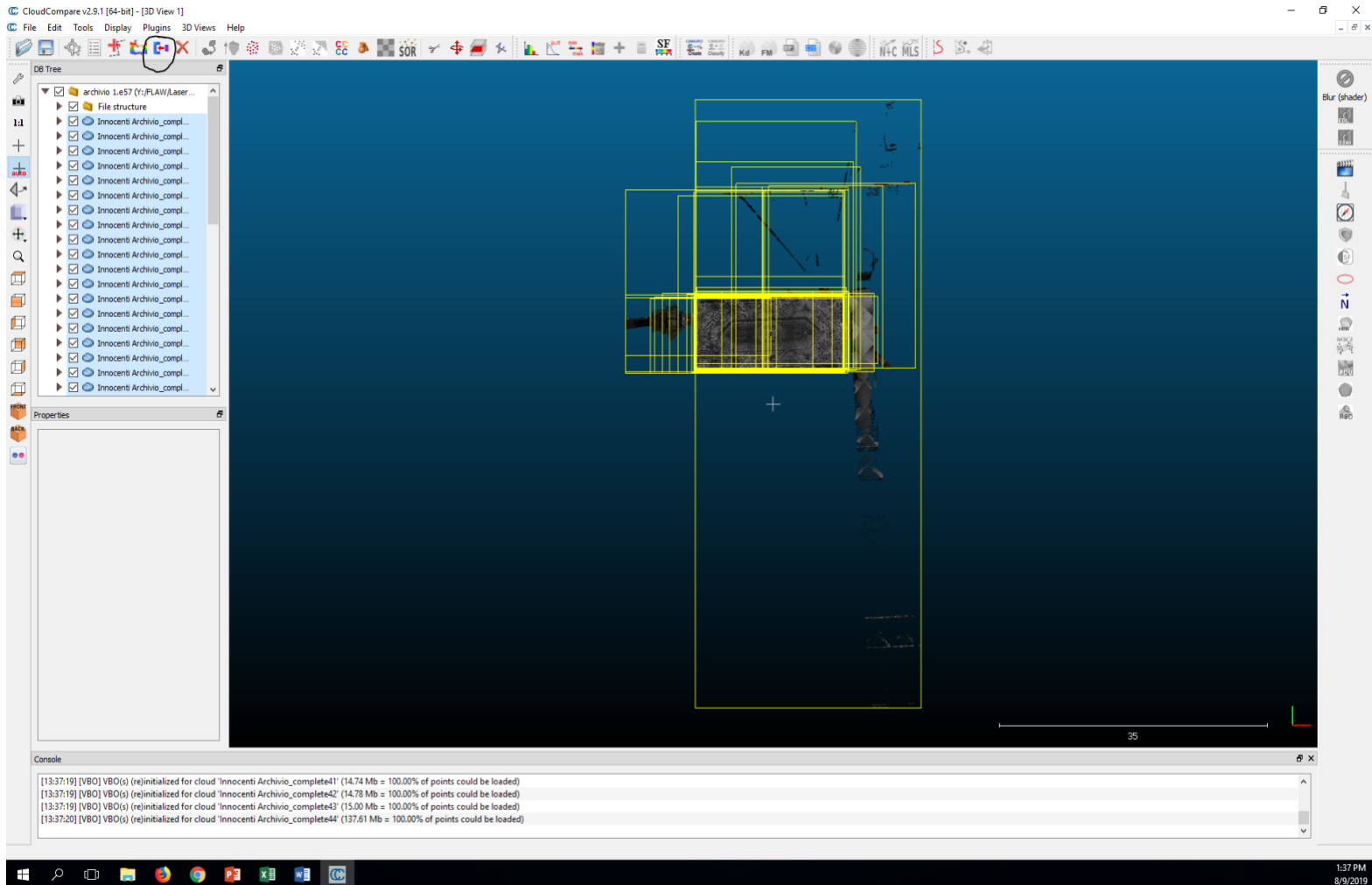
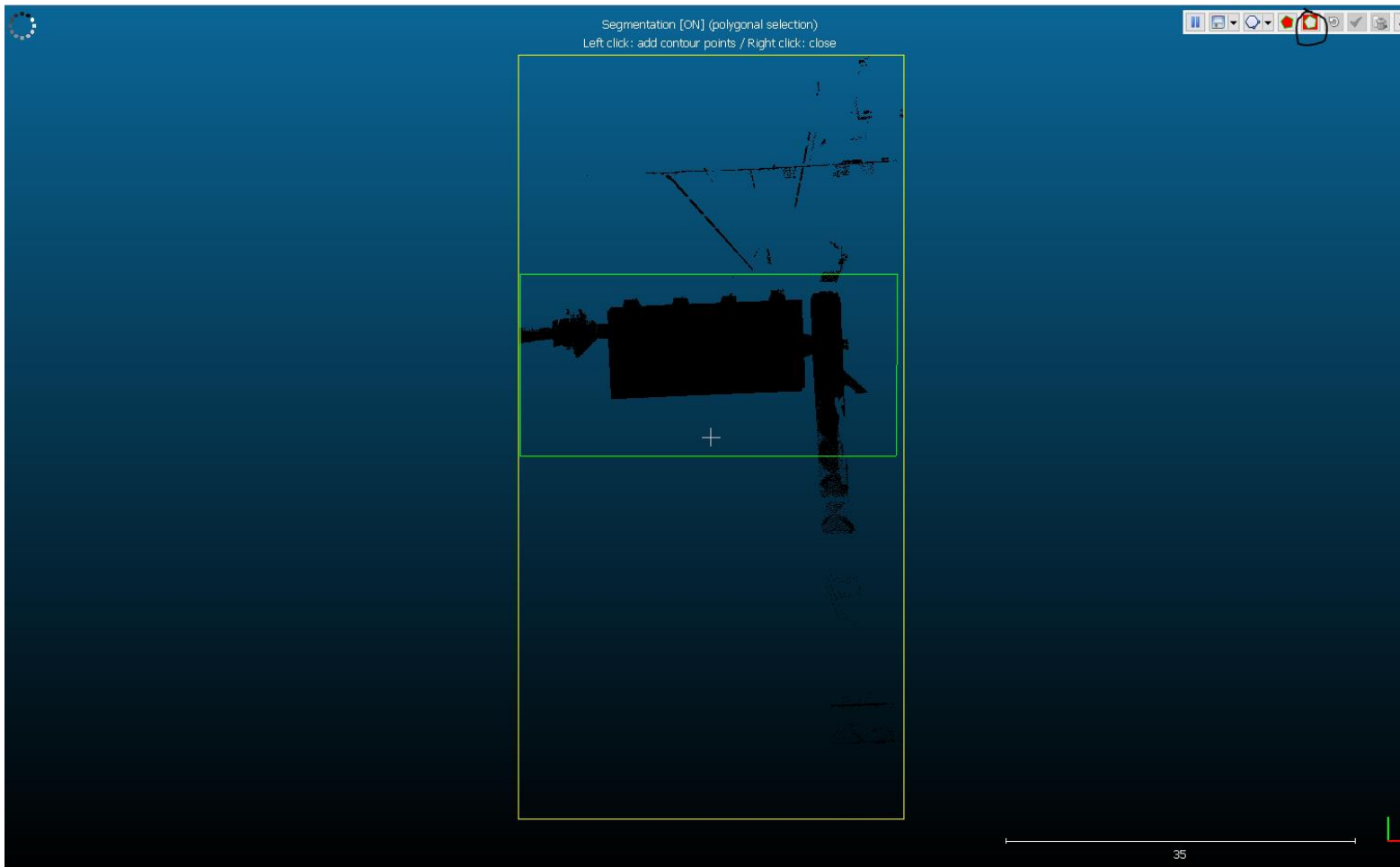


Part 1: Using CloudCompare to Manipulate Point Cloud for Potree

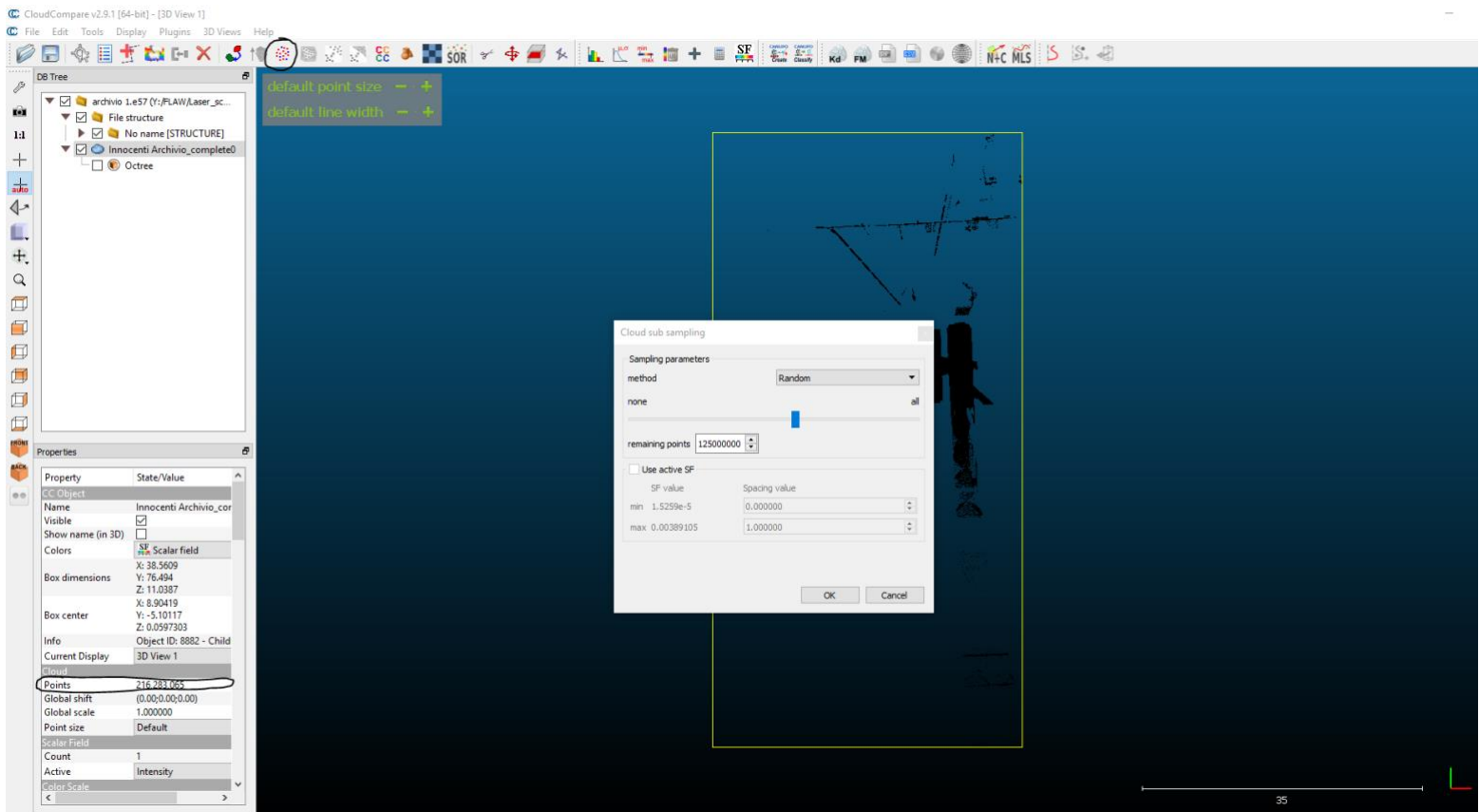
1. Launch CloudCompare and open a point cloud that is saved as a .e57 file.
 - a. If you are having trouble loading in a point cloud, refer to the appendix.
2. All the scans are listed as separate entities in the “DB Tree” located on the far left of the screen. Select all of them and click the merge icon on the top toolbar.
 - a. If asked, “Do you want to generate a scalar field with the original cloud index?” select no.



3. If the model has points that you do not want to include, you can use the segment tool to trim off excess points.
 - a. After selecting the scissors icon on the tool bar, left click and drag to create a polygon of what you want to keep and right click when you are finished.
 - b. Click either the “segment in” or the “segment out” icon on the segmentation toolbar to crop the model.
 - i. “Segment in” will crop everything outside the polygon you created.
 - ii. “Segment out” will crop everything inside the polygon you created.



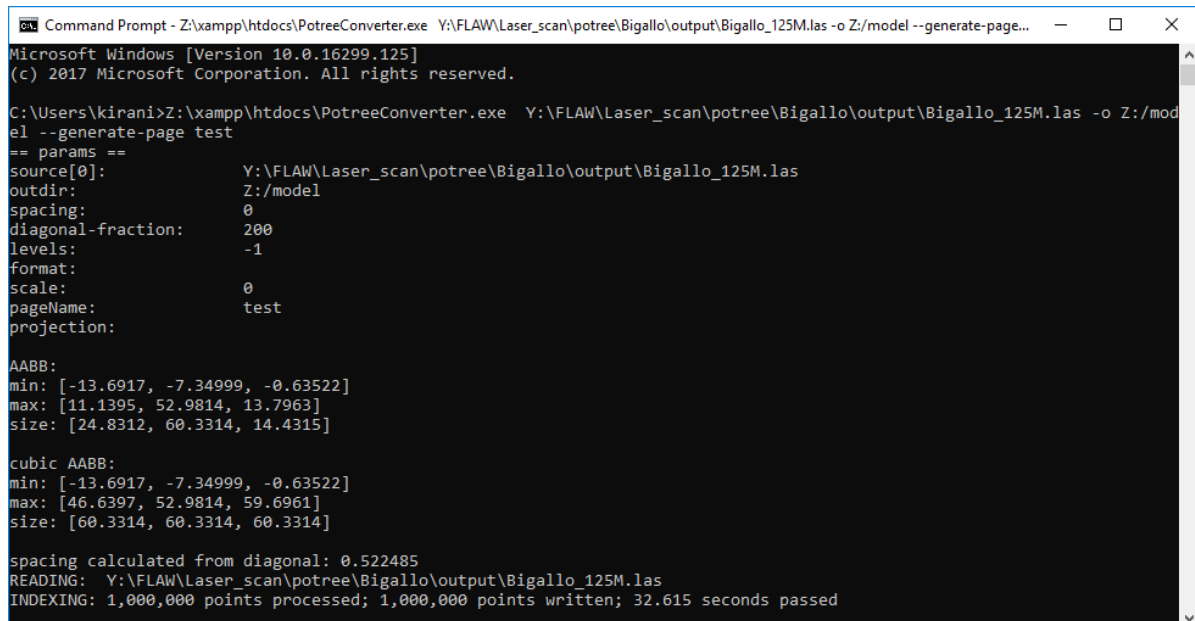
4. In order to upload a point cloud to Potree, it must be 125 million points or less. You can check how many points a model is by looking at the properties panel located in the bottom left of CloudCompare. If it is more than 125 million points, you have to subsample the model to reduce the number of points. The subsample icon is circled in the screenshot below.
 - a. Make sure the sampling parameters are set to a random method and that the remaining points are 125000000.



5. Finish the model by saving it as a .las cloud file.

Part 2: Uploading Point Cloud using PotreeConverter

1. Map a drive (Z: for our examples) to potree \\mpotree1\pointclouddata
2. Before using PotreeConverter, make sure you know the locations of these three files.
 - a. Potree Converter.exe
 - b. The point cloud you want to upload
 - c. The index of where you want to upload it
3. Launch Command Prompt and use this example code to upload a point cloud.
 - a. `./PotreeConverter.exe C:/pointcloud.las -o C:/xampp/htdocs/potree --generate-page pageName`
 - i. This is location of PotreeConverter.exe on the desktop. For most of our cases, it will be **Z:\xampp\htdocs\PotreeConverter.exe**
 - ii. This is the location of the point cloud that is going to be uploaded
 - iii. This is where you want to upload the point cloud. For most of our cases, it will be **Z:\model**
 - iv. Insert the title of the point cloud here



```
Command Prompt - Z:\xampp\htdocs\PotreeConverter.exe Y:\FLAW\Laser_scan\potree\Bigallo\output\Bigallo_125M.las -o Z:/model --generate-page...
Microsoft Windows [Version 10.0.16299.125]
(c) 2017 Microsoft Corporation. All rights reserved.

C:\Users\kirani>Z:\xampp\htdocs\PotreeConverter.exe Y:\FLAW\Laser_scan\potree\Bigallo\output\Bigallo_125M.las -o Z:/model --generate-page test
== params ==
source[0]:      Y:\FLAW\Laser_scan\potree\Bigallo\output\Bigallo_125M.las
outdir:        Z:/model
spacing:        0
diagonal-fraction: 200
levels:        -1
format:         0
scale:          0
pageName:      test
projection:

AABB:
min: [-13.6917, -7.34999, -0.63522]
max: [11.1395, 52.9814, 13.7963]
size: [24.8312, 60.3314, 14.4315]

cubic AABB:
min: [-13.6917, -7.34999, -0.63522]
max: [46.6397, 52.9814, 59.6961]
size: [60.3314, 60.3314, 60.3314]

spacing calculated from diagonal: 0.522485
READING: Y:\FLAW\Laser_scan\potree\Bigallo\output\Bigallo_125M.las
INDEXING: 1,000,000 points processed; 1,000,000 points written; 32.615 seconds passed
```

- b. If done correctly, Command Prompt will start uploading the point cloud and should look like this.

4. Other parameters you can use:

```
usage: PotreeConverter [OPTIONS] SOURCE
Options:
  -h [ --help ]           prints usage
  -o [ --outdir ] arg     output directory
  -s [ --spacing ] arg     Distance between points at root level. Distance
                           halves each level.
  -l [ --levels ] arg     Number of levels that will be generated. 0: only
                           root, 1: root and its children, ...
  -f [ --input-format ] arg Input format. xyz: cartesian coordinates as floats,
                           rgb: colors as numbers, i: intensity as number
  -r [ --range ] arg      Range of rgb or intensity.
  --source arg            Source file. Can be LAS, PLY or XYZ
```

5. Visit 3d.wlu.edu and the model will be wherever you told Potree to upload to.

Part 3: Editing a point cloud using HTML

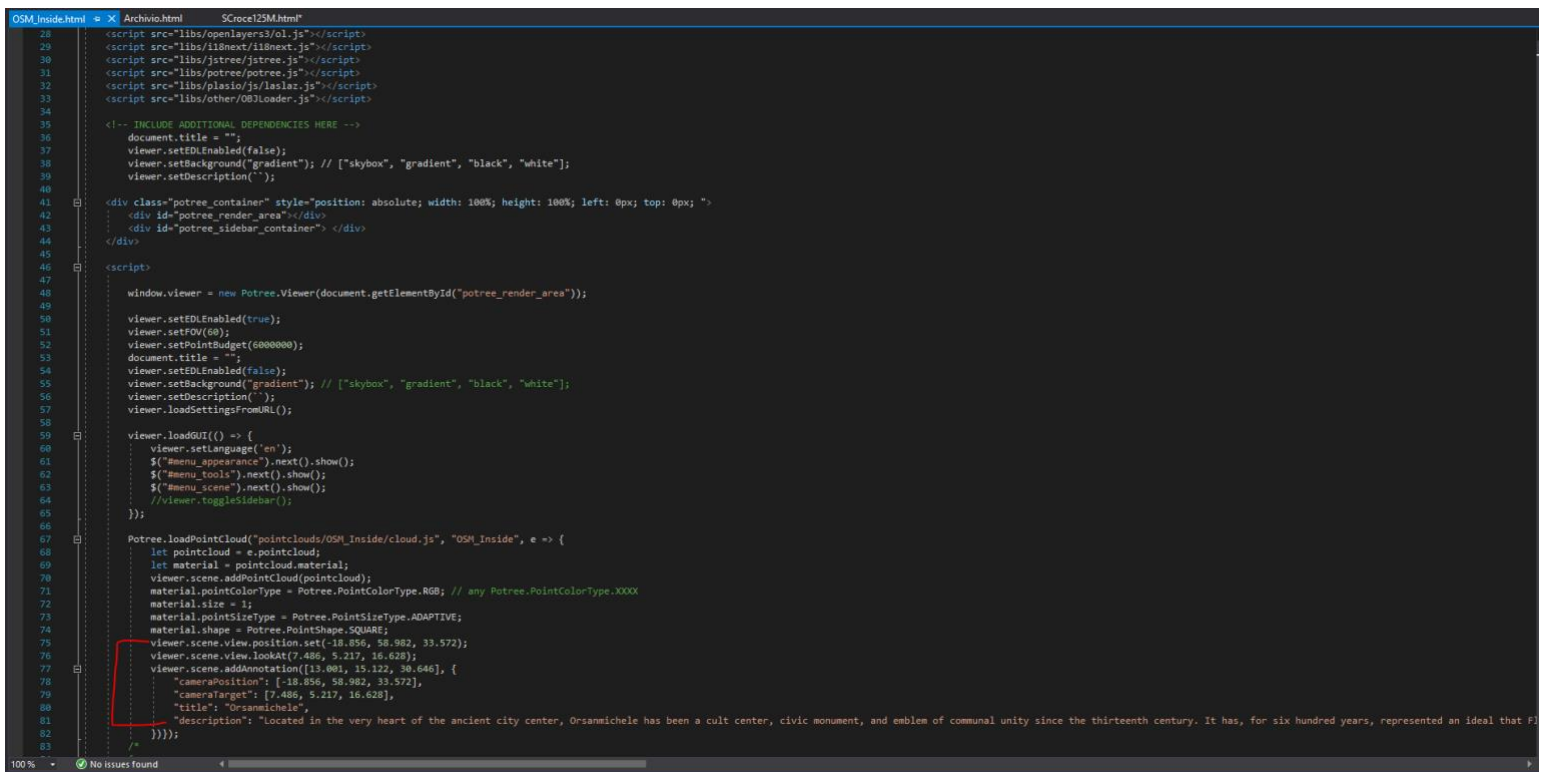
Using HTML, you can manipulate the point cloud and change aspects such as the default camera, point budget, splat quality, and even add labels and titles.

1. The HTML document will be located wherever you uploaded the point cloud in part 2. If you followed the example, it should be in Z:/Model. Right click the HTML document and open it in Microsoft Visual Studio.
2. Changing the appearance of the point cloud
 - a. You can change the point budget from anywhere between 100,000 to 10,000,000 points. We want the default point budget to be 6,000,000 so that it renders nicely and will not take long to load on computers. To change this, find the line of code that reads *viewer.setPointBudget()*; and replace the default *1*1000*1000* to be *6000000*.
 - b. We also want the splat quality to load “high quality” instead of the default “standard.” To change this, add this line of code below the *window.viewer* line: *viewer.useHQ = true*;

```
Archivio.html SCrocel25M.html * X
19 <script src="libs/jquery/jquery-3.1.1.min.js"></script>
20 <script src="libs/spectrum/spectrum.js"></script>
21 <script src="libs/perfect-scrollbar/js/perfect-scrollbar.jquery.js"></script>
22 <script src="libs/jquery-ui/jquery-ui.min.js"></script>
23 <script src="libs/three.js/build/three.min.js"></script>
24 <script src="libs/other/BinaryHeap.js"></script>
25 <script src="libs/tween/tween.min.js"></script>
26 <script src="libs/d3/d3.js"></script>
27 <script src="libs/proj4/proj4.js"></script>
28 <script src="libs/openlayers3/ol.js"></script>
29 <script src="libs/iltbnext/iltbnext.js"></script>
30 <script src="libs/jstree/jstree.js"></script>
31 <script src="libs/potree/potree.js"></script>
32 <script src="libs/plasio/js/laslaz.js"></script>
33
34 <!-- INCLUDE ADDITIONAL DEPENDENCIES HERE -->
35 document.title = "";
36 viewer.setEDLEnabled(false);
37 viewer.setBackground("gradient"); // ["skybox", "gradient", "black", "white"];
38 viewer.setDescription("");
39
40 <div class="potree_container" style="position: absolute; width: 100%; height: 100%; left: 0px; top: 0px;">
41   <div id="potree_render_area"></div>
42   <div id="potree_sidebar_container"></div>
43 </div>
44
45 <script>
46
47   window.viewer = new Potree.Viewer(document.getElementById("potree_render_area"));
48
49   viewer.useHQ = true;
50
51
52   viewer.setEDLEnabled(true);
53   viewer.setFOV(60);
54   viewer.setPointBudget(6000000);
55   document.title = "";
56   viewer.setEDLEnabled(false);
57   viewer.setBackground("gradient"); // ["skybox", "gradient", "black", "white"];
58   viewer.setDescription("");
59   viewer.loadSettingsFromURL();
60
61   viewer.loadGUI(() => {
62     viewer.setLanguage("en");
63     $("#menu_appearance").next().show();
64     $("#menu_tools").next().show();
65     $("#menu_scene").next().show();
66     viewer.toggleSidebar();
67   });
68
69   Potree.loadPointCloud("pointclouds/SCrocel25M/cloud.js", "SCrocel25M", e => {
70     let pointcloud = e.pointcloud;
71     let material = pointcloud.material;
72     viewer.scene.addPointCloud(pointcloud);
73     material.pointColorType = Potree.PointColorType.RGB; // any Potree.PointColorType.XXXX
74     material.size = 1;
```

3. Changing the scene of the point cloud

- a. On the far left of the web page under the folder titled, “other” is the camera option. Clicking on that will show the coordinates of the camera position and target as you move around the point cloud. You can change the default camera by adding these two lines of code under the group of code that loads in the point cloud.
 - i. `Viewer.scene.view.position.set(x,y,z)` This is the camera position
 - ii. `Viewer.scene.view.lookAt(x,y,z)` This is the camera target
- b. To add an annotation to the point cloud, copy the following code, paste it below the camera position, and target code lines.
 - i. `Viewer.scene.addAnnotation([x,y,x], { “cameraPosition”: [x,y,z], “cameraTarget”: [x,y,z], “title”: “insert name here”, “description”: “insert description here” })`
- c. To rotate a point cloud, use this code and mess around with the number values:
 - i. `pointcloud.rotation.x = ();`



```
28 <script src="libs/openlayers3/ol.js"></script>
29 <script src="libs/llnwest/llnwest.js"></script>
30 <script src="libs/jstree/jstree.js"></script>
31 <script src="libs/potree/potree.js"></script>
32 <script src="libs/plasio/js/laslaz.js"></script>
33 <script src="libs/other/OBJLoader.js"></script>
34
35 <!-- INCLUDE ADDITIONAL DEPENDENCIES HERE -->
36 document.title = "";
37 viewer.setEDLEnabled(false);
38 viewer.setBackground("gradient"); // ["skybox", "gradient", "black", "white"];
39 viewer.setDescription("");
40
41 <div class="potree_container" style="position: absolute; width: 100%; height: 100%; left: 0px; top: 0px;">
42   <div id="potree_render_area"></div>
43   <div id="potree_sidebar_container"></div>
44 </div>
45
46 <script>
47
48 window.viewer = new Potree.Viewer(document.getElementById("potree_render_area"));
49
50 viewer.setEDLEnabled(true);
51 viewer.setFOV(60);
52 viewer.setPointBudget(6000000);
53 document.title = "";
54 viewer.setEDLEnabled(false);
55 viewer.setBackground("gradient"); // ["skybox", "gradient", "black", "white"];
56 viewer.setDescription("");
57 viewer.loadSettingsFromURL();
58
59 viewer.loadGUI(() => {
60   viewer.setLanguage("en");
61   $("#menu_appearance").next().show();
62   $("#menu_tools").next().show();
63   $("#menu_scene").next().show();
64   //viewer.toggleSidebar();
65 });
66
67 Potree.loadPointCloud("pointclouds/OSM_Inside/cloud.js", "OSM_Inside", e => {
68   let pointcloud = e.pointcloud;
69   let material = pointcloud.material;
70   viewer.scene.addPointCloud(pointcloud);
71   material.pointColorType = Potree.PointColorType.RGB; // any Potree.PointColorType.XXXX
72   material.size = 1;
73   material.pointSizeType = Potree.PointSizeType.ADAPTIVE;
74   material.shape = Potree.PointShape.SQUARE;
75   viewer.scene.view.position.set(-18.856, 58.982, 33.572);
76   viewer.scene.view.lookAt([7.486, 5.217, 16.628]);
77   viewer.scene.addAnnotation([13.088, 15.122, 30.646], {
78     "cameraPosition": [-18.856, 58.982, 33.572],
79     "cameraTarget": [7.486, 5.217, 16.628],
80     "title": "Orsanmichele",
81     "description": "Located in the very heart of the ancient city center, Orsanmichele has been a cult center, civic monument, and emblem of communal unity since the thirteenth century. It has, for six hundred years, represented an ideal that P
82   });
83 }
```

- d. To upload an object, such as a painting, to the point cloud, upload the .obj, .mtl, and .jpg files in the locations below. After you have copy and pasted the files, refer to the code below and edit what is underlined (To copy the code instead of hand copying each line, open OSM_Inside.html and copy the example code in there).
- For the .obj and .mtl, copy files to Z:\model\libs\potree\resources\models
 - For the .jpg, copy files to Z:\model\libs\potree\resources\textures
 - Line 189: Change the underlined text to be the file location of the .jpg of the object you want to upload.
 - Line 201: Change the underlined text to be the file location of the .obj of object you want to upload
 - Lines 208-210: These are the position, scale, and rotation of the object you are uploading to the point cloud.

```
OSM_Inside.html
181
182 }, onProgress, onError );
183
184 {
185   let manager = new THREE.LoadingManager();
186   manager.onProgress = function ( item, loaded, total ) {
187     console.log( item, loaded, total );
188   };
189   let textureLoader = new THREE.TextureLoader( manager );
190   let texture = textureLoader.load( $(Potree.resourcePath)/textures/matt2.jpg );
191   let onProgress = function ( xhr ) {
192     if ( xhr.lengthComputable ) {
193       let percentComplete = xhr.loaded / xhr.total * 100;
194       console.log( Math.round(percentComplete, 2) + '% downloaded' );
195     }
196   };
197   texture.wrapS = THREE.RepeatWrapping;
198   texture.wrapT = THREE.RepeatWrapping;
199
200   let onError = function ( xhr ) {};
201   let loader = new THREE.OBJLoader( manager );
202   loader.load( $(Potree.resourcePath)/models/matt2.obj, function ( object ) {
203     object.traverse( function ( child ) {
204       if ( child instanceof THREE.Mesh ) {
205         child.material.map = texture;
206       }
207     } );
208
209     object.position.set(10.2, 3.175, 2.75);
210     object.scale.multiplyScalar(.35);
211     object.rotation.set(0, 0, 75 * Math.PI / 64);
212
213     viewer.scene.add( object );
214
215     viewer.onGUIloaded(() => {
216       // Add entries to object list in sidebar
217       let tree = $( "#jstree_scene" );
218       let parentNode = "other";
219
220       let artID = tree.jstree('create_node', parentNode, {
221         text: "Matthews Triptych",
222         icon: $(Potree.resourcePath)/icons/triangle.svg,
223         data: object
224       },
225       "last", false, false);
226       tree.jstree(object.visible ? "check_node" : "unchecked_node", artID);
227       //tree.jstree("open_node", parentNode);
228     });
229     viewer.scene.addAnnotation([11.509, 3.092, 4.307], {
230       "cameraPosition": [8.045, 6.634, 3.061],
231       "cameraTarget": [9.989, 2.877, 2.507],
232       "title": "Matthews Triptych",
233     });
234   }, onProgress, onError );
235 }
236 }
```

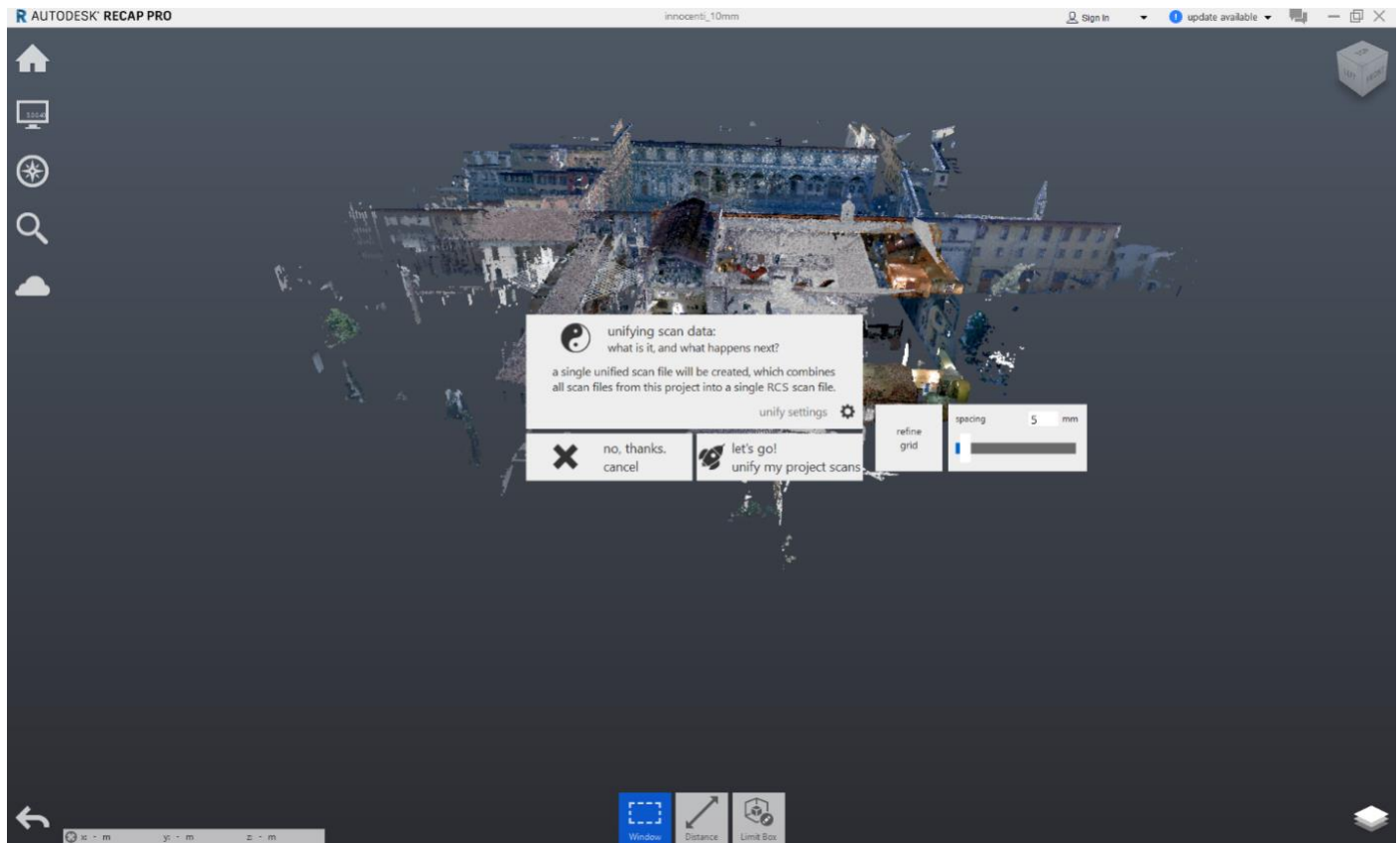
- Line 220: The name of the object uploading.
- Lines 229-232: Adding an annotation to the object uploading (refer to step 3B).

Appendix

There will be some cases where the point cloud is too large to open in Cloudcompare. When this happens, you must open it in ReCap and subsample it in there.

How to subsample a point cloud in ReCap?

1. Open the ReCap project file and export the point cloud as a unified .rcs.



2. Click unify settings and change the spacing to 10 mm. This will sub sample the point cloud.
3. Depending on the project size, it might take a while for the point cloud to export. When it is finished, open the .rcs back into ReCap and export it as a .pcp.
4. Open the file in Cloudcompare and continue the same steps. If the file is too large, try exporting the project file as a .rcs with a larger spacing number.