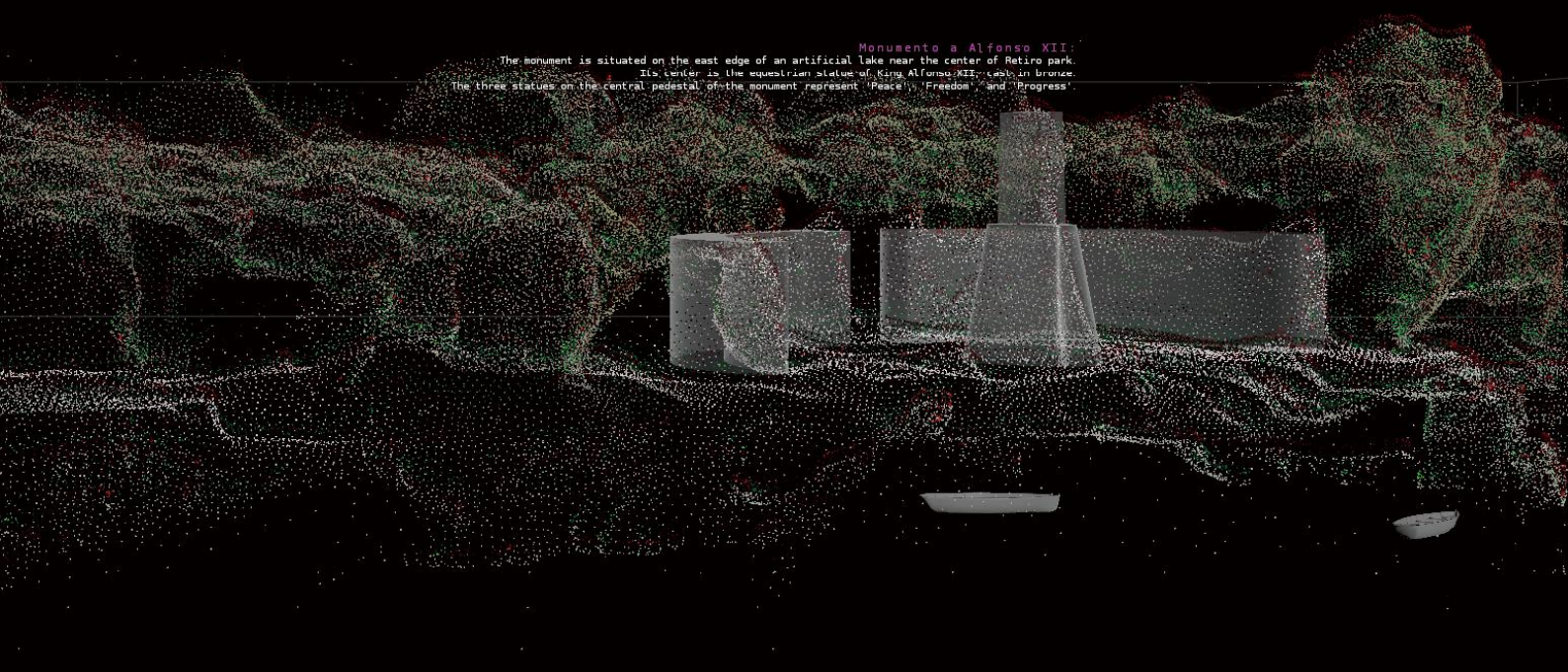
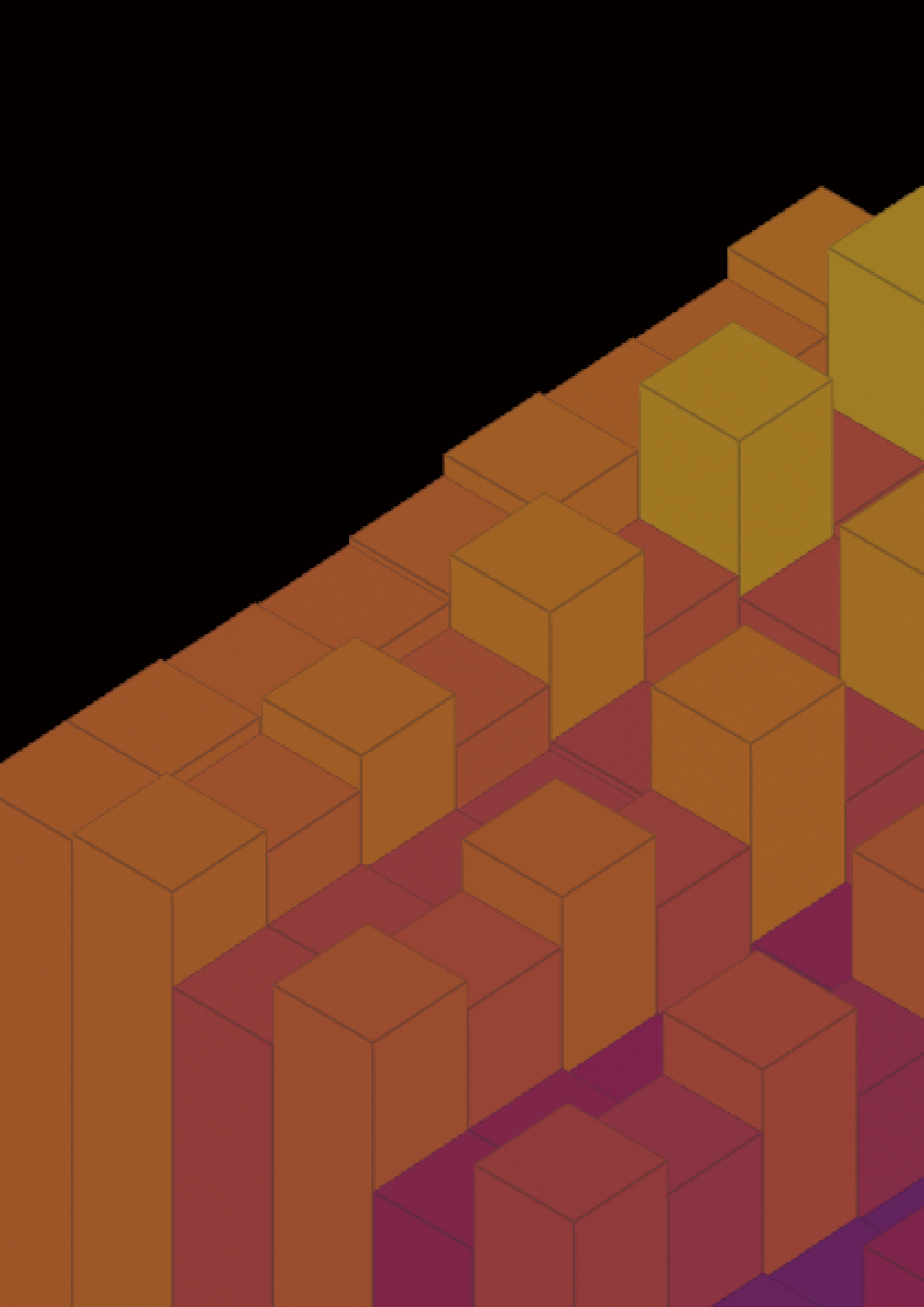
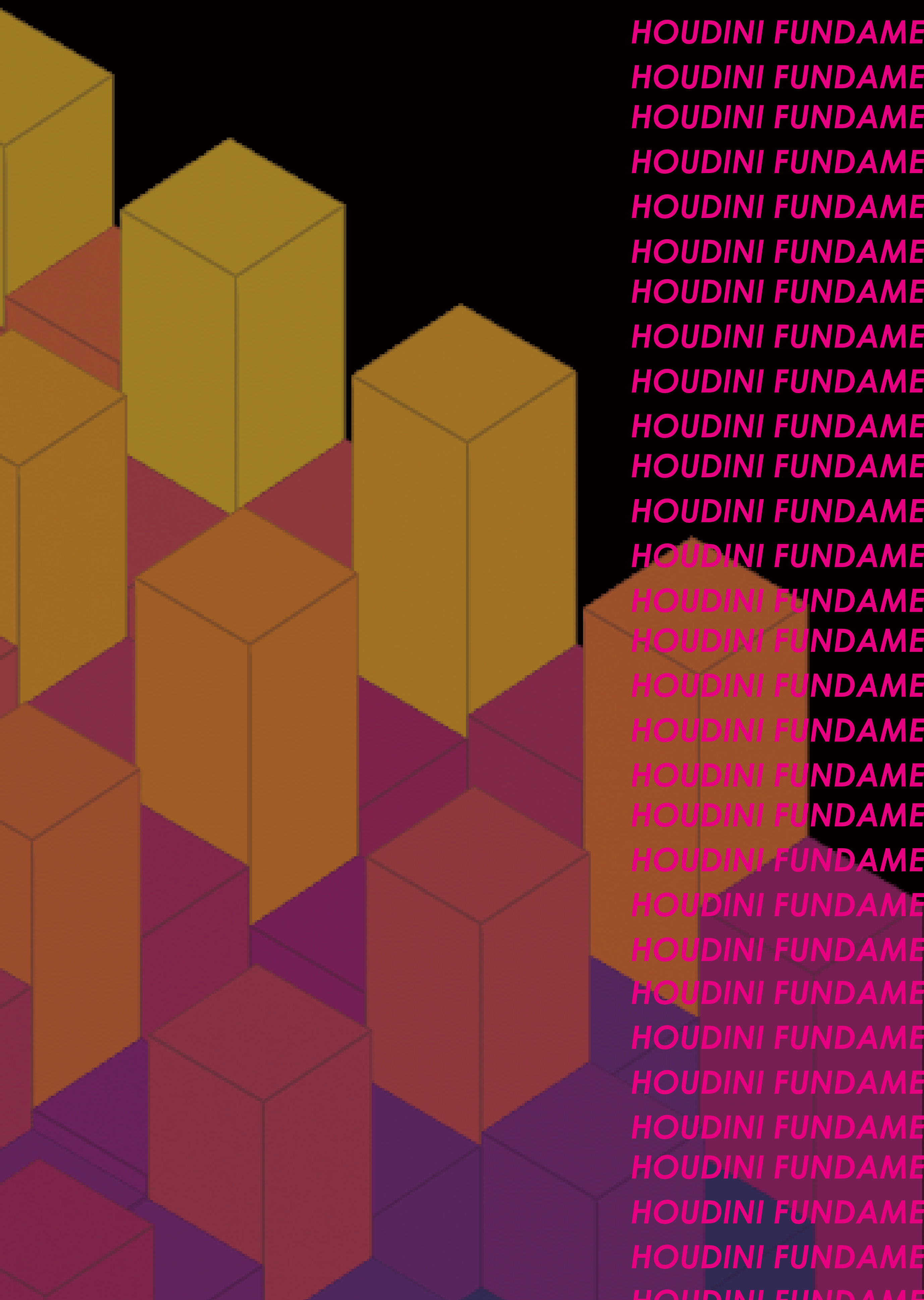
HOUDINI ASSESSMENT

RC11_22161736_HoudiniReport







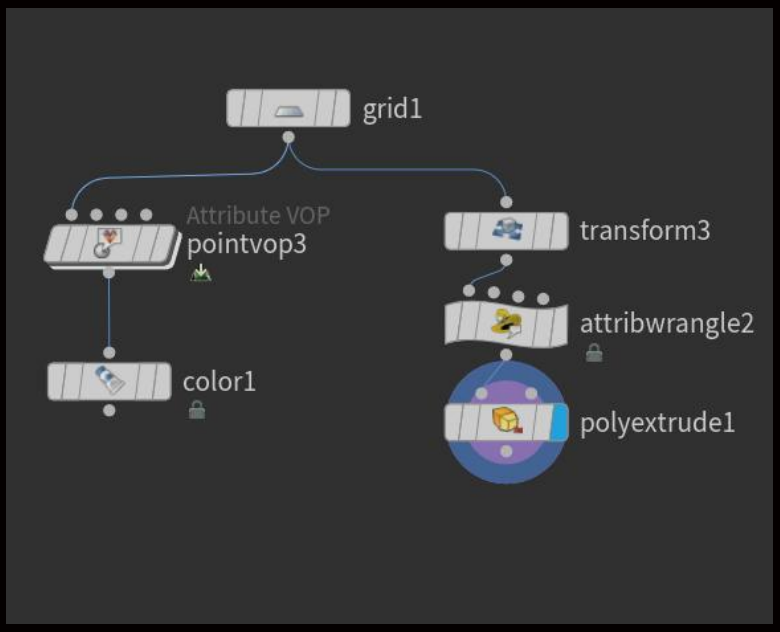
HOUDINI 1

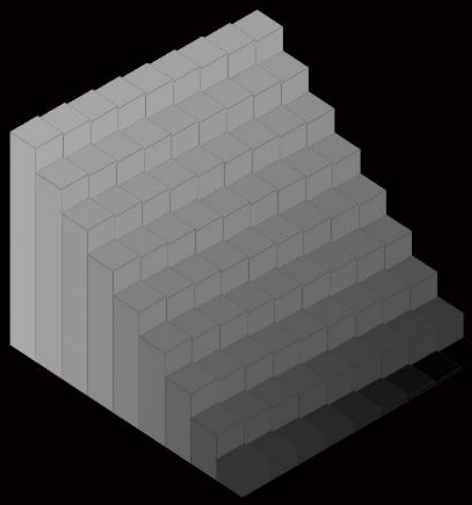
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS
HOUDINI FUNDAMENTALS

In this assessment, I completed all the exercises and understood whole functional modules in class. Afterwards, based on what was taught, I made modifications to two of exmaples.

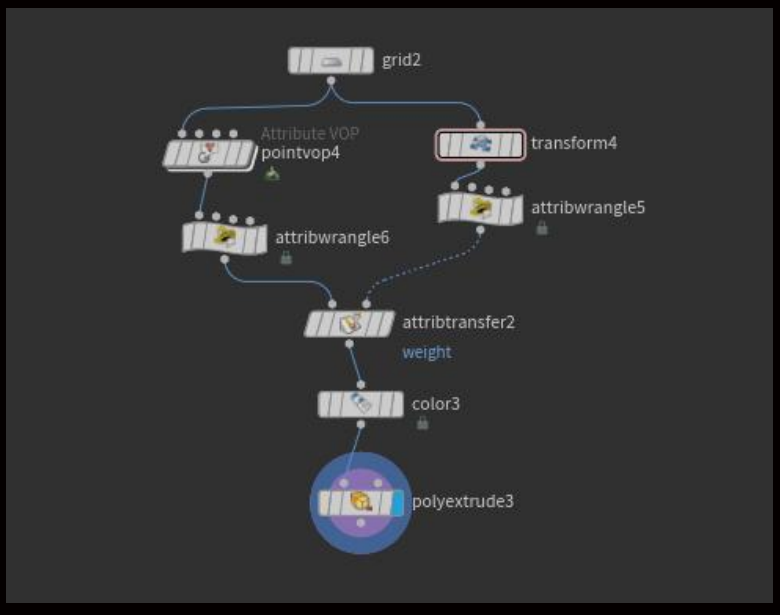
1.1 Generate a staircase, steps could be controlled

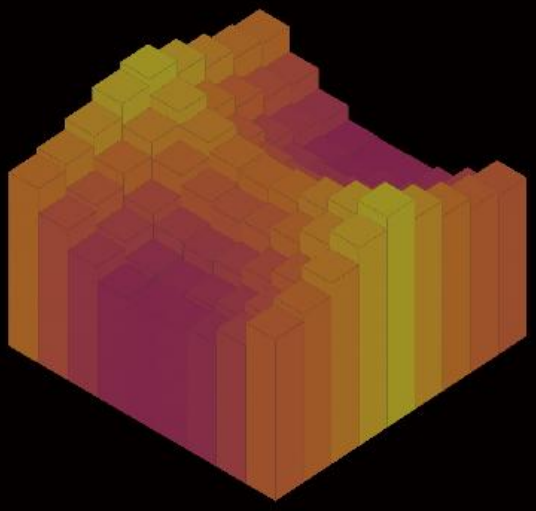
Original exmaple:





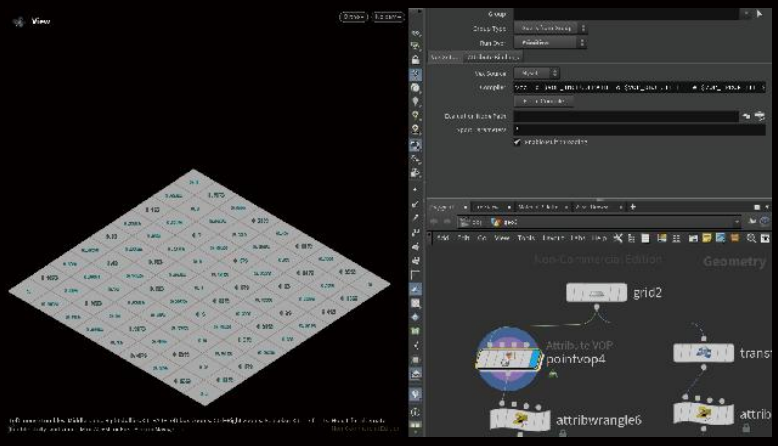
Altered result:





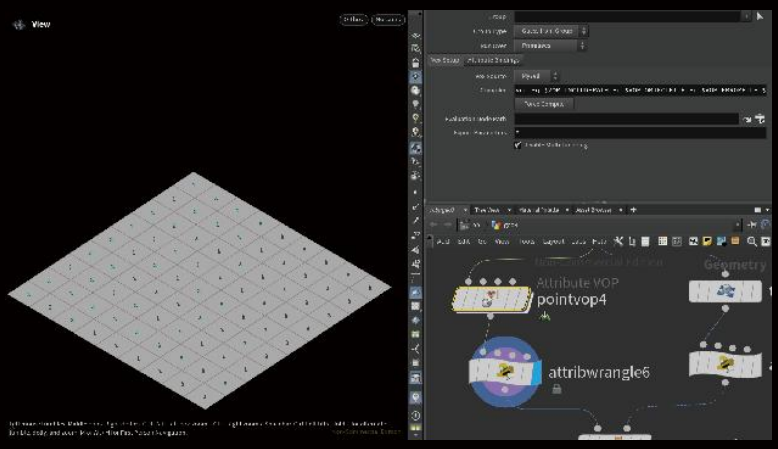
1.1.1 Grid SOP, Pointvop SOP

*The Grid is of primitive type: polygon. One of the basic geometric datatypes that contains points,primitives of type polygon. Here the grid I set is 10*10 in ZX Plane, and be divided into 10*10 (row and column). Pointvop including more detail procedure which aim to create float value for each grid from 0 to the number of grids.*



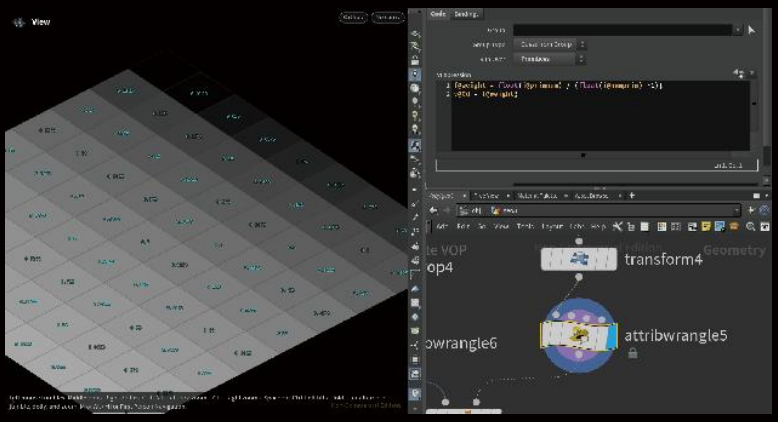
1.1.2 Attribwrangle SOP 1

Attributwrangle SOP 1(added node), where I wrote 'weight' as attribute. The attribute is of type float as described by the "f@" declaration. The attribute is set to run over primitives, because in the node setup later, I use a PolyExtrude node where we will need a primitive attribute to load the extrusion value. The value is set to 1(Limit the maximum value of extrusion).



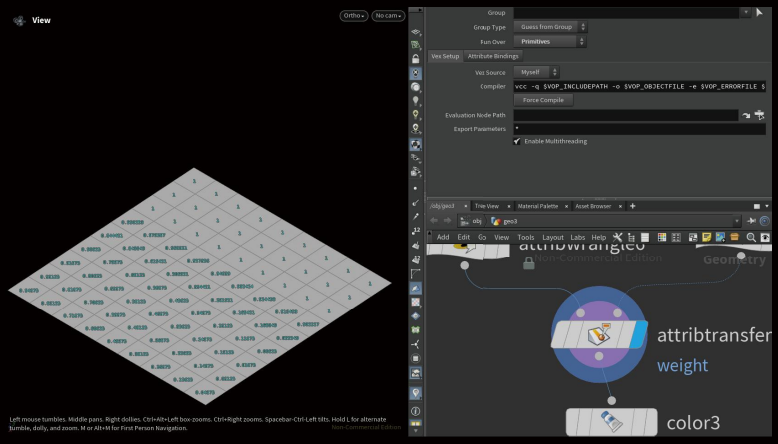
1.1.3 Transform SOP & Attribwrangle 2

Then, I laid down a Transform SOP.This will be the attractor; it is just a duplicate of the original grid. The distance between this duplicate (attractor) and the original grid will effect the final extrusion zones. Attribwrangle 2 I wrote this code, in order to make the value from a corner to another from 0 to 1.



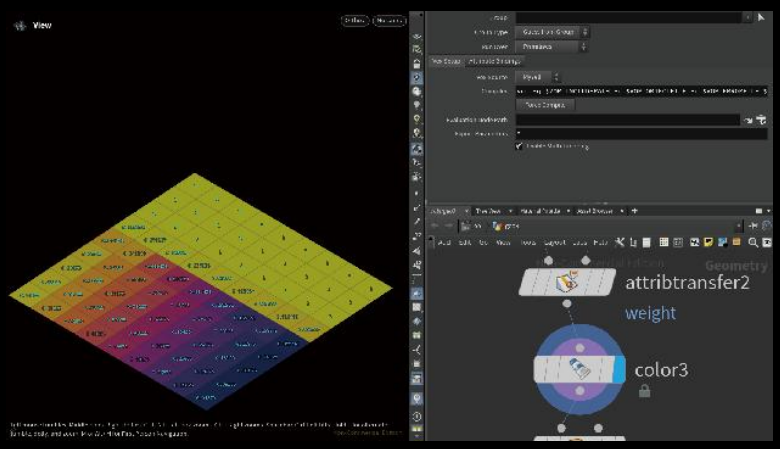
1.1.4 Attribtransfer SOP

Attribute Transfer SOP (added node) uses the "weight" primitive attribute to create the distance value between the original grid and the transformed one. By setting the original 'weight' attribute as float, we can have value interpolations between 0 and 1.



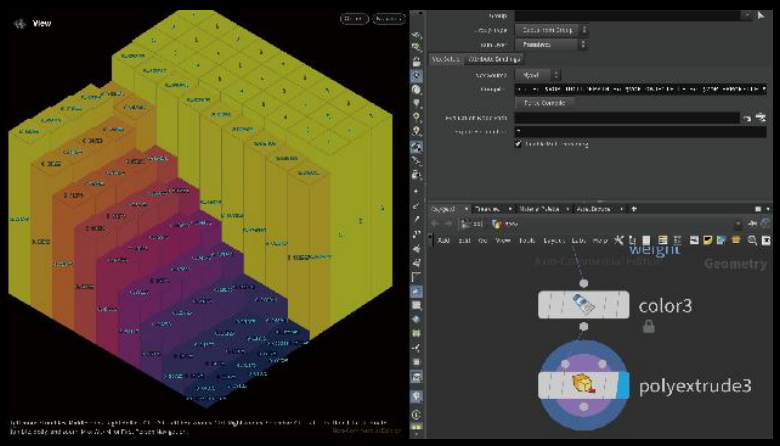
1.1.5 Color SOP

Visualize the primitive attributes of "weights" based on the "viridis" set color scheme. Because I normalized my values between 0 and 1, it is more stable if I change the distance or geometric input.



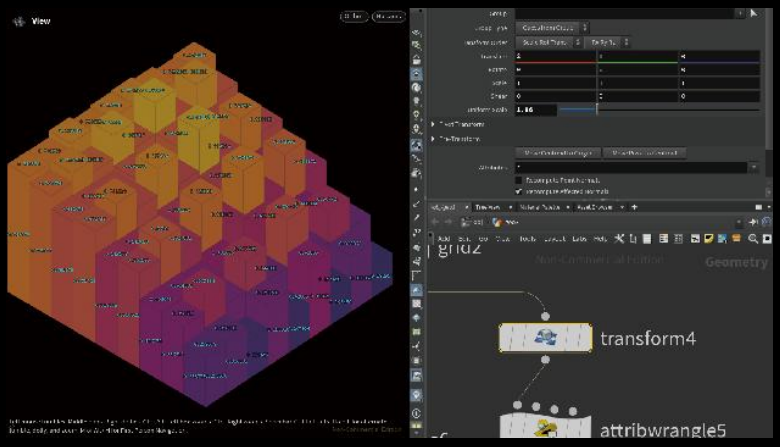
1.1.6 Polyextrude SOP

The Polyextrude SOP, the volume be extruded be divide into individual elements. 'Distance' column could be adjusted to control the distance be extruded (here it could be understand as height). 'Distance scale' is attributed by 'weight'.



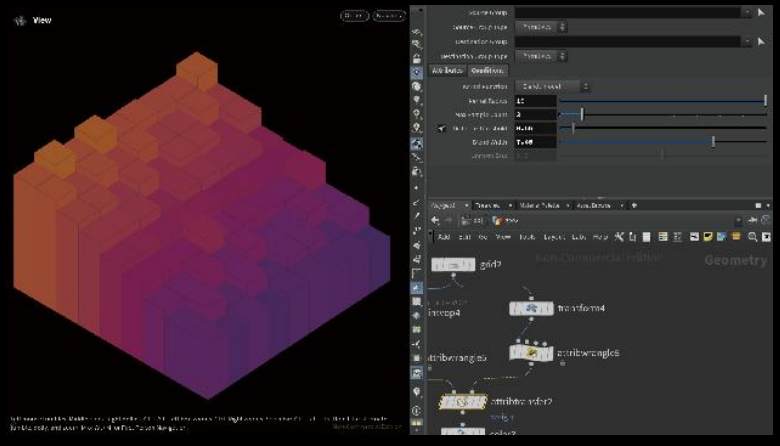
1.1.7 Adjustment_a

The effect is mainly influenced by the Transform, by adjusting settings of transform. The parameter of 'translate' , 'Rotate', 'Scale', 'Shear' and 'uniform Scale'



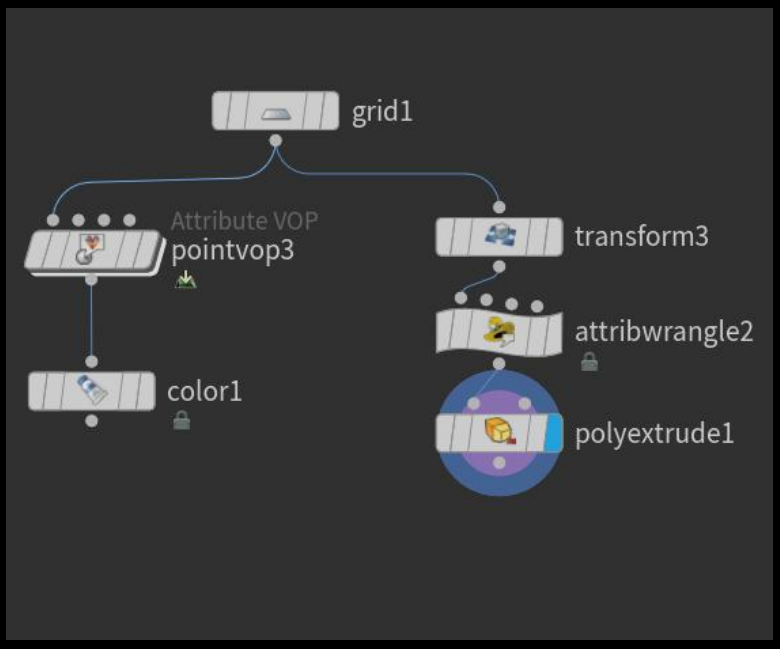
1.1.8 Adjustment_b

Attribtransfer also effect the performance, by adjusting parameter named 'Max Sample Count', 'Distance Threshold' and 'Blend Width'.

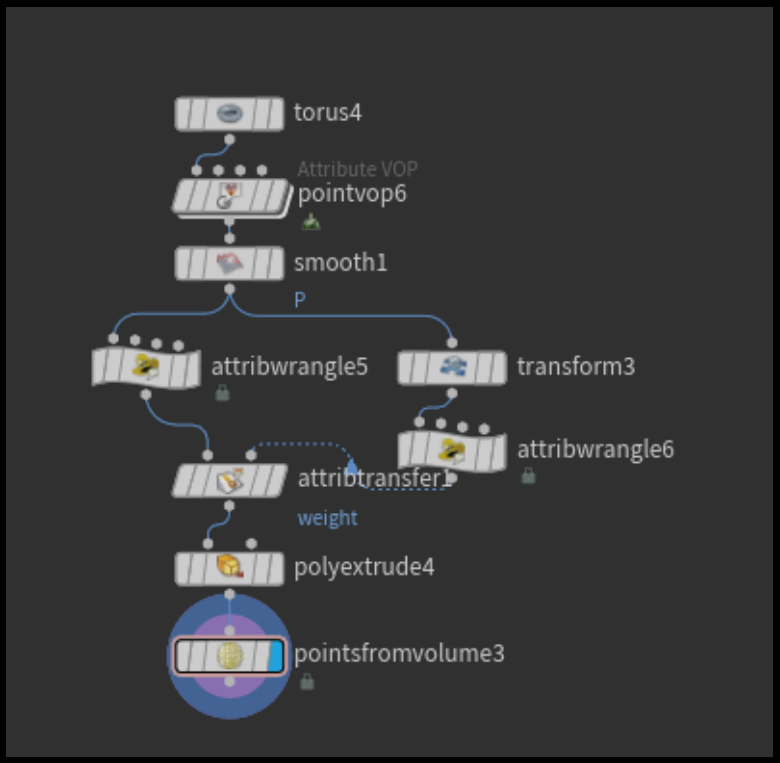


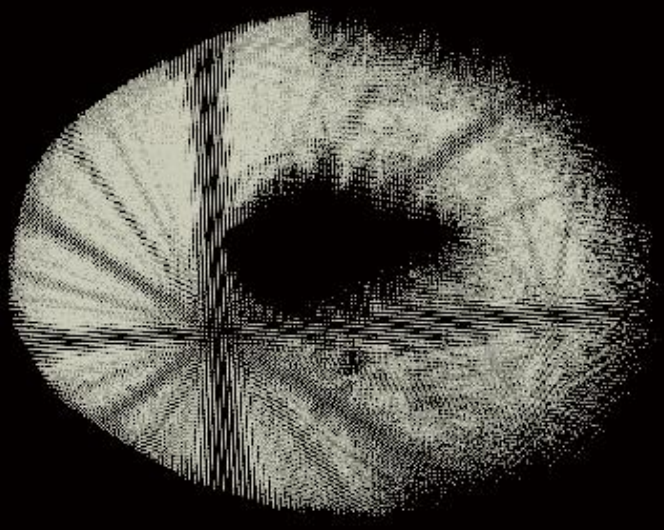
1.2 Generate a staircase, steps could be controlled

Original exmaple:



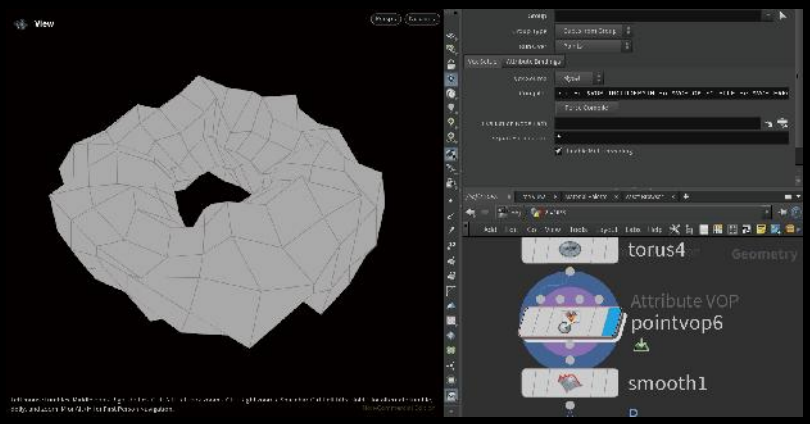
Altered result:





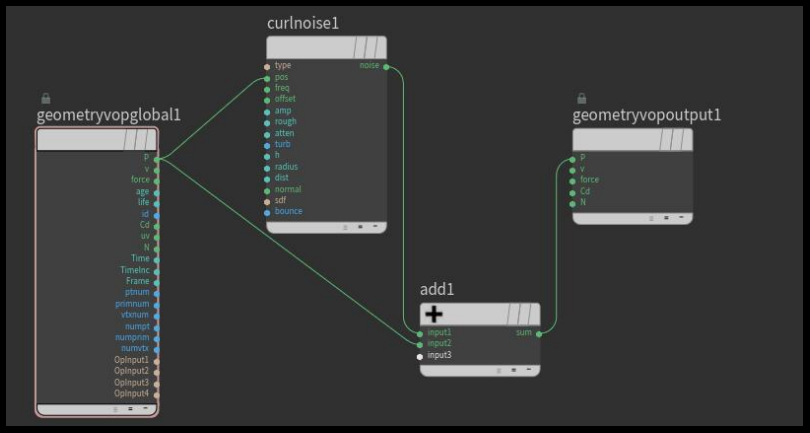
1.2.1 Torus SOP & Pointvop SOP

The Torus is of primitive type: polygon. One of the basic geometric datatypes that contains points,primitives of type polygon. Here the torus I set on Y Axis, with 0.5 radius and 0.25 ring. It be divided into 12 rows and 24 columns.



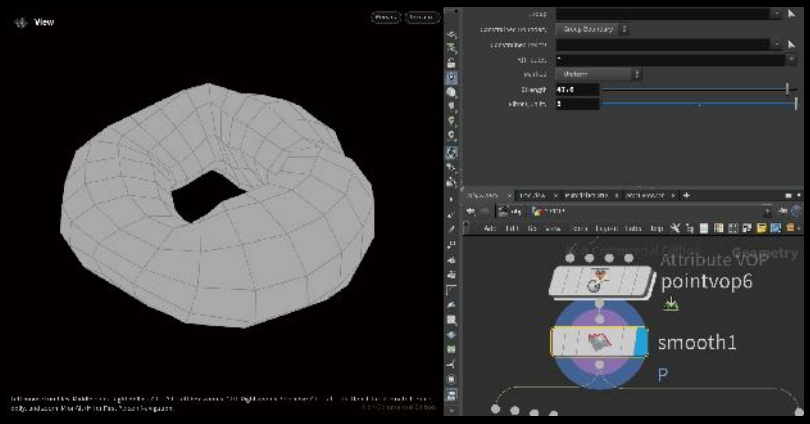
1.2.2 Pointvop SOP

The Vop SOP(added node) is similar to Attribwrangle in my understanding (VEX), Here I work in Vop, linking P with Position of curlnoise, and input to add_1, curinoise also input to add_1. Then the combined value input to geometryvop and make output. I also used parameter like 'Amplitude' and 'Roughness' to control the curvature.



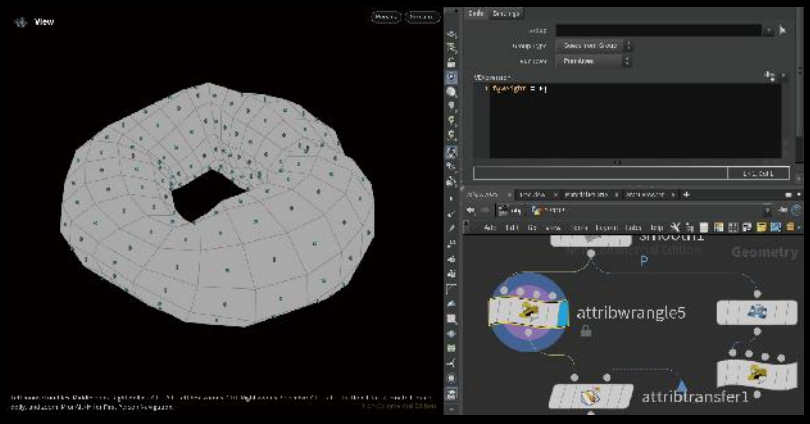
1.2.3 Smooth SOP

The Smooth (added node)rearranges the existing points in the geometry to reduce roughness (attribute in my case: Point Position). The parameters effect this SOP are 'Strength' and 'Filiter Quality', The volume would be smoother when raising the 'Strength', and be smoother when input lower 'Filiter Quality'

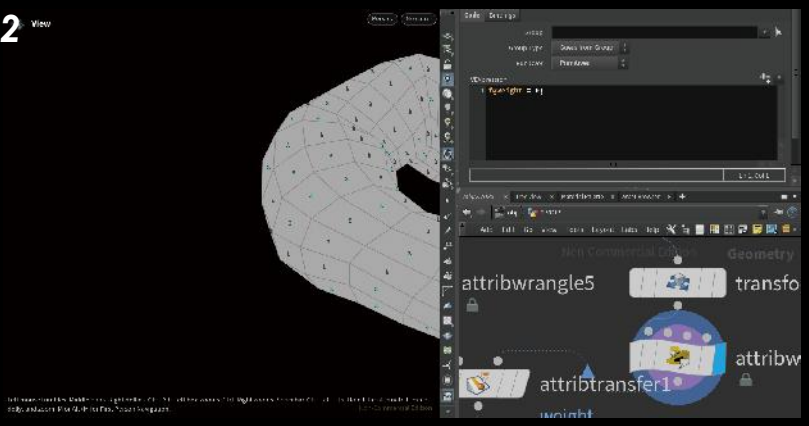


1.2.4 Attribwrangle SOP 1

Attribute Wrangle 1 I created which I made a 'weight' attribute. The attribute is of type float as described by the "f@" declaration. The attribute running over primitives. This is because later I will use a PolyExtrude which need a primitive attribute to drive the extrusion value. The value is set to 0.

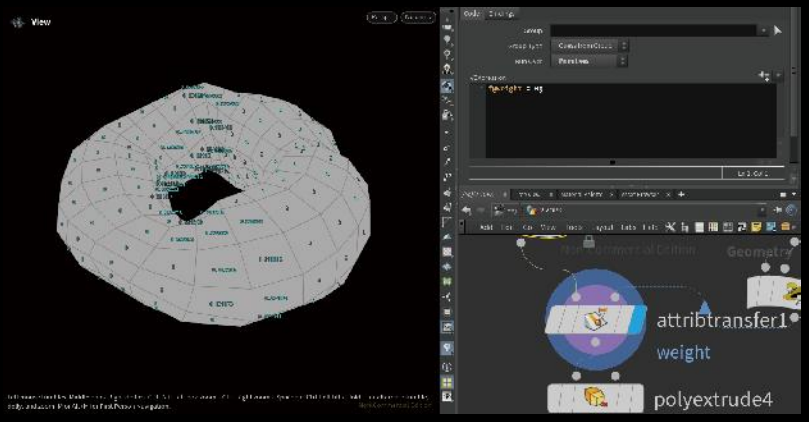


1.2.5 Transform & Attribwrangle SOP 2



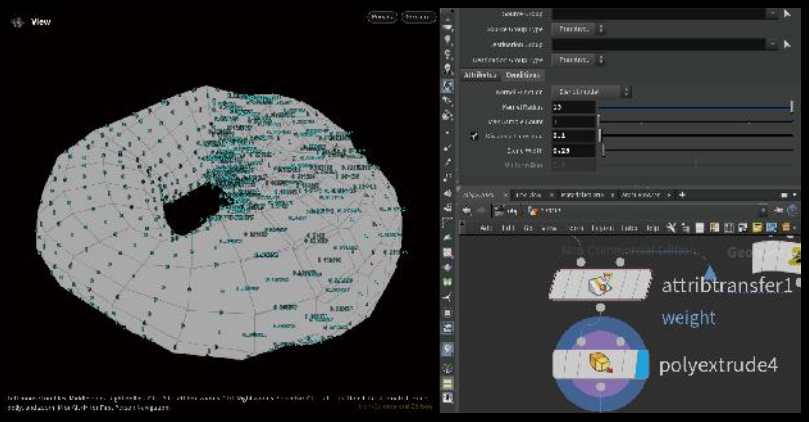
The Transform SOP could create the attractor, just a duplicate of the original sphere. The distance between this attractor and the original torus will determine the final extrusion value. Adjusting the 'Uniform scale'. The Attribwrangle 2 here set value to1. I could interpolate between 0 and 1 in the way later.

1.2.6 Attribtransfer SOP



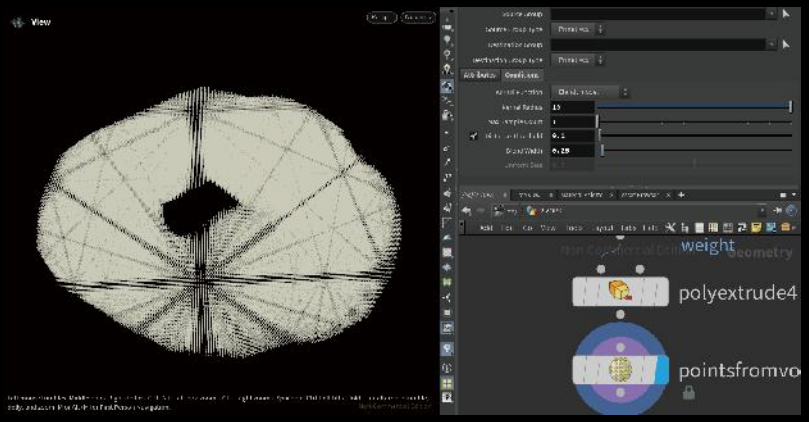
The "Attribute Transfer" SOP (added node) uses the 'weight' primitive attribute to create the distance value between the original grid and the transformed one. By setting the original 'weight' attribute as float, I can get the value interpolations between 0 and 1.

1.2.7 Polyextrude SOP



The Polyextrude SOP, the volume be extruded be divide into individual elements. 'Distance' column could be adjusted to control the distance be extruded.

1.2.8 Pointsfromvolume SOP

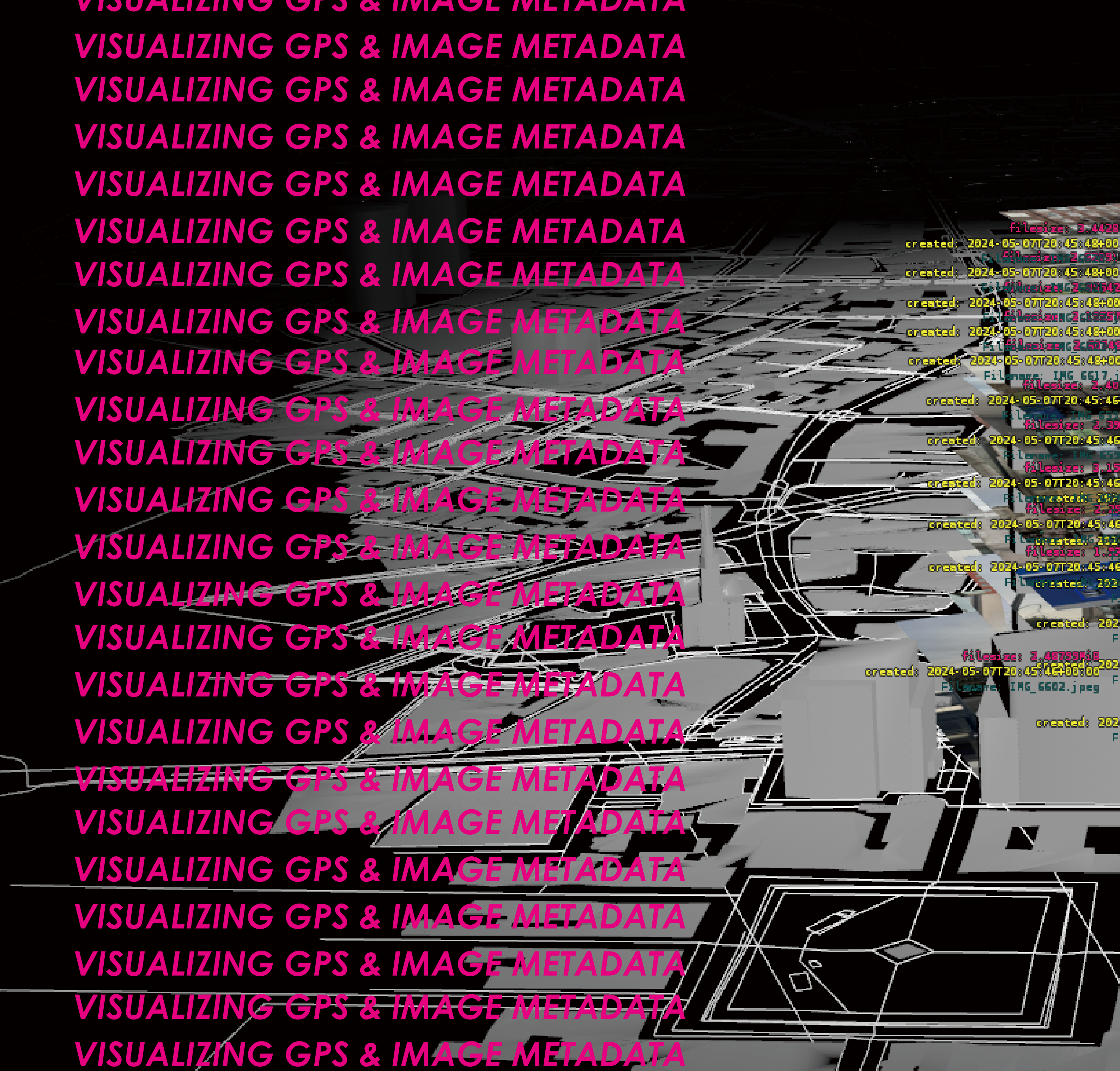


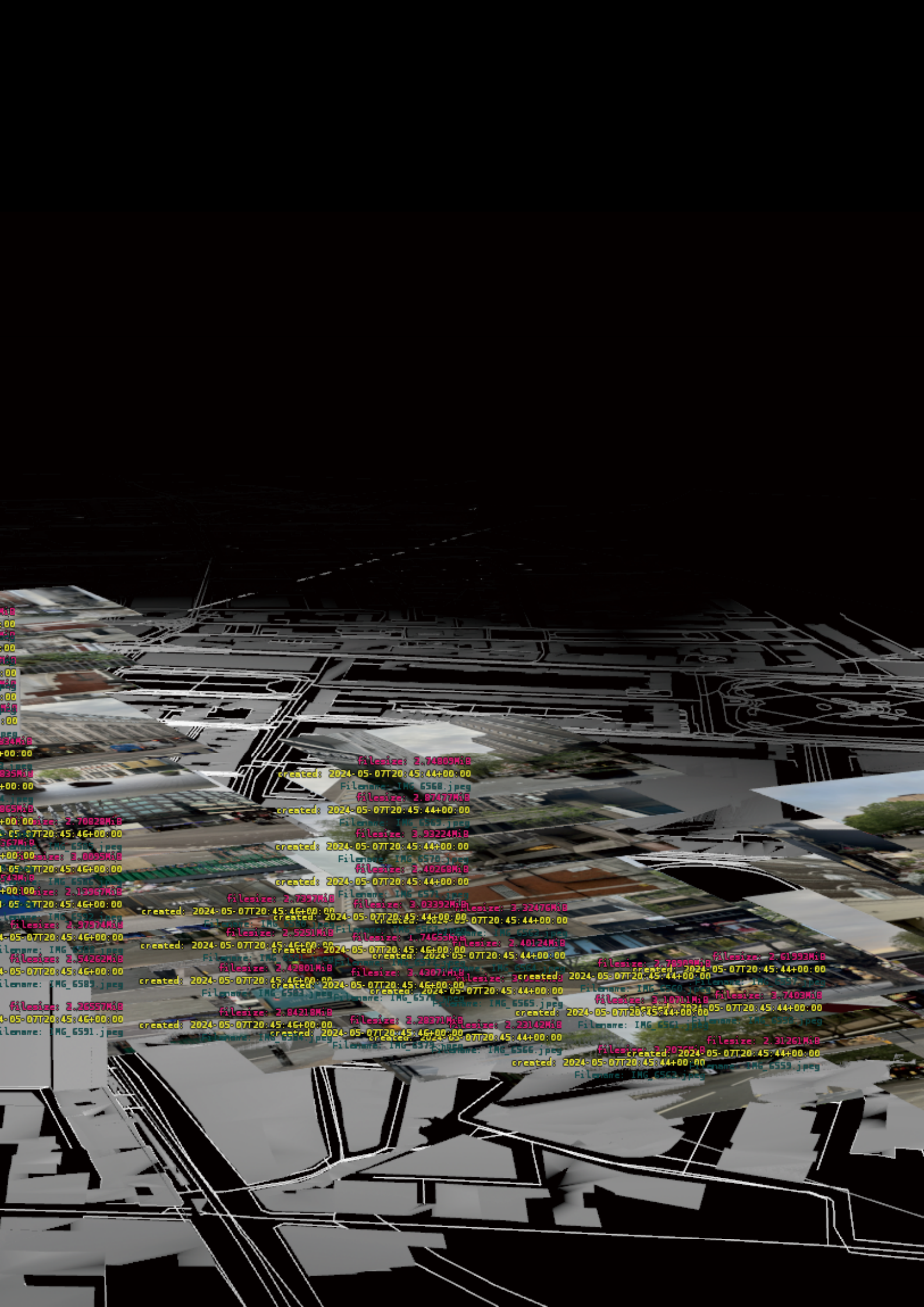
Pointsfromvolume SOP(added node) The type of incoming geometry. In auto-detect, if the input is a single volume primitive, the Fog or SDF method will be used depending whether the volume primitive has the SDF flag set. The adjustable parameter I used is 'Point Separation'. The point pixel woudl be dense (more) if that value lowller.

HOUDINI 2

VISUALIZING GPS & IMAGE METADATA

VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA
VISUALIZING GPS & IMAGE METADATA

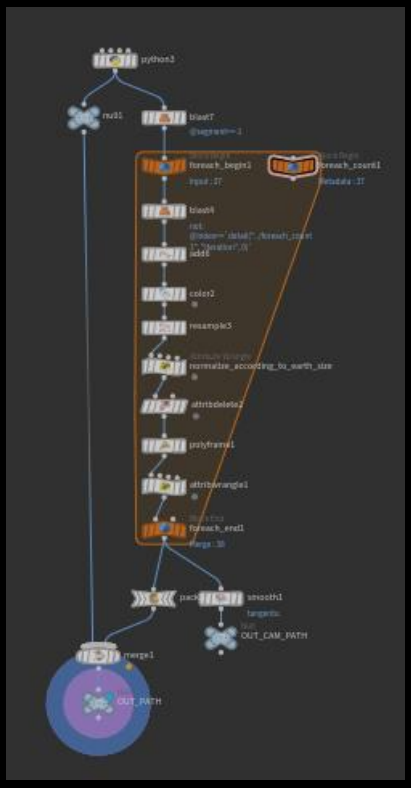



filesize: 2.74809MiB
created: 2024-05-07T20:45:44+00:00
Filename: IMG_6568.jpeg
filesize: 2.87477MiB
created: 2024-05-07T20:45:44+00:00
filesize: 3.93224MiB
created: 2024-05-07T20:45:44+00:00
filesize: 2.40269MiB
created: 2024-05-07T20:45:44+00:00
filesize: 2.73957MiB
created: 2024-05-07T20:45:46+00:00
filesize: 3.03392MiB
created: 2024-05-07T20:45:44+00:00
filesize: 2.5251MiB
created: 2024-05-07T20:45:46+00:00
filesize: 2.42801MiB
created: 2024-05-07T20:45:46+00:00
filesize: 2.84218MiB
created: 2024-05-07T20:45:46+00:00
filesize: 3.32476MiB
created: 2024-05-07T20:45:44+00:00
filesize: 2.40124MiB
created: 2024-05-07T20:45:44+00:00
filesize: 2.61933MiB
created: 2024-05-07T20:45:44+00:00
filesize: 2.7403MiB
created: 2024-05-07T20:45:44+00:00
filesize: 2.31261MiB
created: 2024-05-07T20:45:44+00:00

2.1 Extract GPX data (Path)

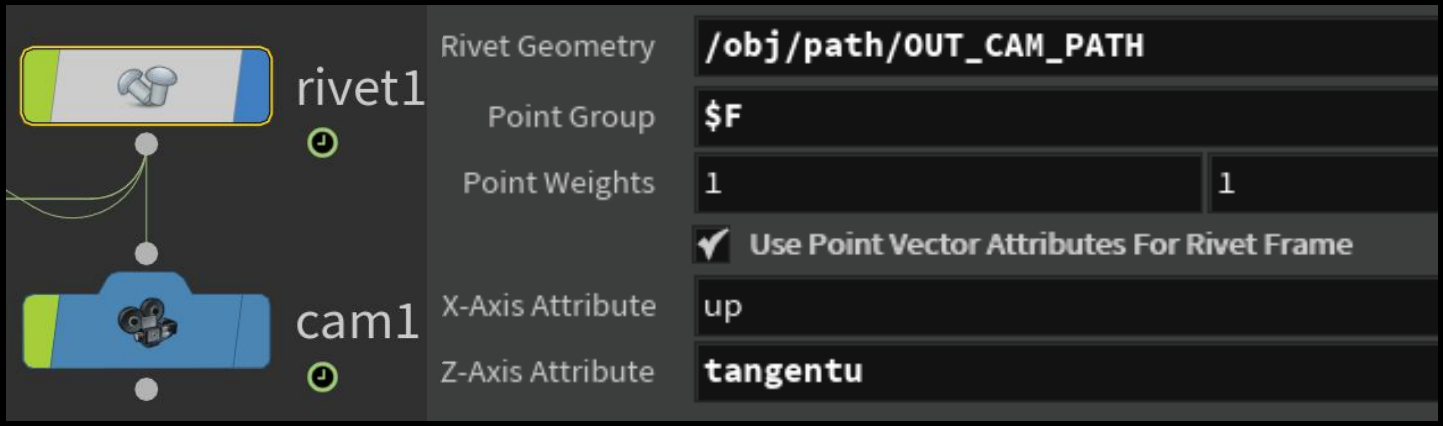
Before starting to run the program in Houdini. Based on the Timeline in my Google Map cannot be displayed, I found a Chinese mobile app called Six Feet, that can record travel routes, generate data, and generate GPX files.

Then I upload the GPX file in python module of Houdini. Add modules/ functions to ForeachPoint to handle the path, and combine it with Smooth to generate OUT_CAM_PATH, which will be used as the Operator input Rivet1 to match the CAM and path line together.



2.2 Camera setting

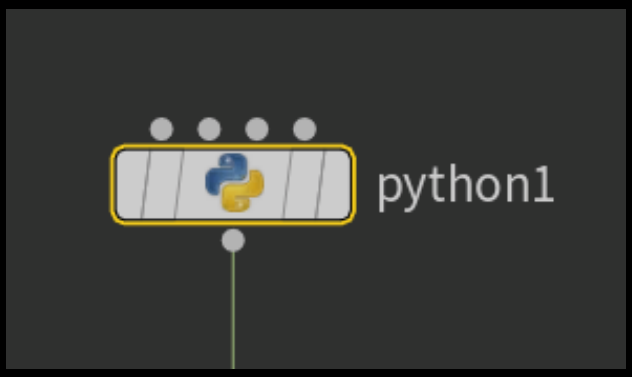
In order to let the CAM follow the path, OUT_CAM_PATH would be used as Operator uploaded in Rivet_1.

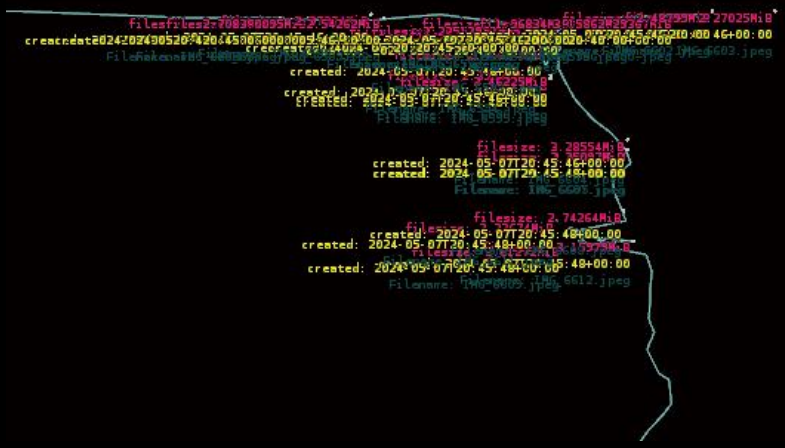


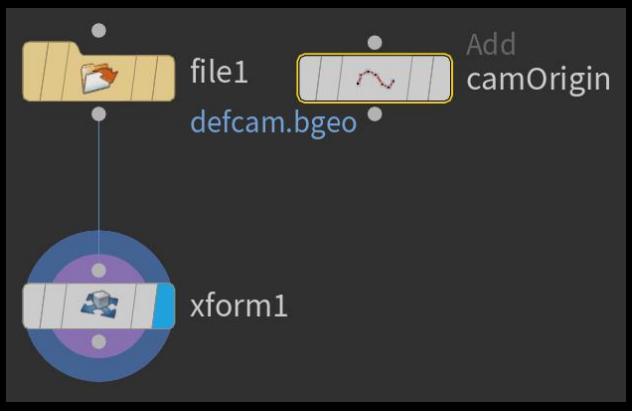
2.3 Loading images (Visualized image data/infomation)

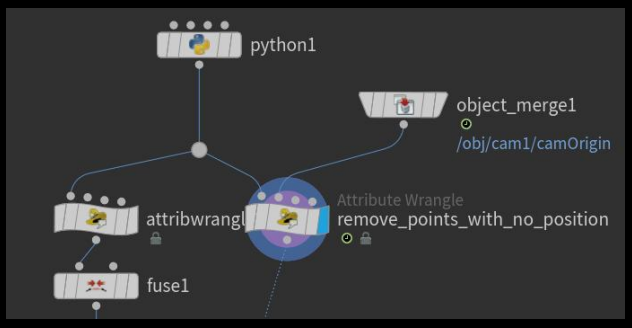
Import the folder where the image is located (in the Python module), read the image information (data) through code, and visualize the information content by adding Marker.

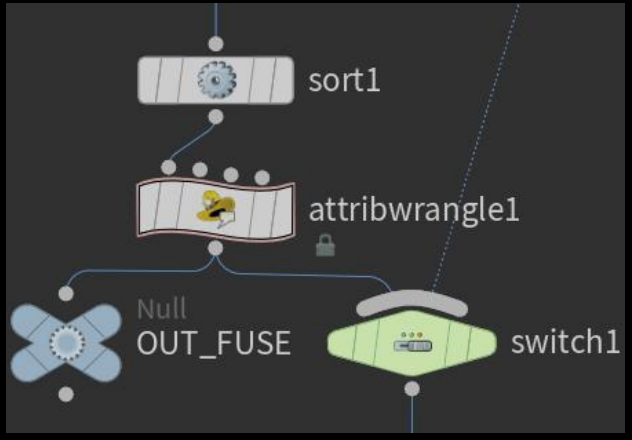
Add the Object_merge function, import camOrigin of CAM, and write a attribwangle to delete points without position. Then output OUT_FUSE which record result of fuse_1, and adjust Switch to make images oriented to CAM.

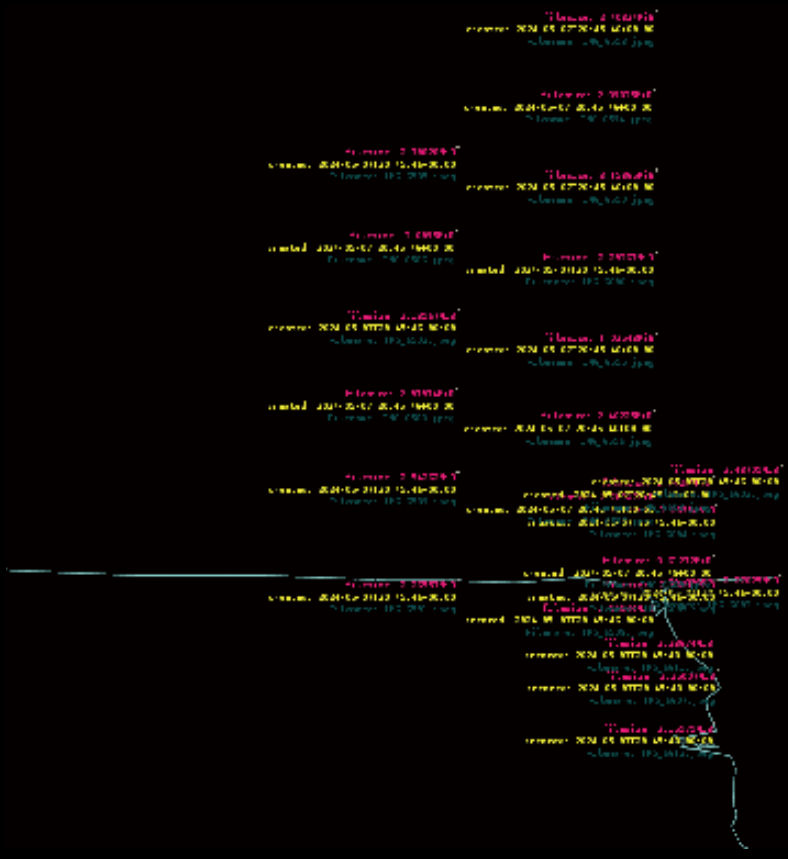








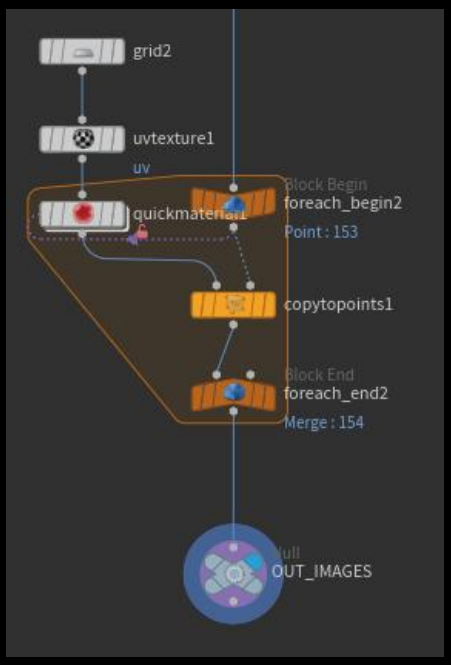




2.4 Loading images (link with points)

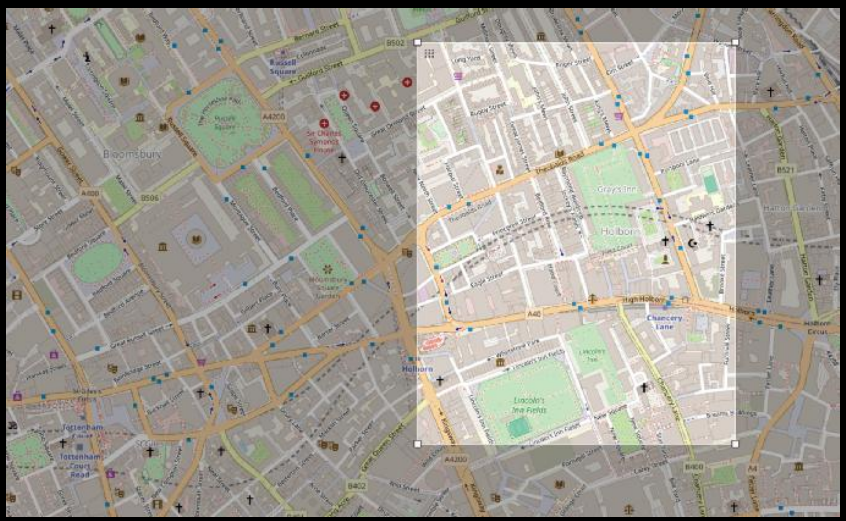
In the previous step, I have visualized the information of the image. The next step is to visualize the images. I created a Grid, connected UVtexture, and adjusted it to z-axis to ensure that the image materials on the grid can be presented correctly. Then connect it to Quickmaterial.

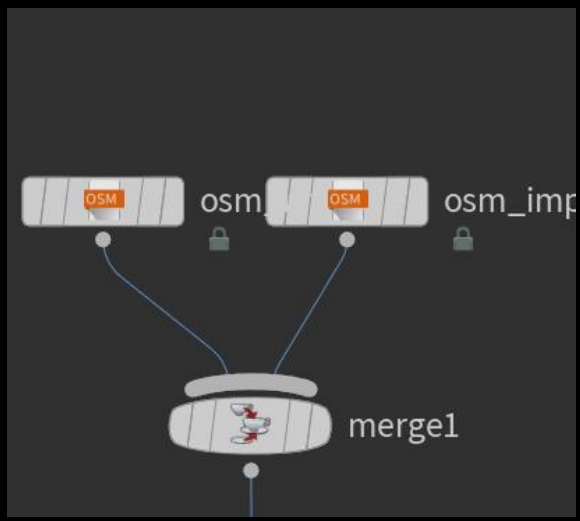
In quickmaterial, adding Spare input, and adding ForeachPoint then drag it into Spare input. After that, Copytopoint link the image infomation with each image.



2.5 Extract geographical data (city map)

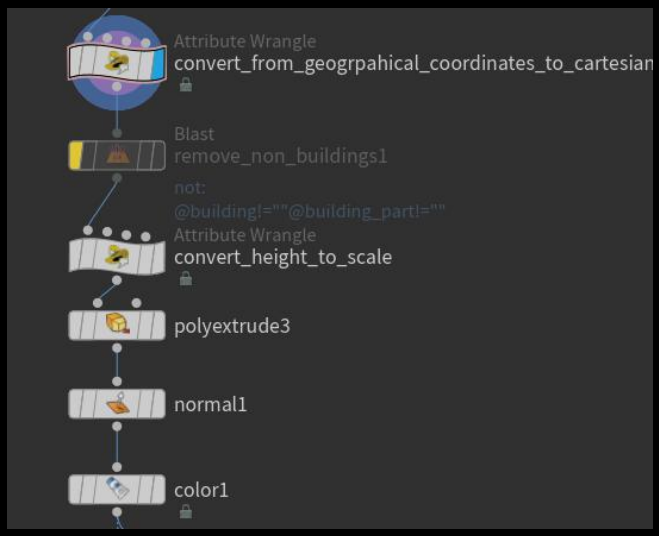
In order to obtain geographical information of the site, I exported the area where the path is located in OpenStreetMap.

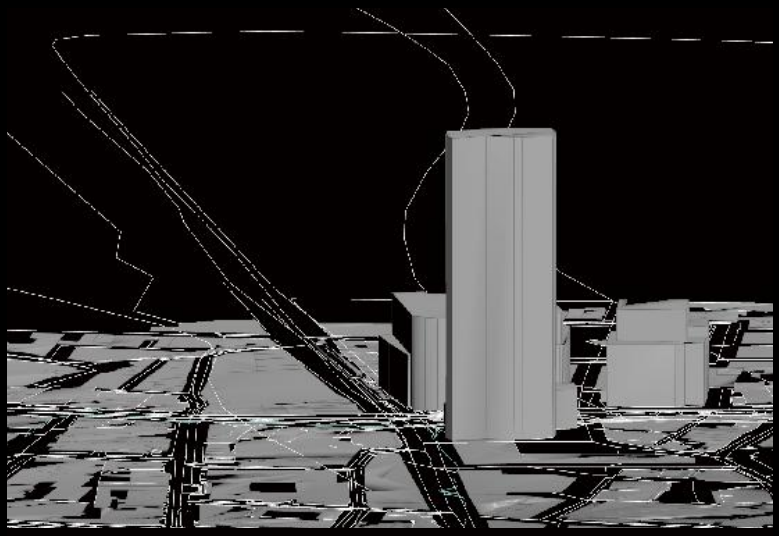


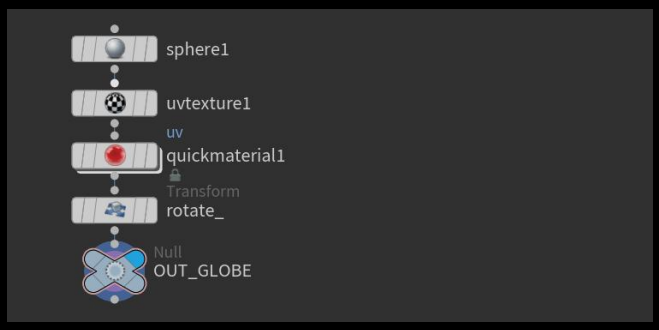


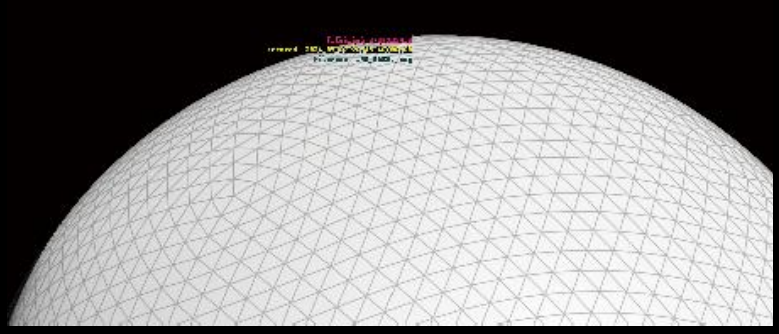
2.6 Generate maps and buildings

After merging Osm files, combine the Attribwangle input code to generate the map and obtain height information, Matching with the Earth (sphere), and then use Polyextrude to generate the volume according data in OSM.



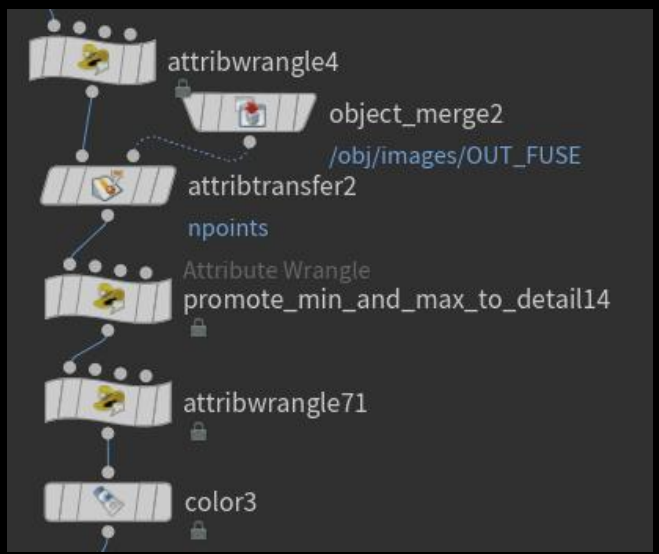






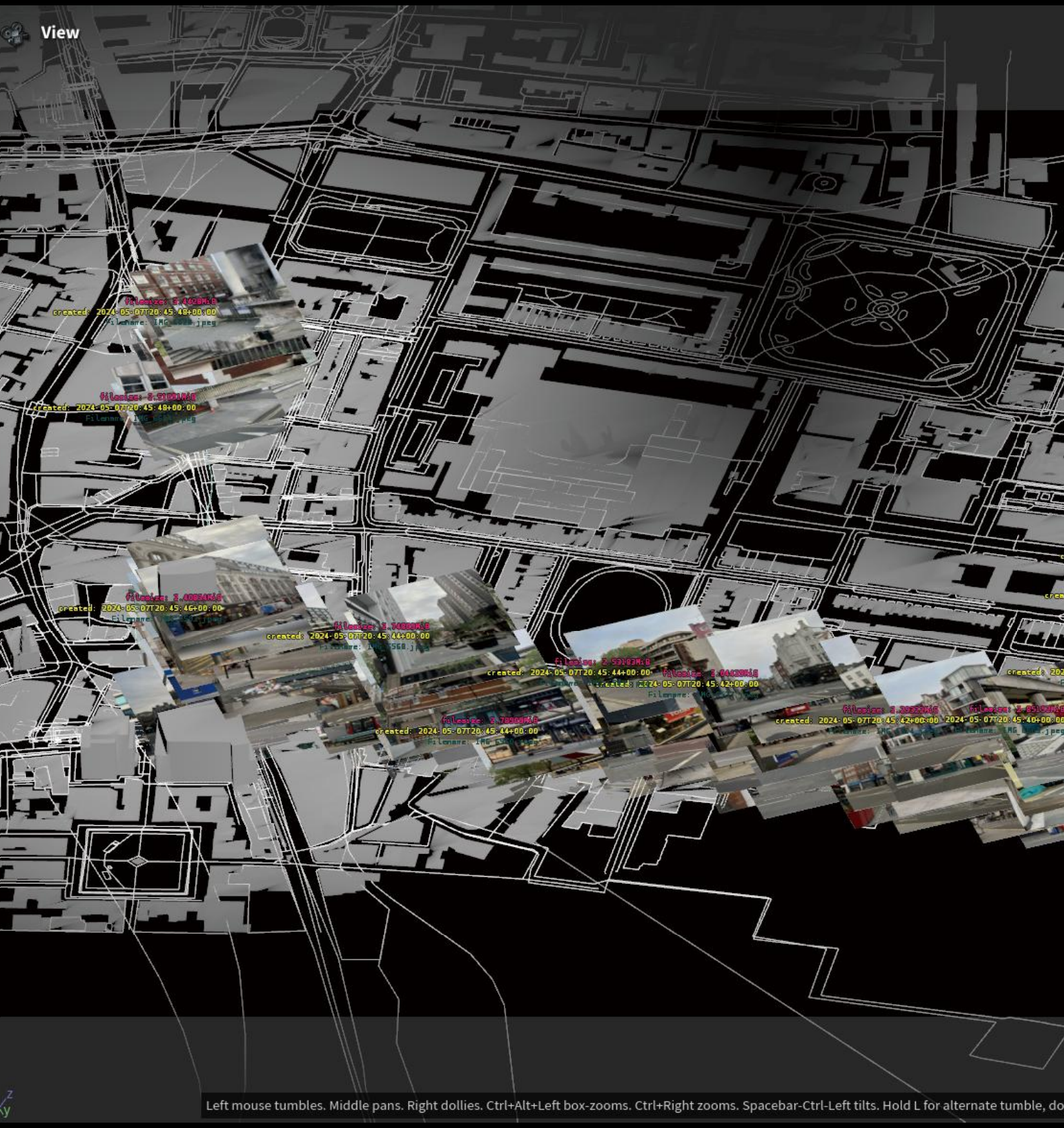
2.7 Adjusting map

In the final part of the City program, I adjusted the map generated by OSM through the settings shown in the left figure for better visibility. Afterwards, output the image frames by frame and generate a video.

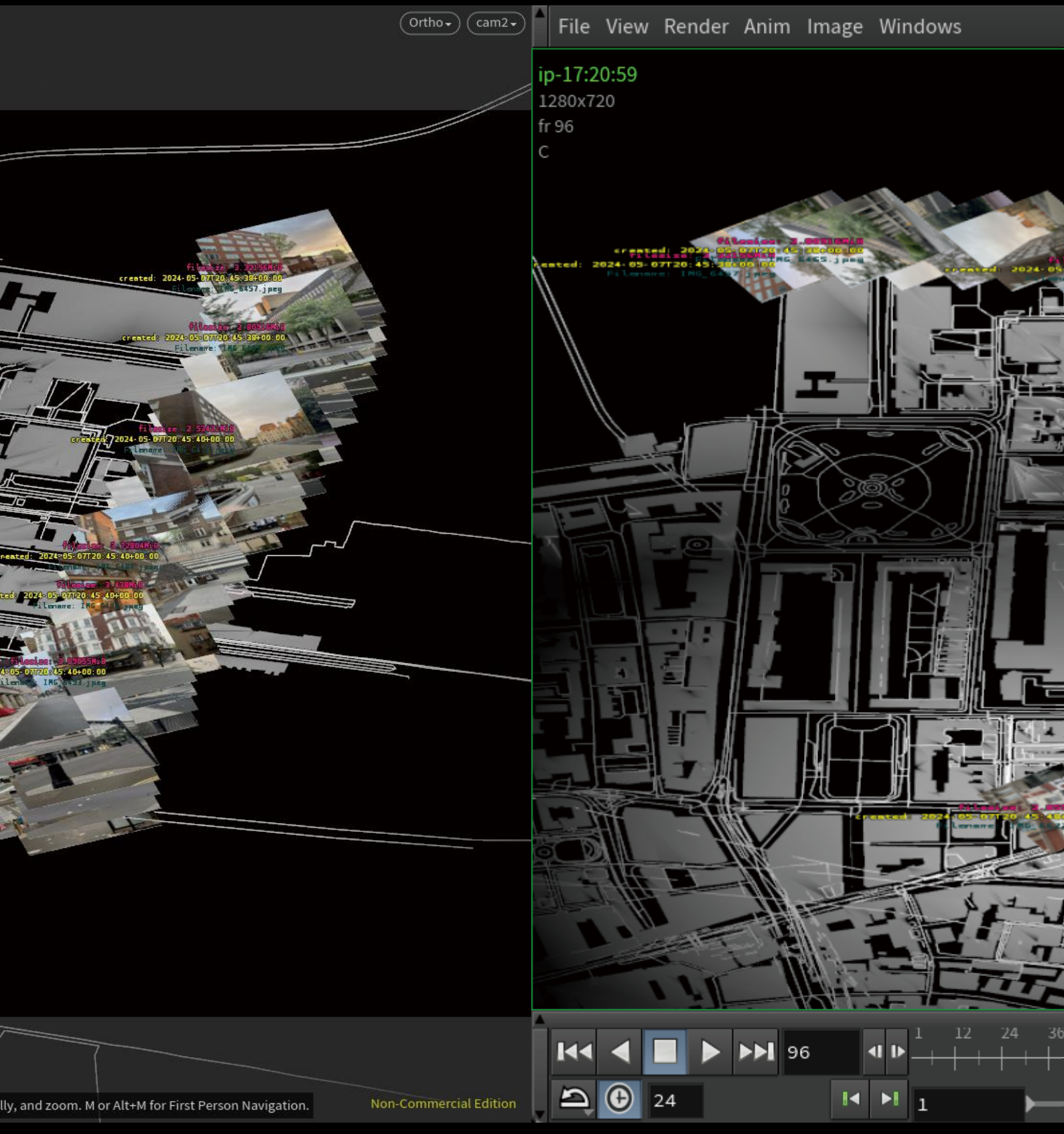


2.8 A series of images depicting the travel. (Performance/Rende

The CAM_1 plays along the walking route. In this step, I set up another camera (CAM_2), which is a orthographic overview, to review the final effect.



er)



Short video by frames


filesize: 2.54483MiB
created: 2024-05-07T20:45:42+00:00
Filename: IMG_6870.jpeg
filesize: 2.85192MiB
created: 2024-05-07T20:45:40+00:00
filesize: 3.03893MiB
created: 2024-05-07T20:45:40+00:00
filesize: 2.52506MiB
created: 2024-05-07T20:45:40+00:00
filesize: 2.15134MiB
created: 2024-05-07T20:45:42+00:00
filesize: 2.22217MiB
created: 2024-05-07T20:45:42+00:00
filesize: 2.71783MiB
created: 2024-05-07T20:45:42+00:00
filesize: 3.12268MiB
created: 2024-05-07T20:45:42+00:00
CHIPOTLE MEXICAN GRILL
J.&J. GOODYEAR
KFC
CASINO


filesize: 3.89055MiB
created: 2024-05-07T20:45:40+00:00
filesize: 3.60212MiB
created: 2024-05-07T20:45:40+00:00
filesize: 2.50503MiB
created: 2024-05-07T20:45:40+00:00
filesize: 3.65037MiB
created: 2024-05-07T20:45:40+00:00
filesize: 2.51306MiB
filesize: 4.78164MiB
2024-05-07T20:45:40+00:00
filesize: 3.18362MiB
2024-05-07T20:45:40+00:00
filesize: 2.00242MiB


1169.14m^3
Monumento a Alfonso XII
The monument is situated on the east edge of an artificial lake near the center of Retiro park.
Its center is the equestrian statue of King Alfonso XII, cast in bronze.
The three statues on the central pedestal of the monument represent 'Peace', 'Freedom', and 'Progress'.
483.95m^3
1169.14m^3

HOUDINI 3

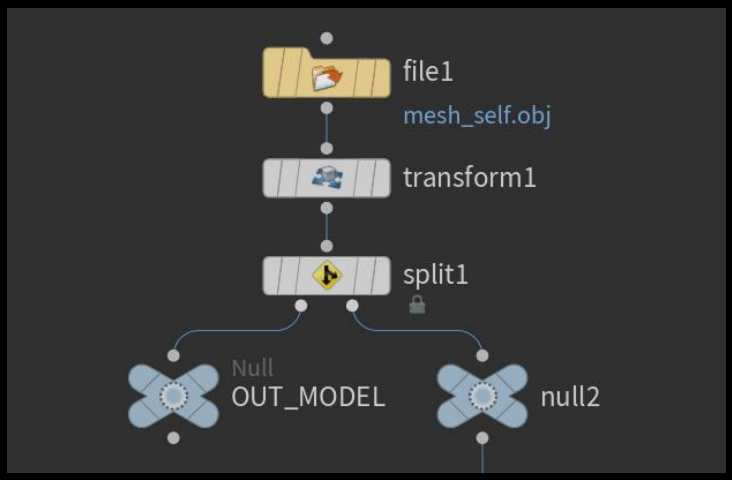
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION
3D RECONSTRUCTION

3.1 Generate photogrammetry models

Firstly, the video frames are deconstructed from the found video by code, and the images of these video frames are imported into RealityCapture to generate the reconstructed model.

For this section, I chose an overhead video of Madrid's Retiro Park from Youtube. Because our project site is in Madrid; the overhead video contains more information about the site and is more helpful for reconstruction.

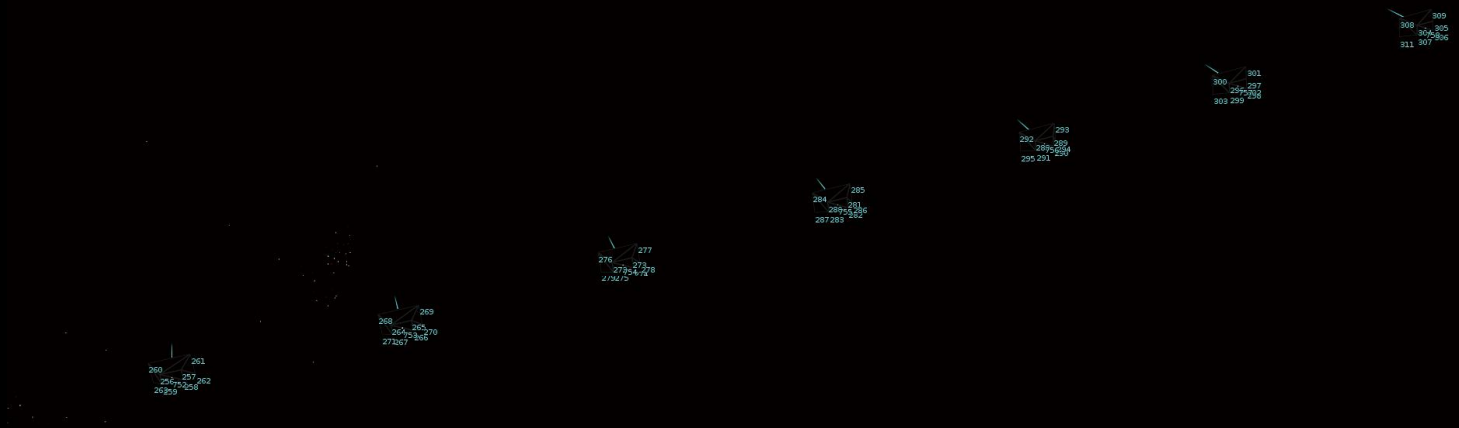
3.2 Reconstruct camera path.



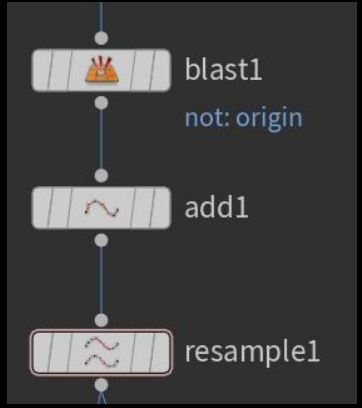
At first, after reconstructing the 3D model using RealityCapture and exporting the mesh, upload model in houdini, split it into the subsequent processed models and the Camera path to be processed now.

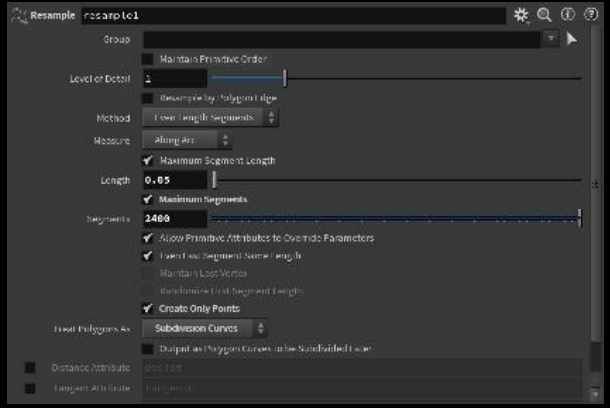
```
VEXpression
1
2  for (int pt = 0; pt<npoints(0); pt +=8){
3
4
5      float mult = 28;
6
7      vector posA = point(0, "P", pt );
8      vector posB = point(0, "P", pt +2 );
9      vector posC = point(0, "P", pt +4 );
10     vector posD = point(0, "P", pt +6 );
11
12     vector normalStart = lerp(posA, posB, 0.5);
13     vector normalEnd = lerp(posC, posD, 0.5);
14
15     int startPt = addpoint(0, normalStart);
16     setpointattrib(0, "N", startPt, -mult *(normalStart - normalEnd), "set");
17     //add a point on normalStart, and set a normal vector to that point
18     setpointgroup(0, "origin", startPt, 1, "set");
19     setpointattrib(0, "up", startPt, set(0,1,0), "set");
20 }
```

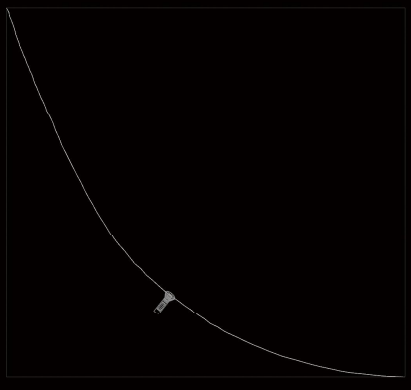
Step 2 is creating an attributewangle module and use the code shown in the figure to obtain the center point of each camera projection surface, as well as create corresponding lines for the camera facing the field.

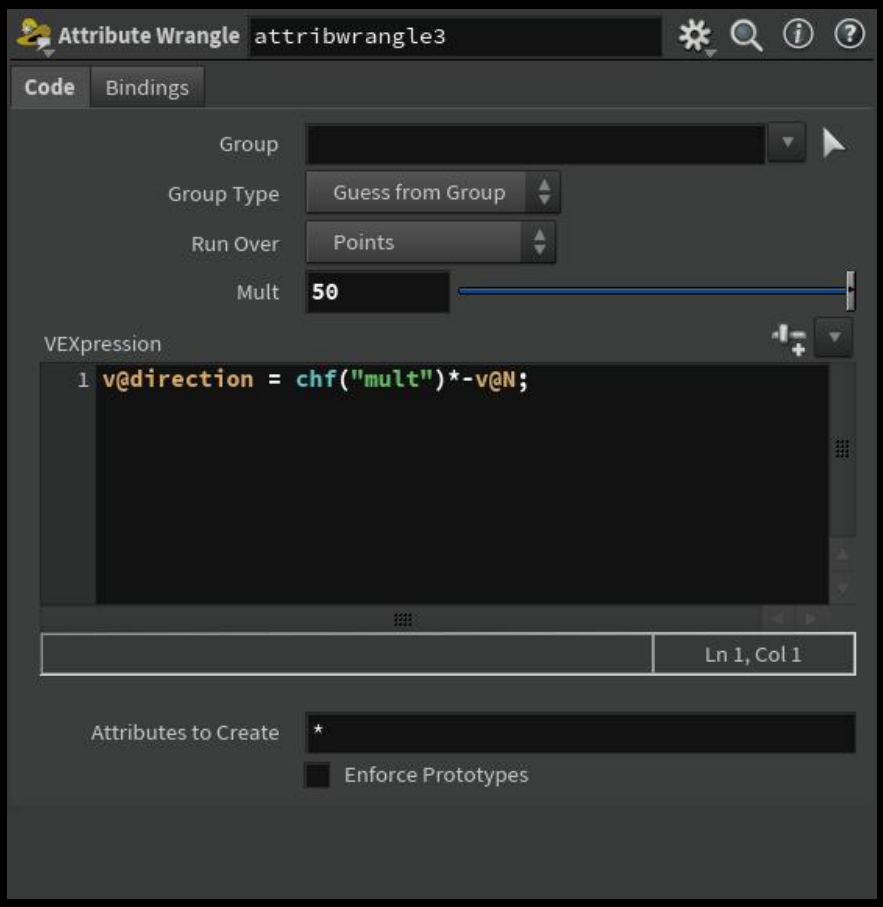


This stage is going to reconstructing the camera path, there is no need to delete points. I think the original path is good, so I did not use blast to delete the camera points. But the path itself was too short, I added the resample module, inserted more points between the original points, and extended the camera path.



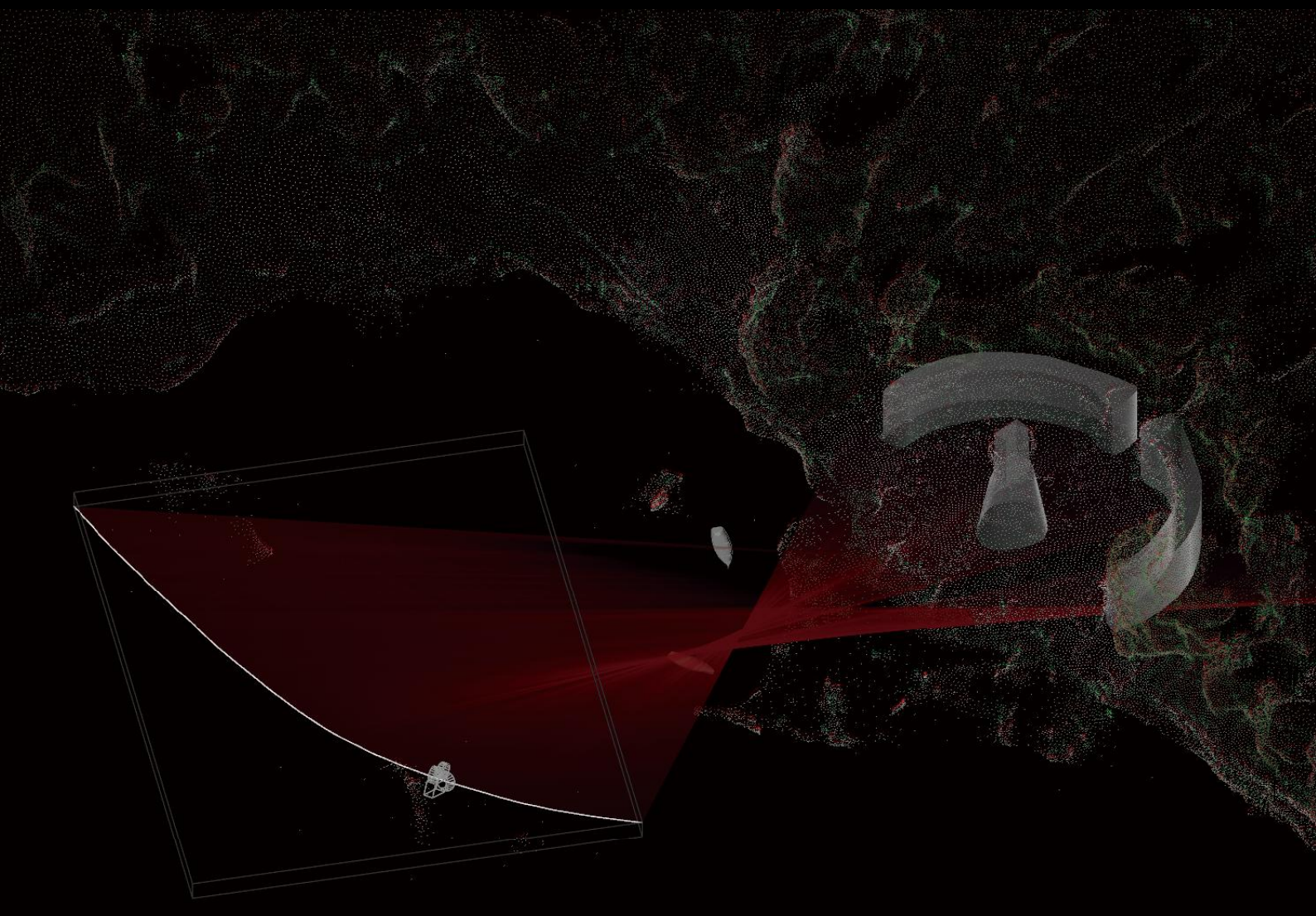






In the step 2, the corresponding lines already created for the camera facing the model. Here I add code in attribwrangle which add Mult, to control the length of those lines.

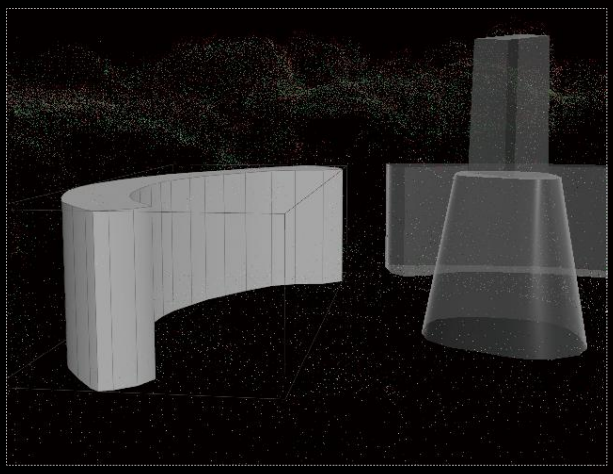
The final step in 3.2 is output the camera path' data, which will be used for the CAM part, the CAM would follow the path after this.



3.3 Volume speculation

Through the Measure curvature module, all the boundaries of the site could be seen, and based on these boundaries, I used Curve + polyextrude to generate objects. Finally, I created two Attribwrangle, one for visualizing volume data, and another attribwrangle for adjusting the transparency of volume objects.

Draw curves according to point edges



Extruded geometric block

VEXpression

```
1 s@totalvolume = "1169.14m^3";
```

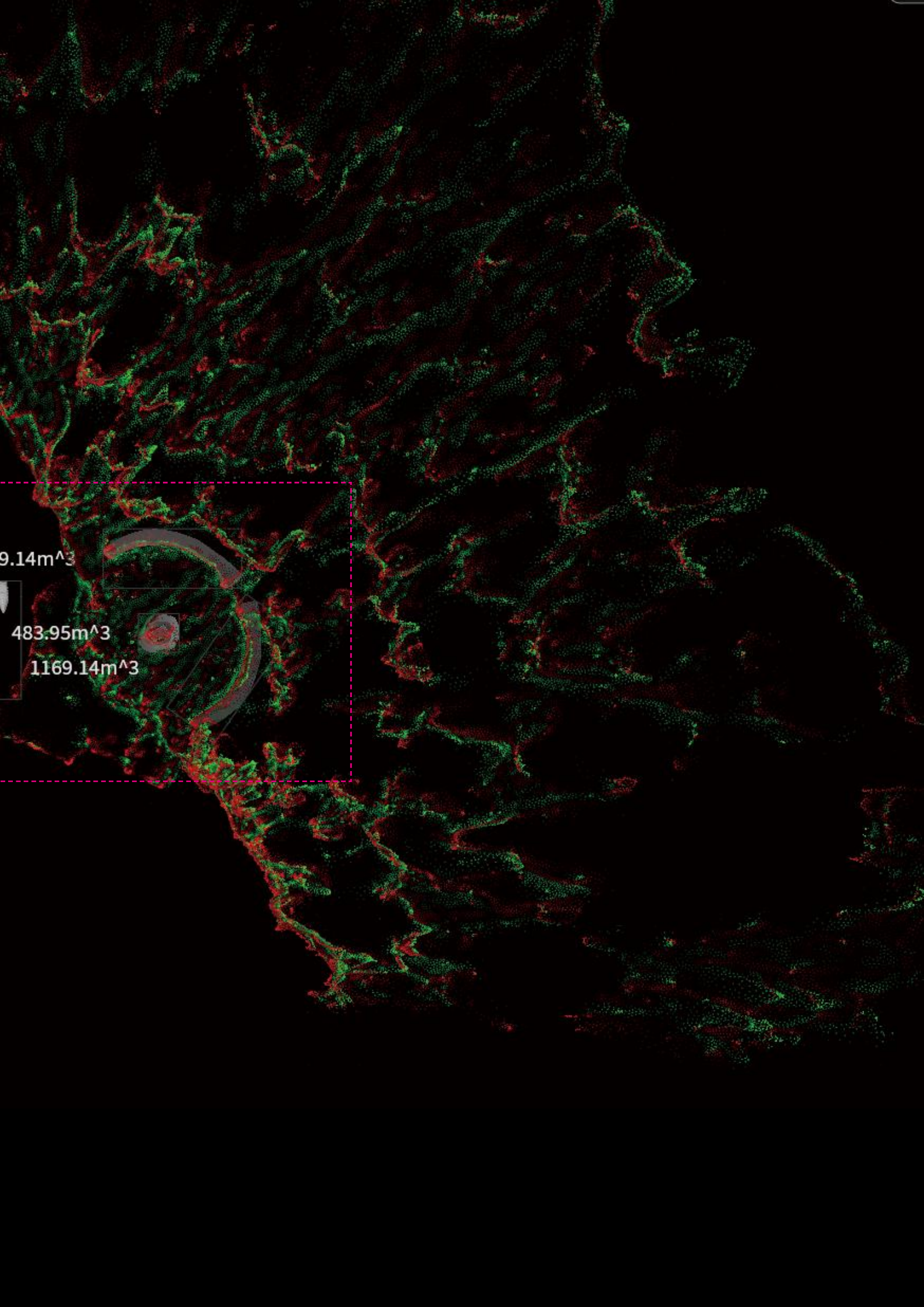
Adding a Measure module to extract value of volume, and then visualize the value through attribwrangle1

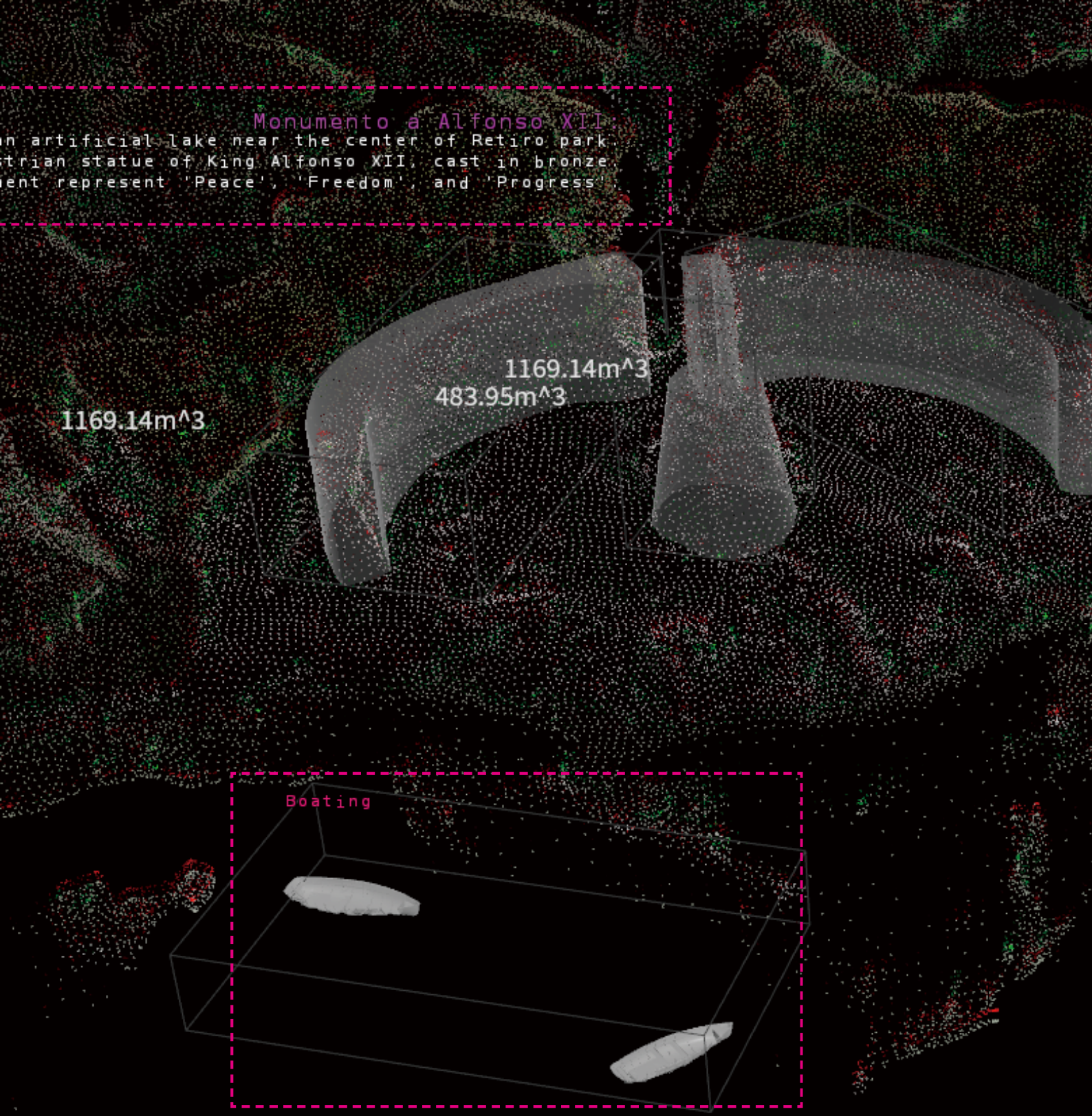
VEXpression

```
1 f@Alpha = chf("slider");
2
```

Slider 0.3

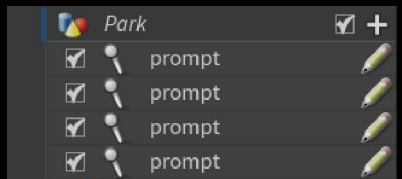
Creating slider to control transparency


9.14m^3
483.95m^3
1169.14m^3



3.4 Adding information to the subject

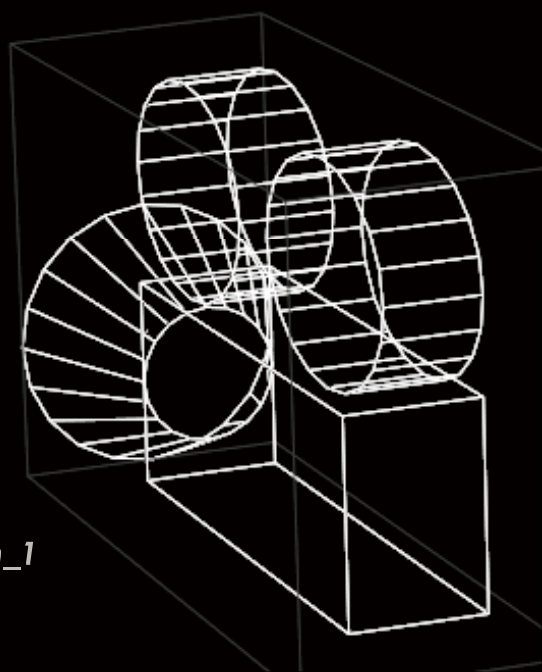
In the last part (3.3), I already add volume data to my objects.
In this part I created Markers which named prompt. Adding a attribwrangle moudle including four lines, which would attribute to the Markers. In addition, I also add a extra description for the boats models (Try to restore more scenes).



```
r of Retiro park.";
 Freedom', and 'Progress'.";
```

Short video by frames

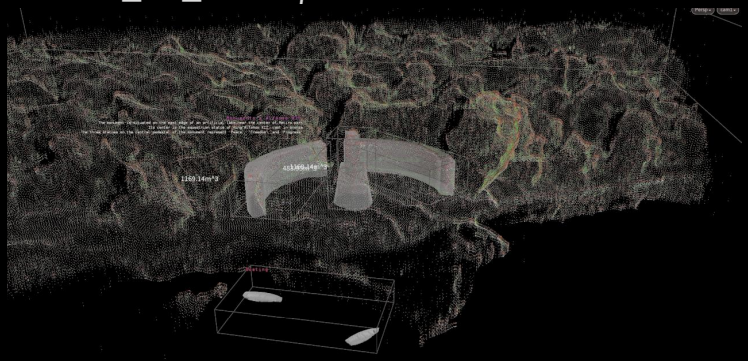
Cam_1

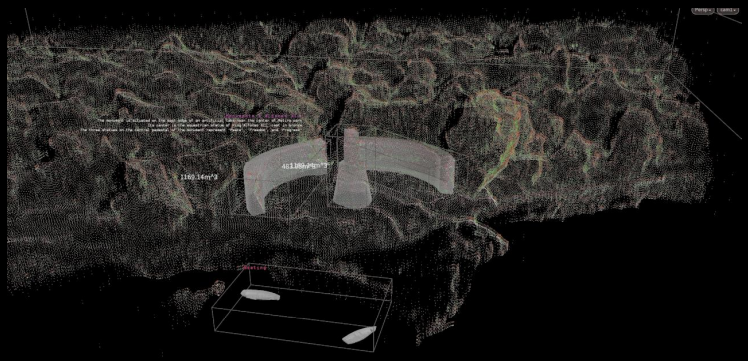


3.5 A COLLECTION OF IMAGES/RENDERS

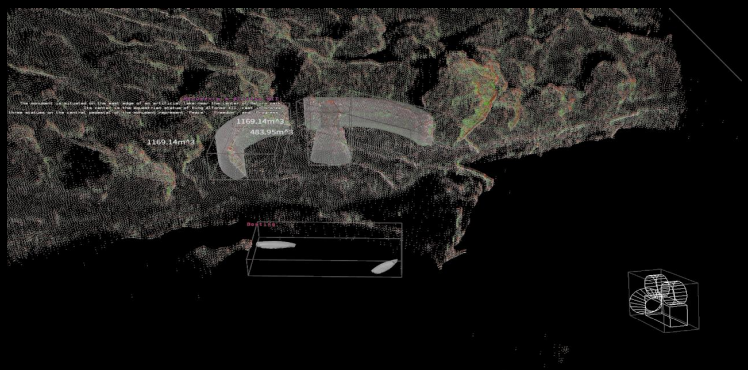
I created two camera positions, and in the second position, you can see the first camera. There are also some screenshots:

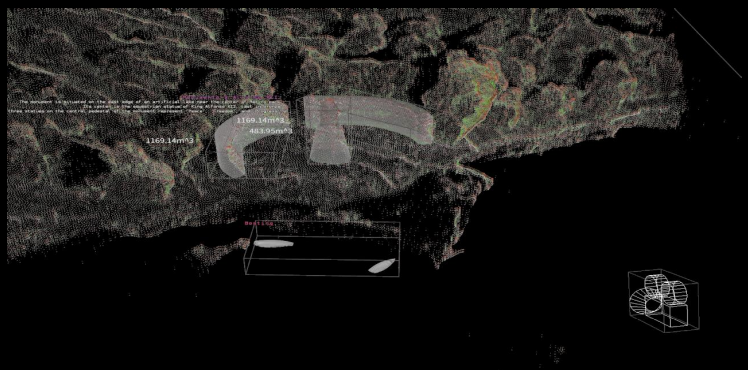
Cam_01_Examples:



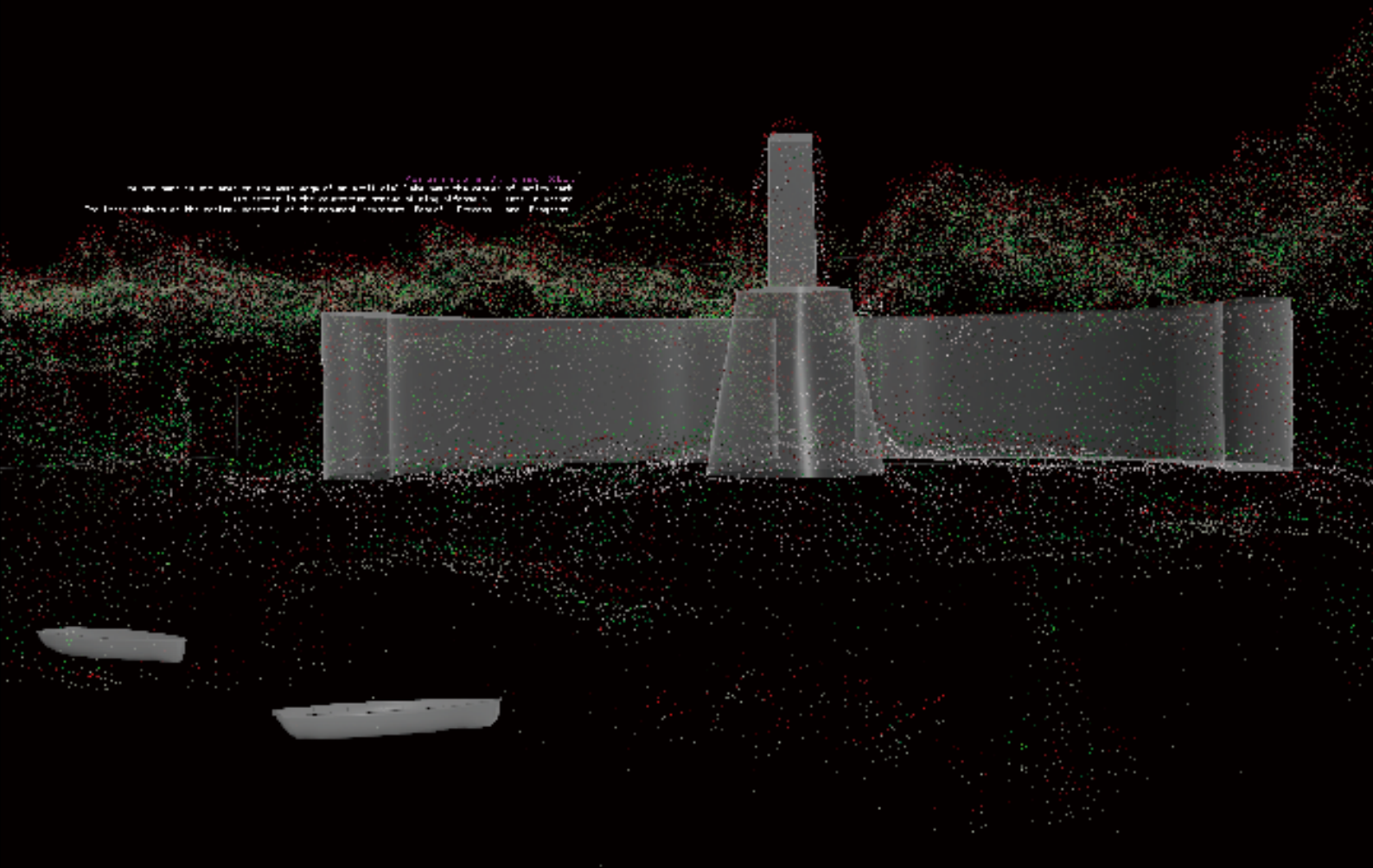


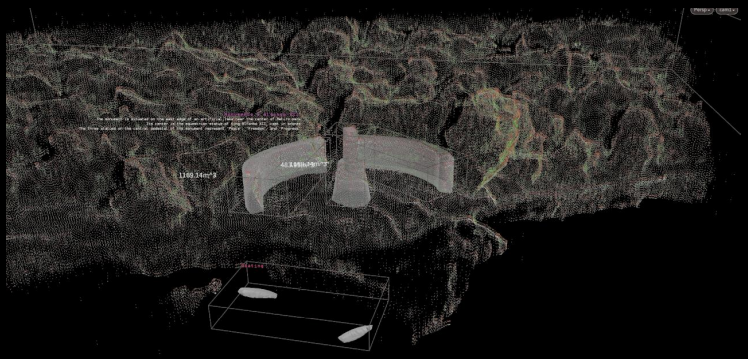
Cam_02_Examples:

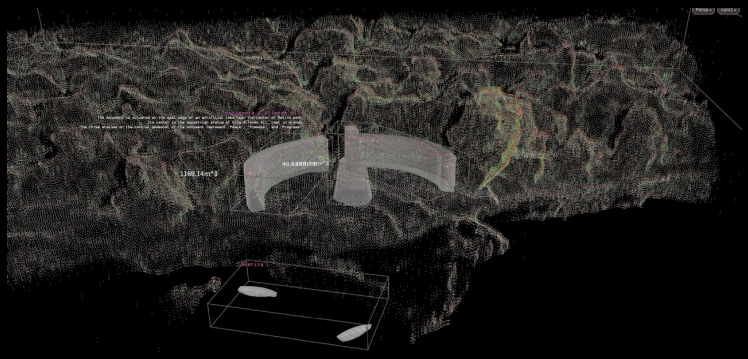


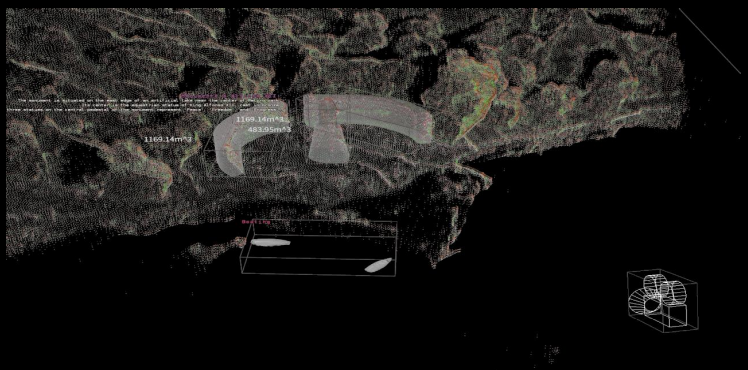


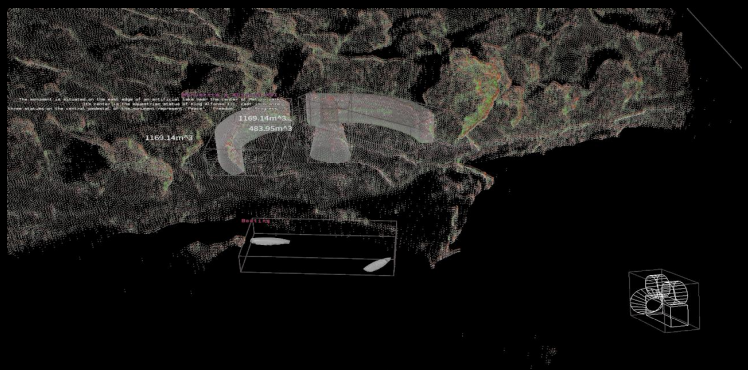
Screenshot_Examples:

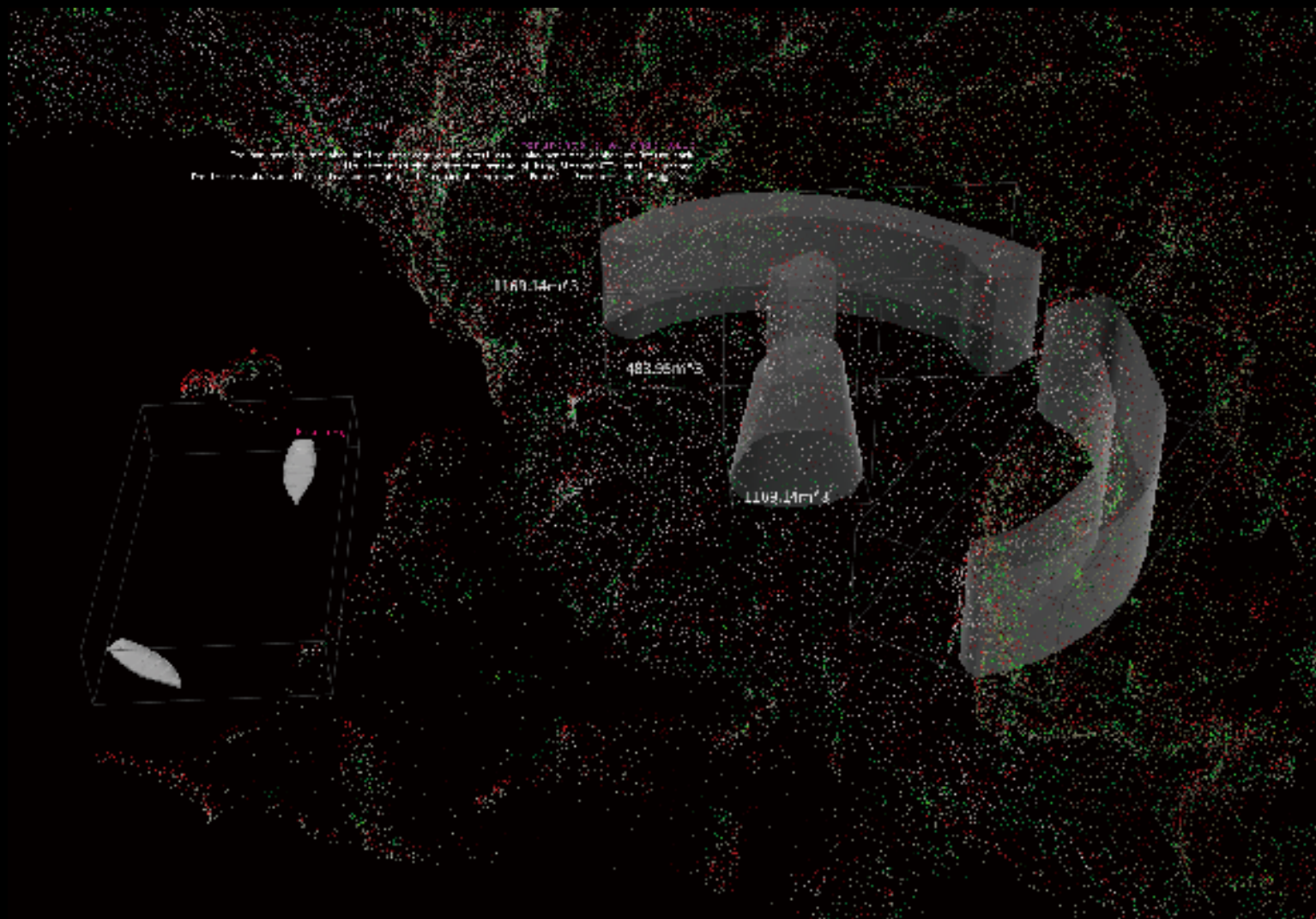






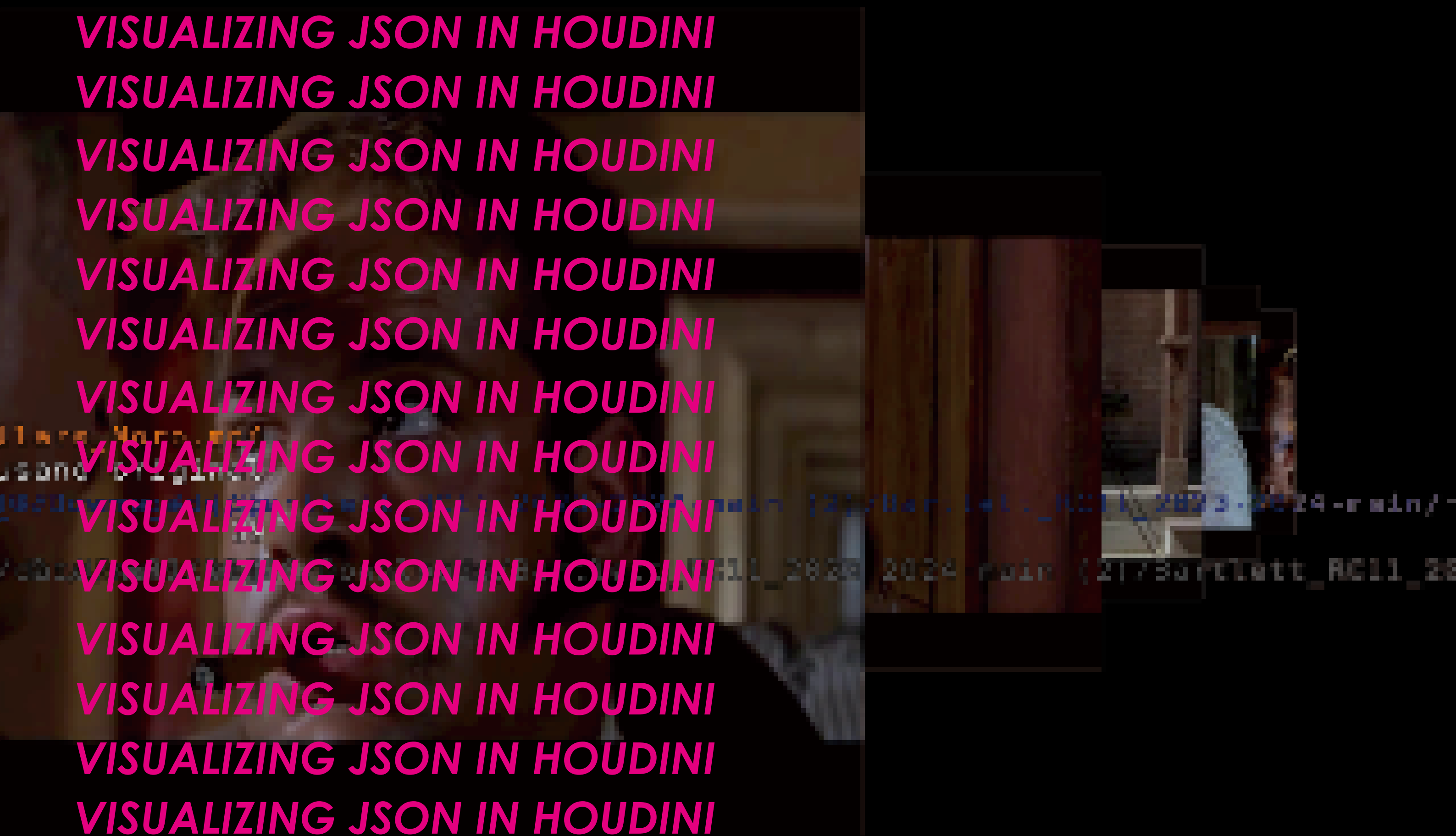





1169.14m^3
483.95m^3
1169.14m^3

HOUDINI 4

VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI
VISUALIZING JSON IN HOUDINI

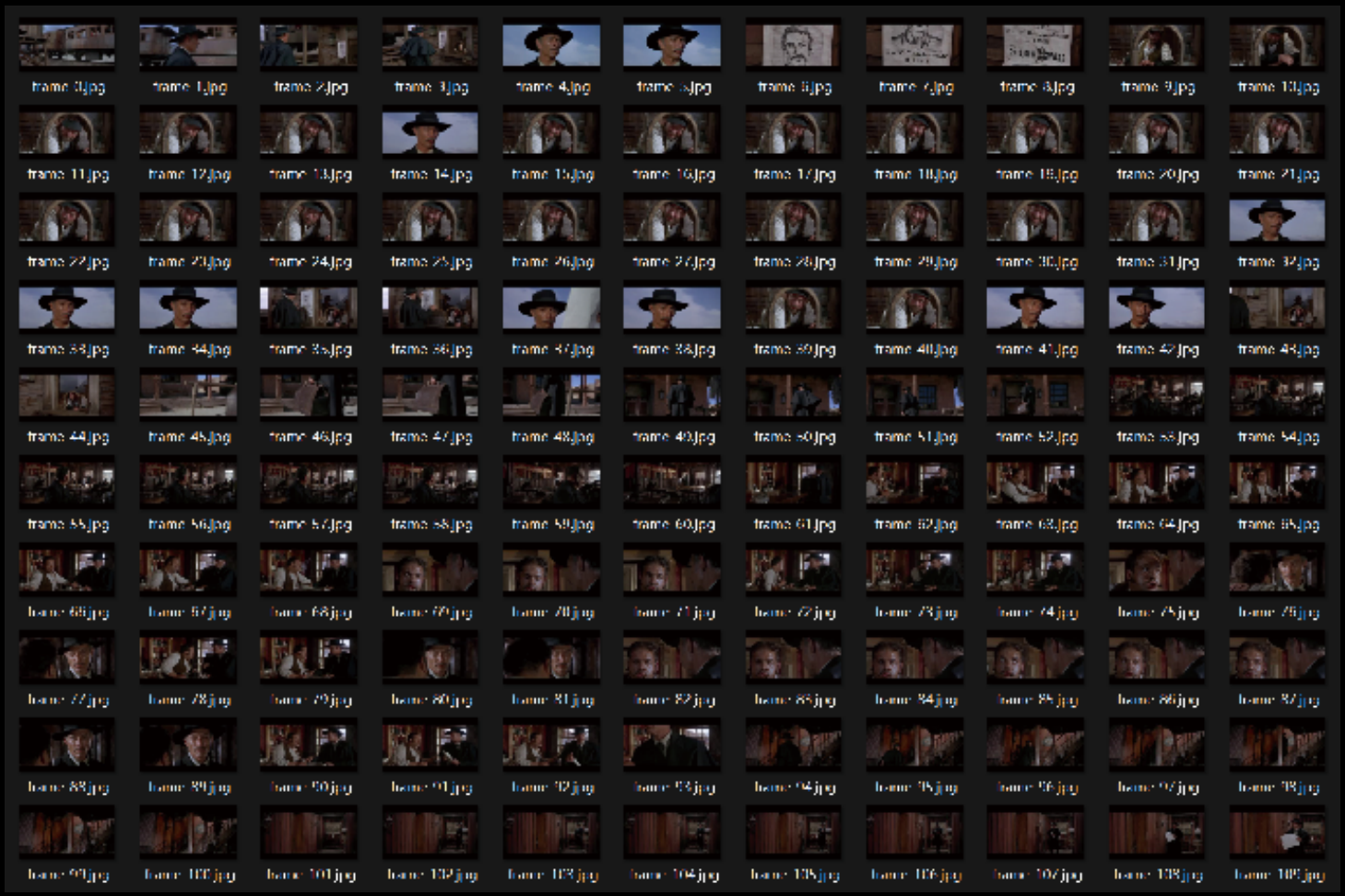



For_a_Few_Dollars_More.mp4
Houdini_visualizer/Data/Images/5/frame_4.jpg

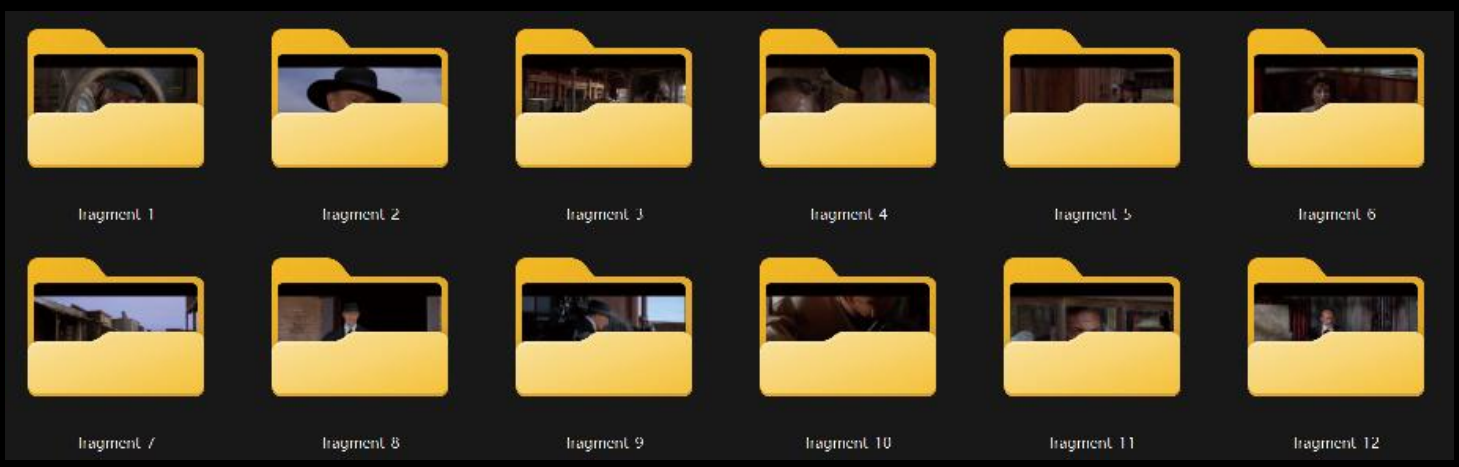
4.1 Extracting video frames

Same as assignment 3, at the beginning I used python code to first download the video from Youtube based on the url and split the video into video frames, in this assignment I split the video into 240 frames in total, which corresponds to 12 subtitles.

The selection of the video was based on our project, There are many places in Madrid that were used to shoot Spaghetti western Film in the last century. Therefore, My group members and I chose the famous one, which named 'For_a_Few_Dollars_More'.



Divide the frames into 12 subfolders for subsequent processing



Next, generate a JSON file from the pickle file using code. Here, I also attempted to manually input video information into a JSON file. The following image is the result of manual input. The information is mainly divided into: Film ID; Paragraphs; Frame_n; Corresponding model; Time; Film path...

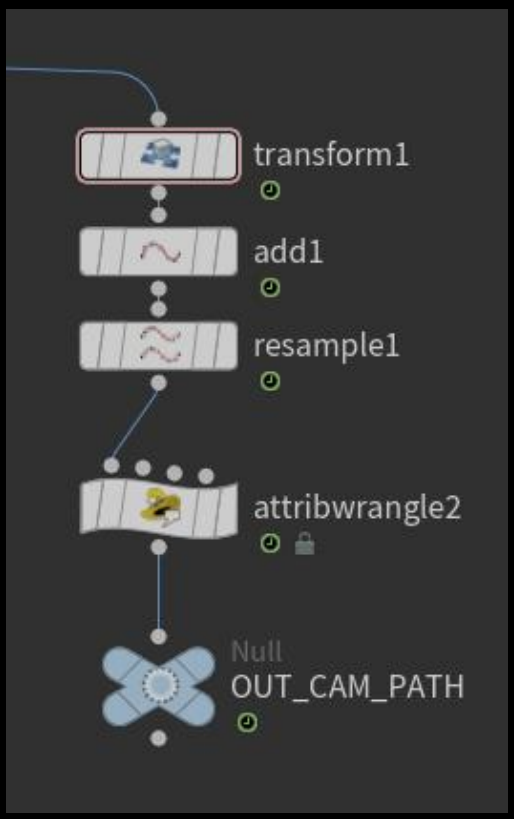

```
{
"folder": [
    {
      "paragraph" : "zeros he was spitting that one short",
      "filmID" : "For a Few Dollars More.mp4",
      "image name" : "frame",
      "model path" : "model.obj",
      "image n" : 33,
      "time" : 27,
      "film path" : "For a Few Dollars More.mp4"
    },

    {
      "paragraph" : "said a measly thousand bucks for me is",
      "filmID" : "For a Few Dollars More.mp4",
      "image name" : "frame",
      "model path" : "",
      "image n" : 17,
      "time" : 32,
      "film path" : "For a Few Dollars More.mp4"
    },

    {
      "paragraph" : "land that's right he said that many out",
      "filmID" : "For a Few Dollars More.mp4",
      "image name" : "frame",
      "model path" : "",
      "image n" : 23,
      "time" : 36,
      "film path" : "For a Few Dollars More.mp4"
    },

    {
      "paragraph" : "of the zeros and thousand original",
      "filmID" : "For a Few Dollars More.mp4",
      "image name" : "frame",
      "model path" : "",
      "image n" : 22,
      "time" : 39,
```

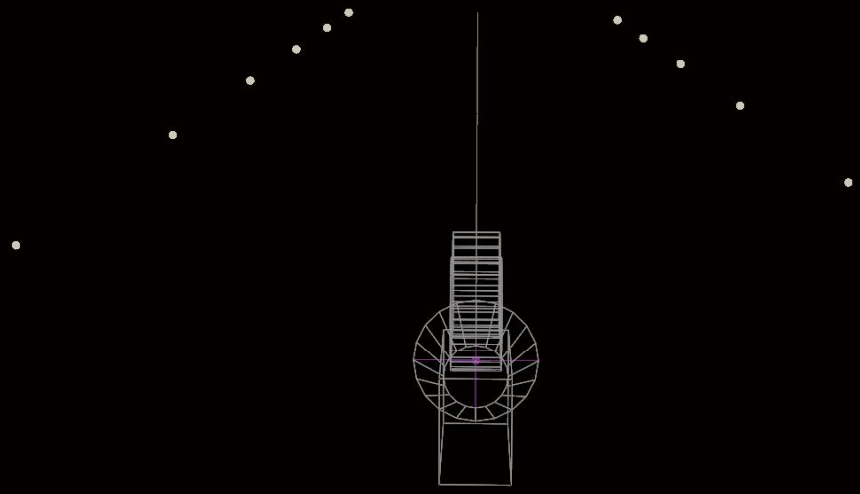
4.2 Extracting video frames

In Houdini, creating a Python modules and import Json files. Next, creating points based on the number of subtitles in the Json file and plan the positions of the points. I will divide these points into two column. In addition, writing code to define and load the infomation of json file (Film ID; Paragraphs; Frame_n...)

4.3 Creating camera path

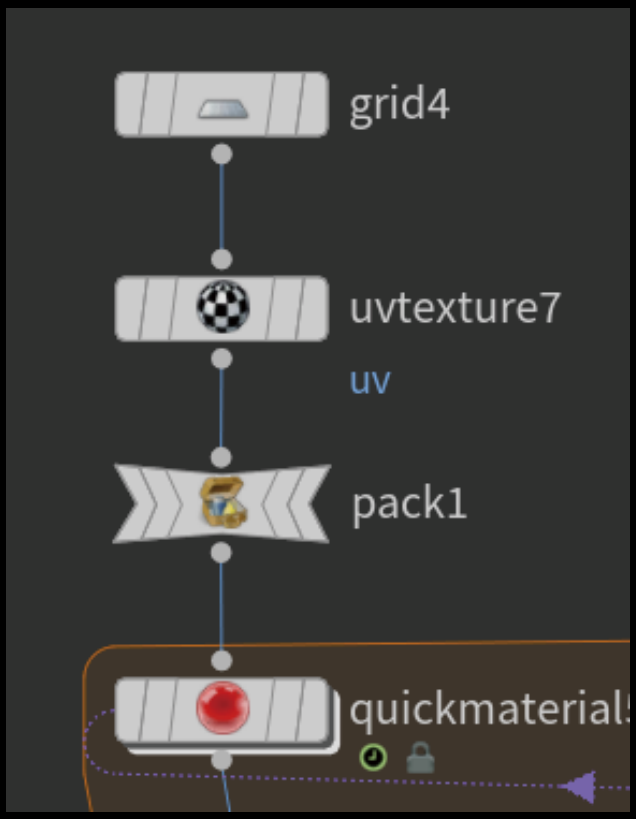
Similar to the method in assessment 3 to create a camera action trajectory. However, the code this time was used to set the route between two points lines.

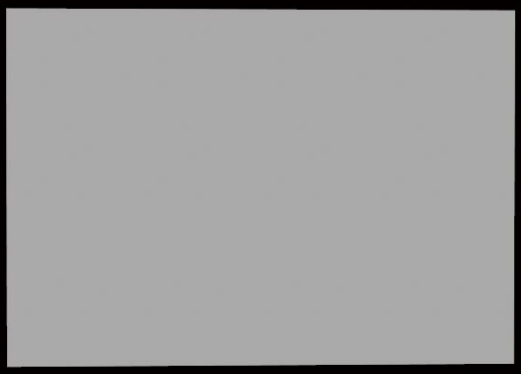




4.4 Input film frames(images)

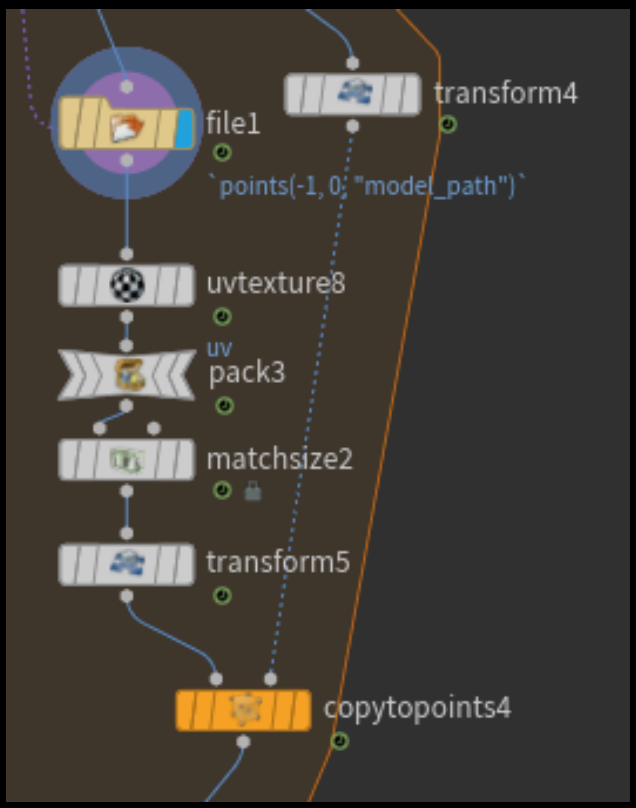
Setting a grid, the UV texture is used to ensure the correct display of images on the grid. The Pack module is used to make the information more clean (orignally, four points of a grid have the information). Then set Quickmaterial to load the frame images.

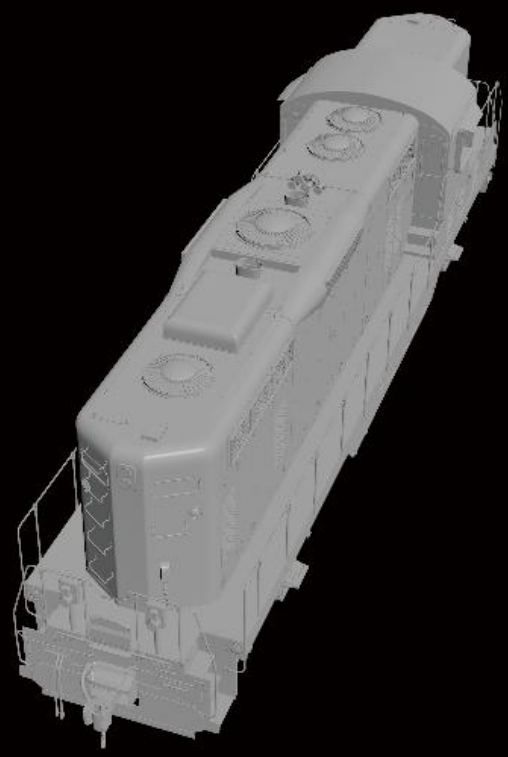




4.5 Model input

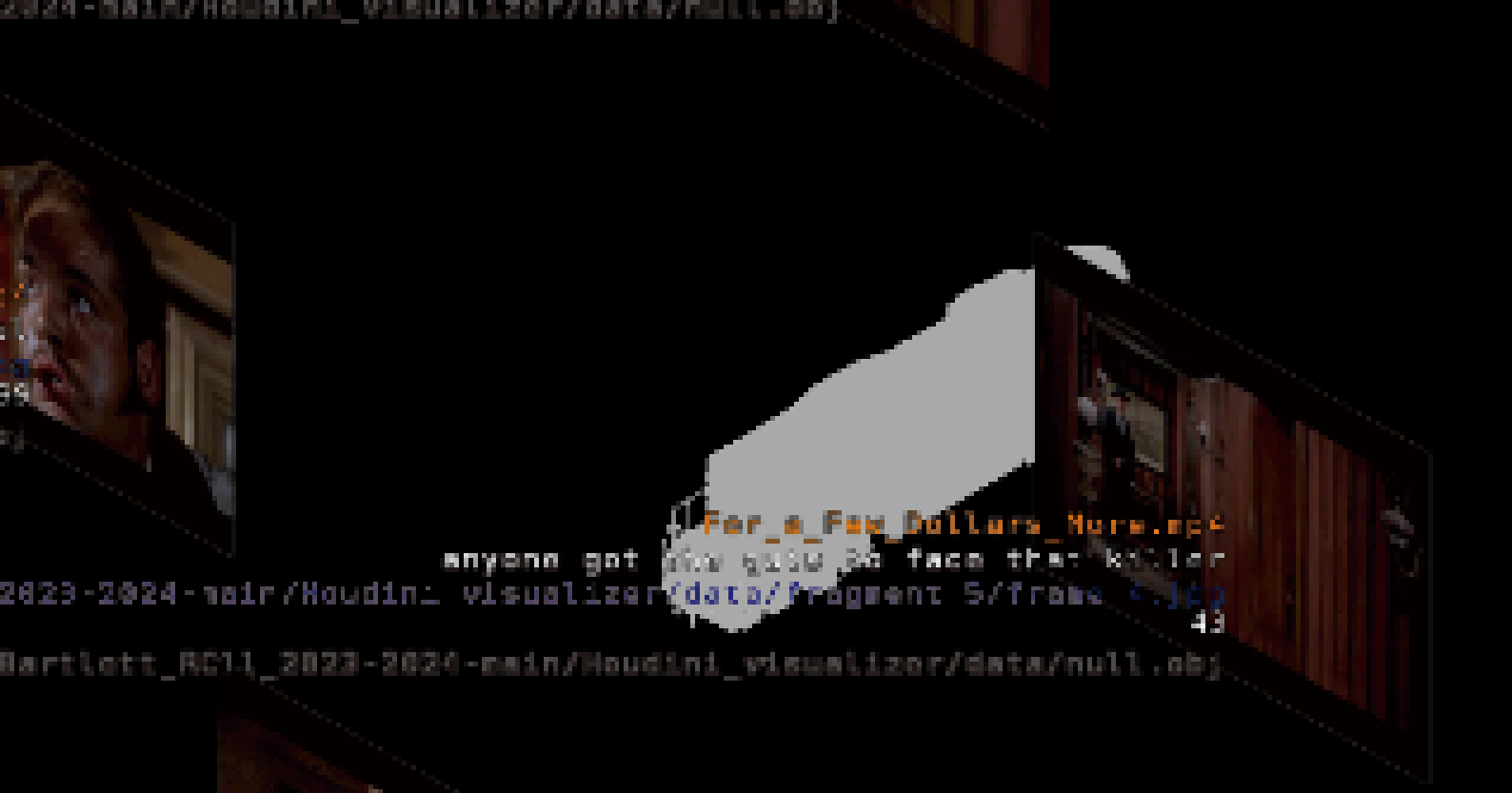
In this assessment, I also add a model by File module. Matchsize and Transform were set to adject the position of model. and the catch those points.





4.6 A COLLECTION OF IMAGES/RENDERS

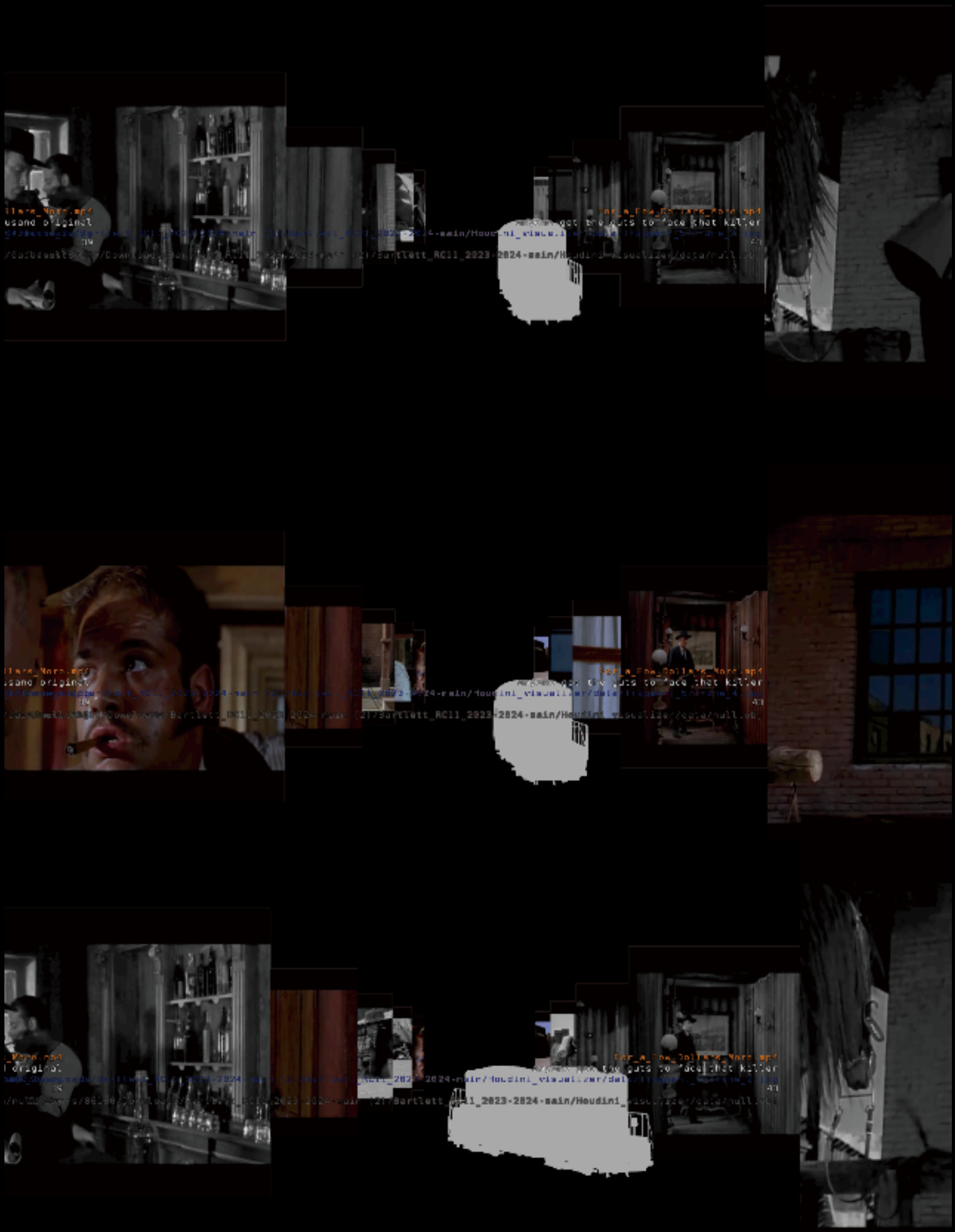
Setting another CAM to see the overview. A series of images rendered.


For_a_Few_Dollars_More.mp4
anyone got how many $ face that killer
2023-2024-main/Houdini_visualizer/data/fragment_5/frame_
43
Bartlett_RC11_2023-2024-main/Houdini_visualizer/data/null.obj


_Few_Dollars_More.mp4
e said that many out
ragment_3/frame_
35
alizer/data/null.obj

4.6 A COLLECTION OF IMAGES/RENDERS

The view of CAM_1, which following the path set firstly, between two image lines.



5. REPORT SUMMARY

In Houdini workshop, I learned how to apply basic SOP and how to write and use code in Houdini. I also learned about visualizing images, video data, and reconstructing 3D models.After completing the required tasks, I try to combine these skills together. My understanding of these technologies is that they can help designers aggregate information about a site, visualize information/data, and gain a better understanding of the location.