26      "image_n": 30,  
27      "time": 100,  
28      "film_path": "Dune Part Two Official Trailer 3.mp4"  
29    },  
30    {  
31      "paragraph": "The mysterious spice Melange holds the",  
32      "filmID": "Dune.mp4",  
33      "image_name": "frame",  
34      "model_path": "",  
35    }  
36  ]  
37}  
38
```