



SCAN2FX

Mesh Modeler

Manual

Version 3.5.0
September 2018

1. Introduction

1.1 Background

SCAN2FX was developed out of the need to create photo-realistic assets, visualizations, structures and sets for production use in a more time efficient manner -- without the need for an extensive process, and without too many intermediate steps.

1.2 SCAN2FX Mesh Modeler

SCAN2FX Mesh Modeler allows users to efficiently create polygon meshes from point clouds, as well as other elements for export straight into 3D software, compositing, game engines, 3D tracking, or other VFX software.

SCAN2FX Mesh Modeler offers both manual polygon creation and primitive extraction features as well as automatic point cloud meshing.

In terms of polygon creation, users can create polygons on top of the point cloud e.g. to fill windows or other holes in the scan data, or to create a very simple mesh of a structure (instead of using automatic meshing) with clean topology and few triangles. There is also the ability to move vertices off the point cloud when needed for filling, or to use only certain axes and combine the attributes of several points from the point cloud for a vertex. Bridging and extrusion of polygons is also possible.

SCAN2FX Mesh Modeler also enables primitive extraction. Users can extract boxes, spheres, cylinders or planes, by clicking points on a point cloud surface. These get either retained as primitives or converted to faces. There is also the option to place cylinders or a simple pipe (connected set of cylinders) without extraction e.g. to fill in small railings with insufficient point cloud data.

Furthermore, SCAN2FX Mesh Modeler provides a sophisticated survey tool that allows extracting surfaces. These options are unique in the industry, and include things like

- smoothing of the exterior shape,
- simplifying the shape to a rectangle,
- straightening out of specific corners,
- cutting of the survey area at a certain distance or height,
- automatically creating holes in the surface (or not),
- creating extra, separate interior faces (e.g. for windows or inlets),
- flattening or creating 3D locations for points at the border of the surfaces,
- combining elements projecting onto the plane up to a certain distance in front or behind the surface
- etc.

SCAN2FX Mesh Modeler offers its unique SCAN2FX proprietary automatic meshing. Meshing operations are performed in batch during export, rather than each area separately. The whole scene can be selected and meshed, or also components can be meshed with different settings and their own labels (so that those components are exported separately as labeled objects). Meshing includes different resolution/sampling settings as well as automatic decimation (which creates a second, lower-res mesh for backup). The meshing on higher resolutions retains significant detail such as branches, leaves, thin railings, or even electricity wires. It is designed to also retain human-made structures with sharp creases and edges. The meshing times are pretty reasonable, allowing completion of the work in minutes or tens of minutes for large areas. In addition, the meshing offers special effects modes that allow the creation of a kind of a world out of “cubes” / “blocks” as well as to export a point sampling as a mesh.

SCAN2FX Mesh Modeler also allows extraction of particle systems (including color and native Maya particle systems with the SCAN2FX Exporter for Maya).

SCAN2FX Mesh Modeler also allows the placing of names and locators that can be used to mark important points in the 3D scene for other artists, given references, or to be used as additional information for 3D motion tracking.

Components can be named within Mesh Modeler so the structure and naming get exported straight to OBJ or native Maya (with the optional SCAN2FX Exporter for Maya module).

One thing to also note is that SCAN2FX Mesh Modeler also runs on SCENE LT, allowing other artists that did not use SCENE before to model straight on the project point cloud previously created. This allows scaling modelling teams more efficiently and enabling access of SCAN2FX Mesh Modeler to a variety of artists, designers or modelers on a team.

SCAN2FX Mesh Modeler significantly reduces the time needed to create the meshes from the point cloud measurement data and enables powerful new workflows straight to 3D and VFX software. It was designed by VFX artists and algorithm experts specifically for VFX/3D/game/VR/AR artists and designers.

SCAN2FX creates, for the first time, a straight and efficient path to the most popular visual effects and 3D software packages, from your laser scans, designed with real production use and workflows in mind.

2. System Requirements and Version History

2.1 System Requirements

- FARO® SCENE or Scene LT 2018+
- Windows 10 (may work with previous versions, but not tested)
- 3D application that imports OBJ or Maya MA scenes
- For native Maya export, **SCAN2FX Exporter for Maya** needs to be purchased.

2.2 Version History

NEW with Release 3.5

Release 3.5

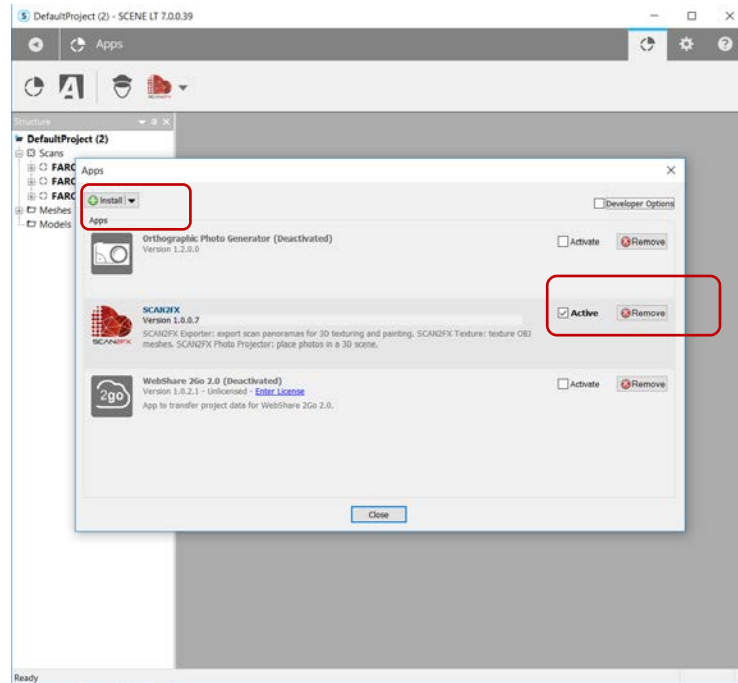
- a. **Grouping Fix for triangulated OBJ exports** – fixed grouping in OBJ with triangulation turned on
- b. **SCENE 2018 version** – optimized for SCENE 2018
- c. **Select All** to determine Meshing Box – creates rough bounding box for meshing (usually a bit too large though)

Release 3.3

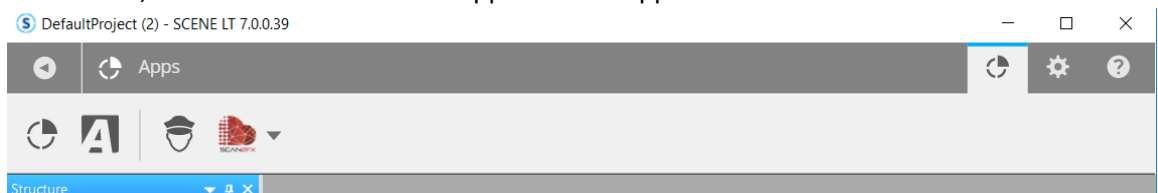
- d. **Subdivide Mesh Volumes into Chunks** – option to divide selected mesh box into multiple separate meshes.
- e. **Fix to ensure Exports do not include previously deleted faces**
- f. **Error message if no project point cloud created** – avoids crash during meshing.

3. Installation

1. Open SCENE or SCENE LT (tested with version 2018 or higher, but may support other versions).
2. If you have a previous version of SCAN2FX installed, please remove this version first with the App Manager in SCENE or SCENE LT (in the new Scene User Interface: Apps -> Apps, and then click remove right of the application in the pop-up. In the previous User Interface: Tools -> Apps, and then click remove in the pop-up).



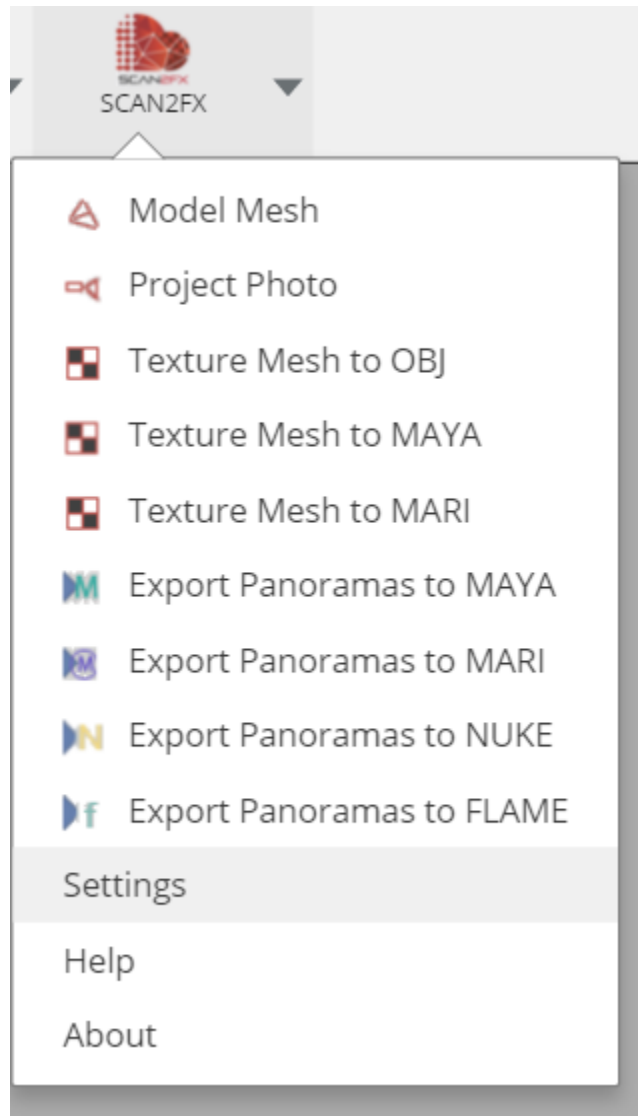
3. Install the downloaded SCAN2FX app by doing one of the following:
 - Drag & Drop the SCAN2FX.fpp file into SCENE.
 - Double click the SCAN2FX.fpp file in the Windows Explorer.
 - Click install in the App Manager in SCENE or SCENE LT to install the SCAN2FX app, and follow the instructions.
4. Once installed, the SCAN2FX icon should appear in the apps list.



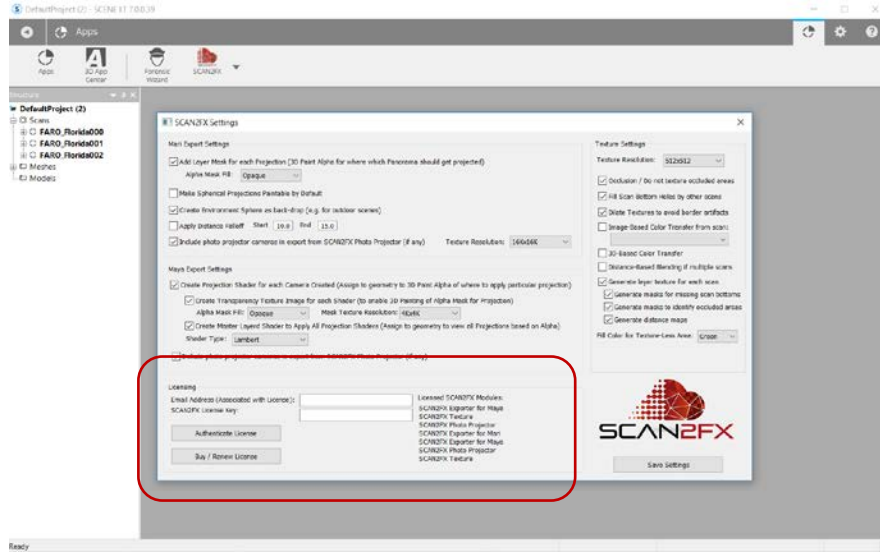
4. Licensing

To activate the SCANFX Mesh Modeler module, a valid license key needs to be authenticated. You can purchase the SCAN2FX Mesh Modeler module or also other modules, or all modules combined via the FARO® 3D App Center or from a licensed reseller. If you are interested in a trial first, and need a trial license, please email sales@scan2fx.com with your company information, intended use, and email address.

1. To activate your license, click on the red SCAN2FX icon as highlighted, and select Settings in the menu.



2. In the following pop-up dialogue, see the section “Licensing” at the bottom left of the dialogue box. Enter the email address that was used when purchasing the license and is associated with the license. And paste in your SCAN2FX license key.



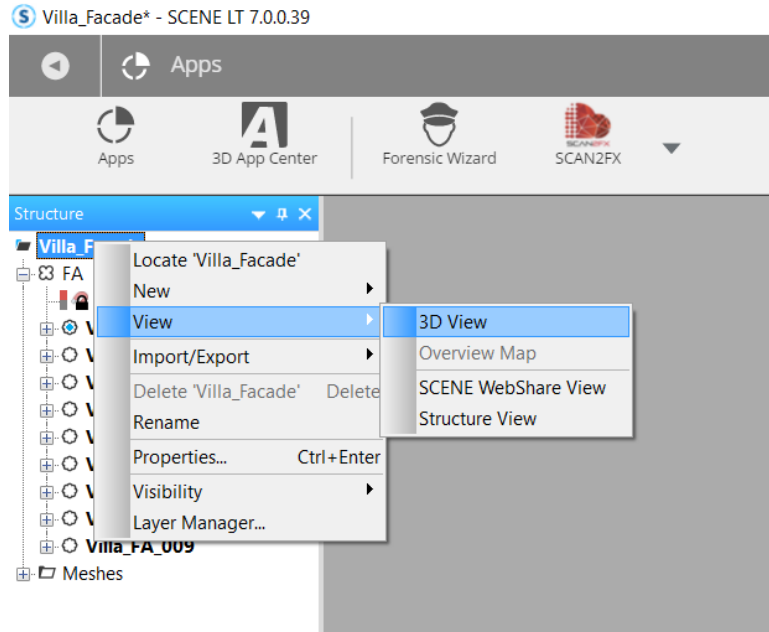
3. Click “Authenticate License” to connect to the SCAN2FX cloud licensing server for authentication.

Please make sure that your computer is connected to the Internet for this step, as SCAN2FX will send this information to SCAN2FX’s licensing servers for license authorization. Each license key may enable one or more modules within SCAN2FX. The licensed SCAN2FX Modules will get listed on the right side of the email address and SCAN2FX license key box.

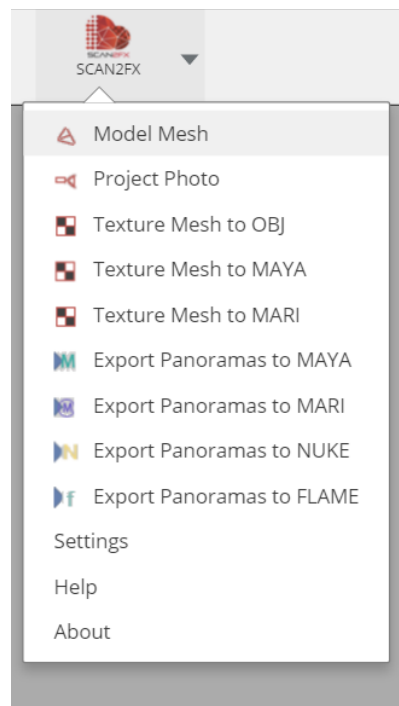
Finally, please note that all licenses in SCAN2FX are subscription-based, meaning they will expire after your service term and a renewal subscription needs to be purchased in order to continue using the module. When a licensing key gets entered the first time in SCAN2FX, this particular license key will be node-locked to the particular hardware and cannot be re-used on another machine. Please note that licenses are not transferable to other machines or hardware during the subscription term once they have been activated on one hardware. A new subscription can be purchased separately and assigned to the new or modified hardware.

5. Using SCAN2FX Mesh Modeler – Getting Started

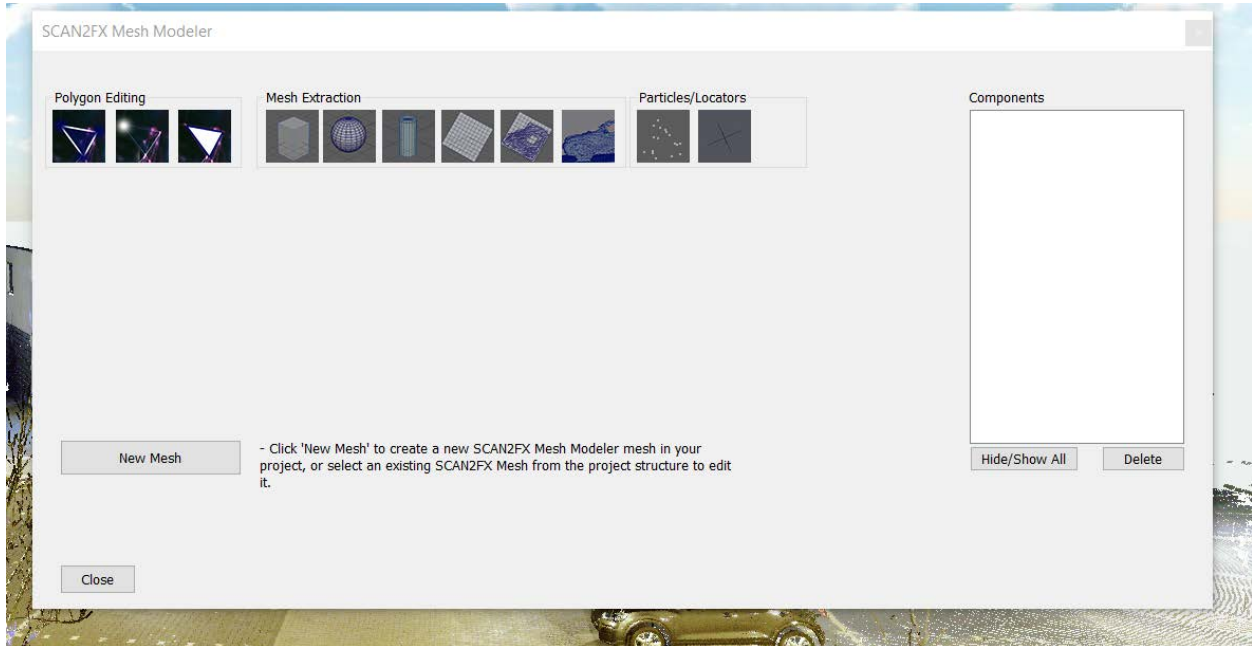
Open a 3D view of your point cloud. SCAN2FX Mesh Modeler requires an active 3D view to work. Also make sure to create a **project point cloud** prior to launching SCAN2FX Mesh Modeler. Make sure you utilize a perspective 3D view (and not orthographic).



To get started, activate the SCAN2FX Mesh Modeler dialogue / tool box by clicking Model Mesh in the SCAN2FX menu.

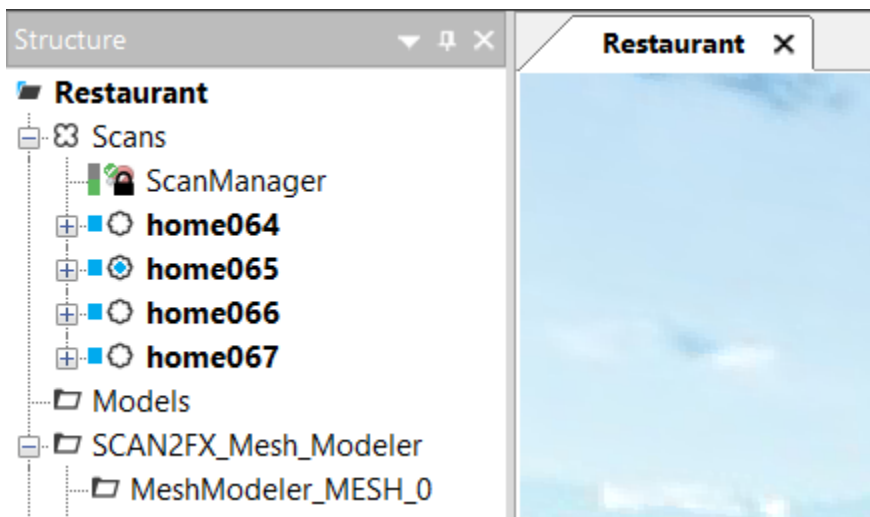


If you have no photo projector selected in your scene structure / graph, the SCAN2FX Mesh Modeler tool will pop up like this:

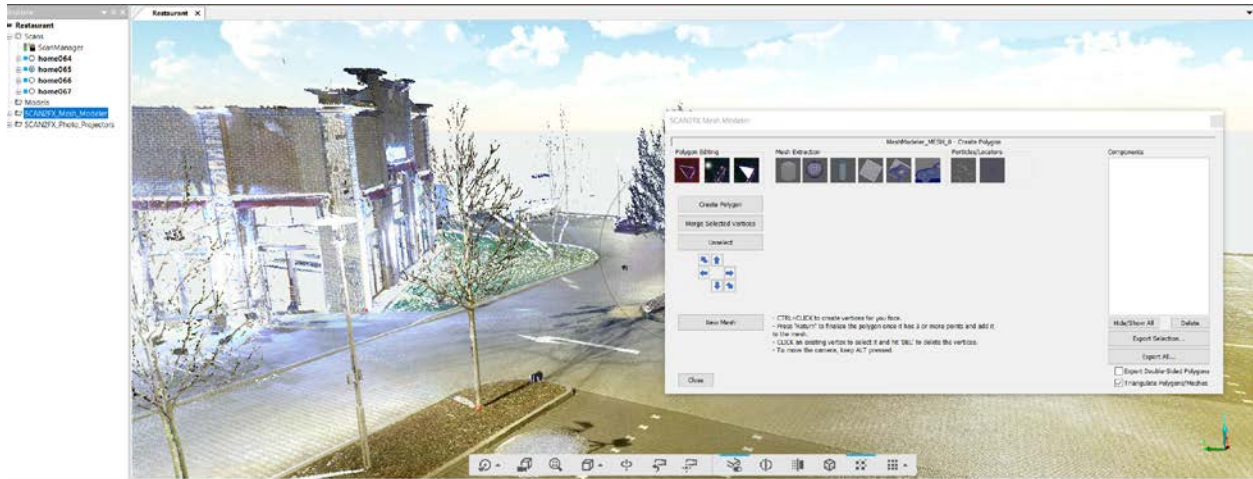


You can now click the "New Mesh" button to create a SCAN2FX Mesh Modeler node.

A mesh modeler node will get created in the structure of Faro Scene under the SCAN2FX_Mesh_Modeler folder:



Also the tool will now allow switching between the different tools, represented by the icons. Initially, the “Create Polygon” tool is activated and you are ready to start creating new polygons.



To activate an existing SCAN2FX Mesh Modeler node later, open the SCAN2FX Mesh Modeler tool as before through the SCAN2FX menu, and then click the node in the structure tree. Selecting the node will open up the existing mesh components in the tool for the selected node.

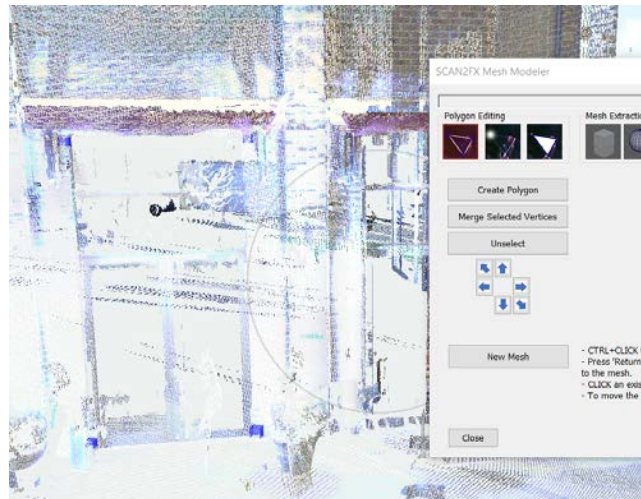
6. Using SCAN2FX Mesh Modeler – Polygon Editing / Creating Polygons



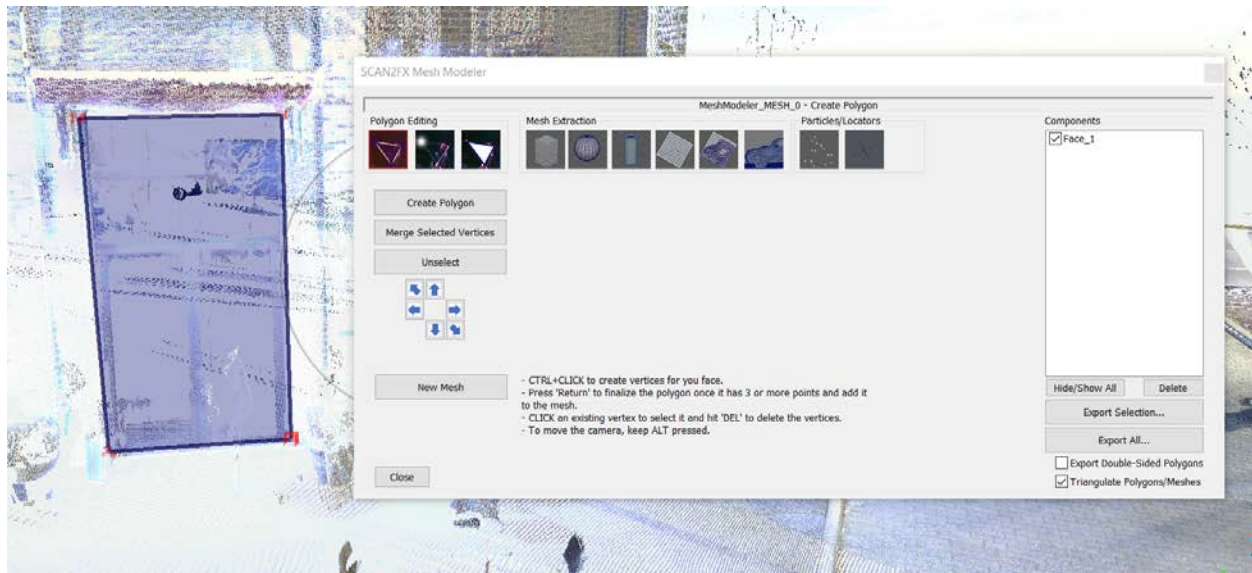
Click the “**Create Polygon**” icon to activate the tool. The icon will appear slightly red when active. The “Create Polygon” tool enables creating simple polygons e.g. to fill holes in the point cloud (such as windows, unscanned areas, water, etc.), or to create a simplified mesh structure of your scene (e.g. think background buildings, walls, etc.).

6.1 Creating a Polygon

To create a polygon, simply CTRL + click on the point cloud to place a vertex. Now continue placing vertices either clockwise or counter clockwise. For each vertex, a small blue box appears to highlight the vertex. Blue vertices mean they are selected and part of the polygon you are creating.

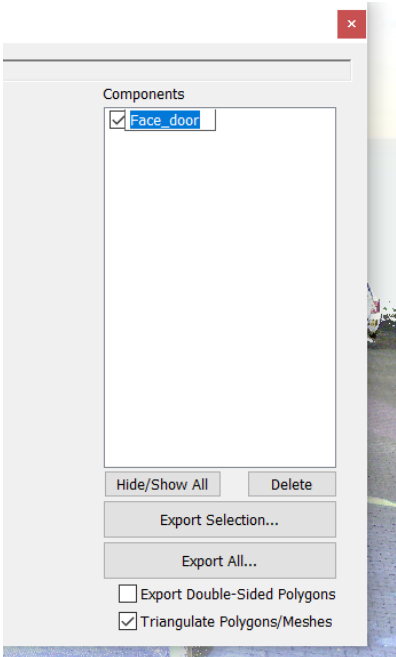


When done, hit the “enter” key to create the polygon (make sure to click first on the 3D view to activate it before pressing “enter”). Alternatively, you can click the “Create Polygon” button. A polygon requires at least three vertices. The polygon will appear in blue, and the vertices will turn red (unselected). Also note how the polygon appears as “Face_1” in the **Components List** on the right of the SCAN2FX Mesh Modeler tool.



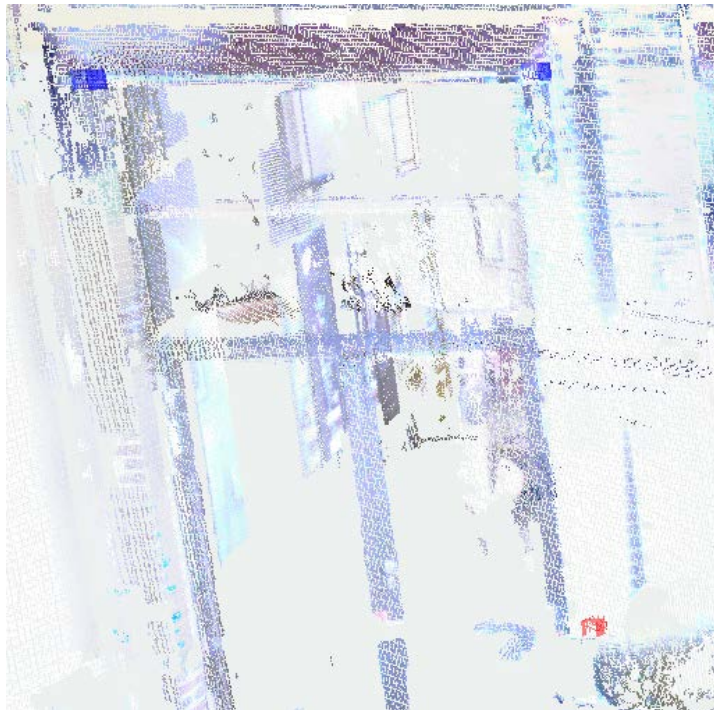
6.2 Renaming a Component

You can rename a component by clicking the label on the right once, and then entering a new label or editing it.



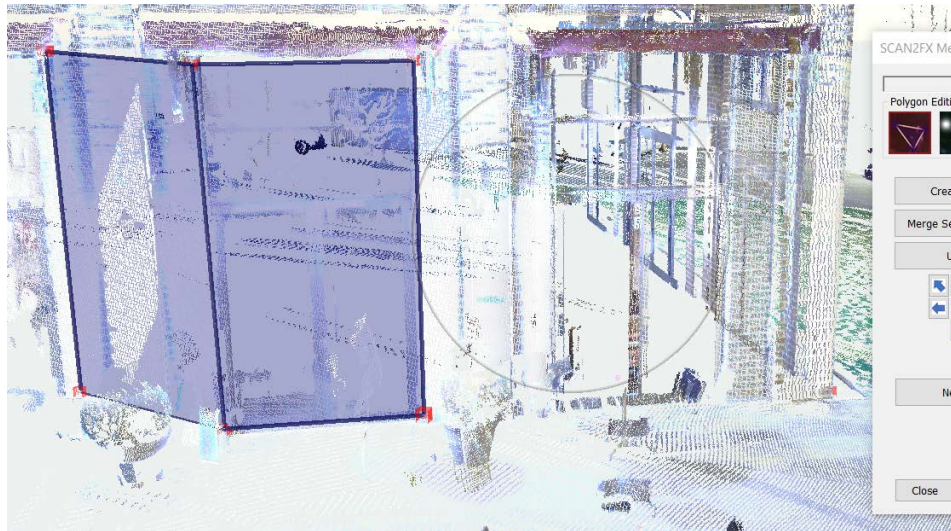
6.3 Unselecting Vertices

To unselect a vertex (e.g. when placed in the wrong location by accident), simply click the blue vertex. It should turn red (i.e. unselected). This way the vertex will not be considered for the polygon you are creating.



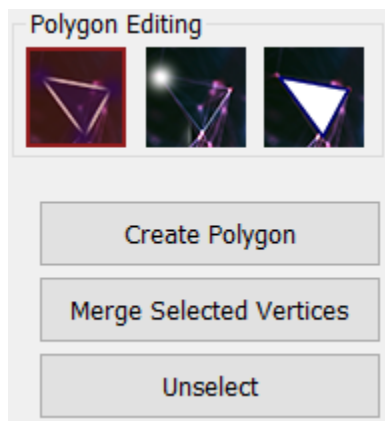
6.4 Selecting Existing Vertices

When creating a polygon, you can also select previously created, red vertices to make them part of the new polygon. This way you can make a new polygon fit precisely next to an existing polygon.



6.5 Unselecting All Vertices / Starting Over

If you want to start with your polygon, just press the “ESC” key or click the “Unselect button.” This way all currently selected vertices get unselected. And you can start from fresh.

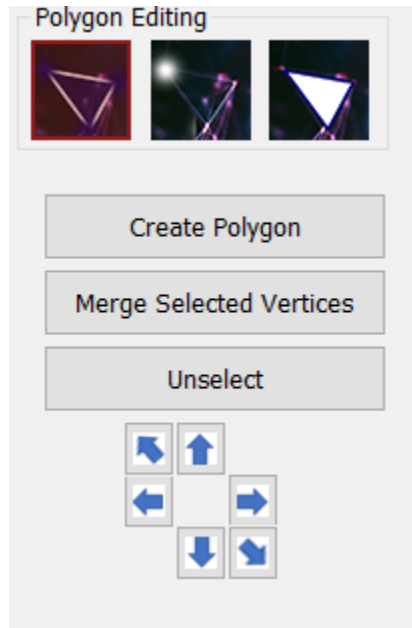


6.6 Merge Selected Vertices

Select two or more very close and nearby vertices, and click “Merge Selected Vertices” to merge the selected vertices so all are at the same location. This is a handy feature to help merge the location of vertices from separate polygons.

6.7 Moving Vertices

Clicking one of the arrows when a vertex is selected, will automatically switch to the “Move Vertex” tool. The arrows enable moving vertices “off” the point cloud e.g. into a location that was not part of the point cloud. The “Move Vertex” tool is described in more detail in the next chapter.



7. Using SCAN2FX Mesh Modeler – Polygon Editing / Moving Vertices

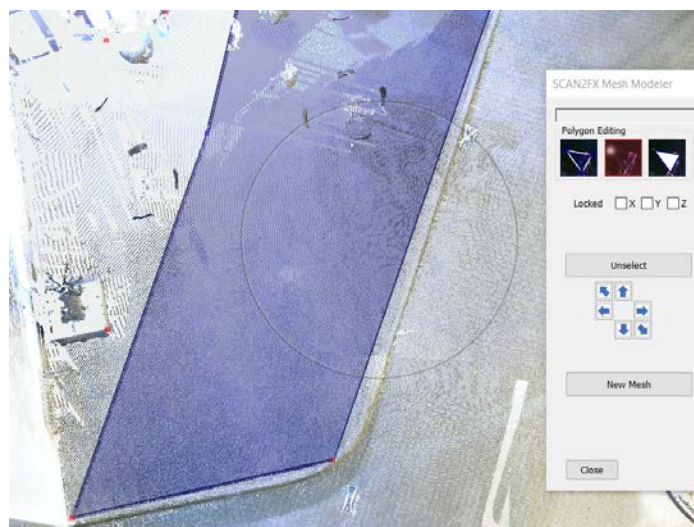


Click the “**Move Vertex**” icon to activate the tool. The icon will appear slightly red when active. The “Move Vertex” tool moves an existing vertex to a different location on the point cloud, or even a location off the point cloud, and enables modifying existing polygons.

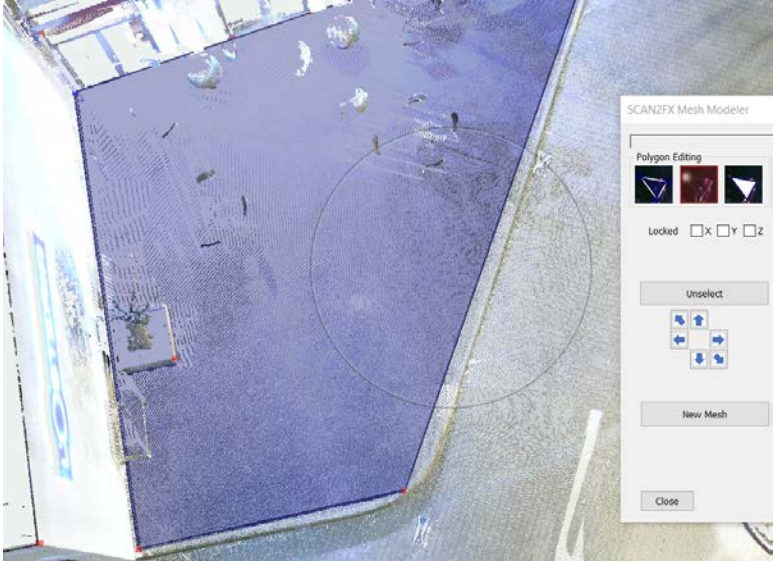
Here a few examples of how this can work.

7.1 Moving an Existing Vertex to Modify a Polygon

Select a vertex (red box) by clicking it in the 3D view (no CTRL key), and the box will turn blue.

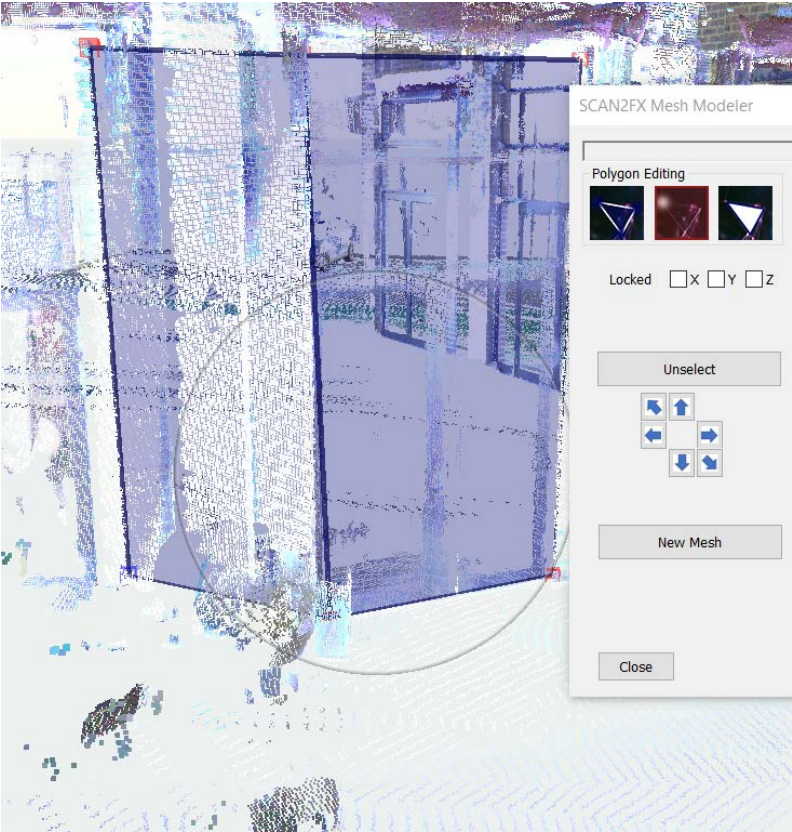


Now CTRL + click somewhere else on the point cloud to move it. The polygon that the vertex is part of will also get modified automatically.

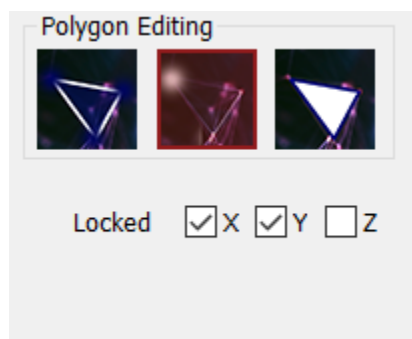


7.2 Utilizing Axis Locks

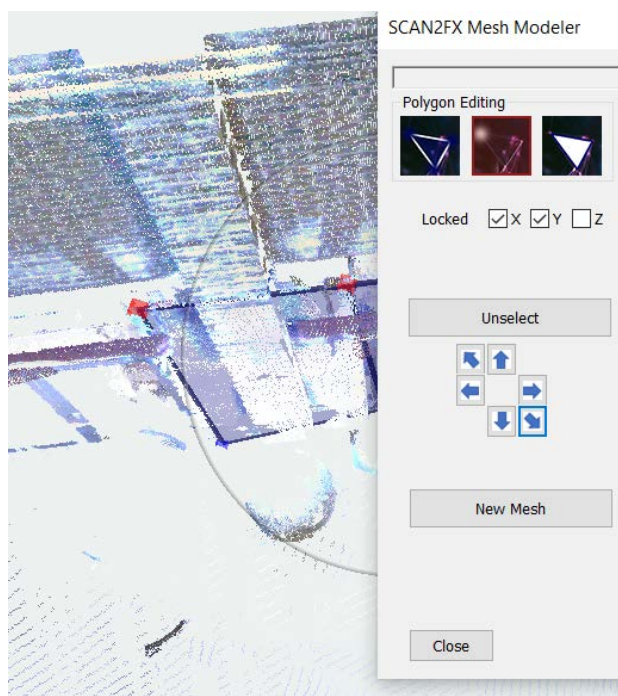
The vertex at the left bottom is too high since there was a hole in the point cloud and nowhere to click any lower to match the ground floor. Click the vertex to select it and it will turn blue.



Now we will lock the X and Y axis, and then modify the Z axis of our vertex by utilizing a different area of the point cloud. Lock X and Y by checking off the checkboxes:



Now CTRL + click somewhere else on the point cloud (e.g. the ground floor of the building). SCAN2FX Mesh Modeler will now modify the selected vertex's height to the Z coordinate of the ground floor. Now the polygon goes all the way down to the ground, even though the point cloud had a hole there. This feature enables creatively filling in holes with polygons of unscanned areas or other holes.

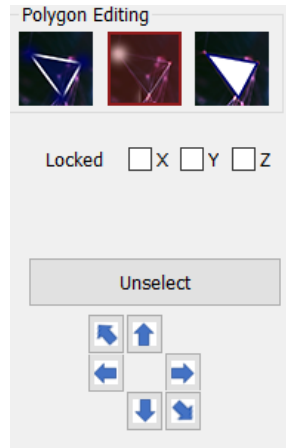


7.3 Unselecting Selected Vertex

To unselect the selected vertex, click the “Unselect” button or hit “ESC” on the keyboard (make sure to first click on the 3D view). In the “Move Vertex” tool, only one vertex can be selected at any given time.

7.4 Manually Moving Vertices with Arrow Buttons

The “Move Vertex” tool also allows manually moving a vertex by clicking the arrow buttons. The adjustments take place in small steps and also allow moving vertices completely off a point cloud to fill areas that were not scanned.



There are 6 buttons to move a vertex Up/Down, Left/Right and Forward/Backward in world space.

8. Using SCAN2FX Mesh Modeler – Polygon Editing / Modifying Polygons



Click the “Polygon” icon to activate the tool. The icon will appear slightly red when active. The “Polygon” tool enables selecting a polygon, bridging of two polygons, and extruding a polygon. Also, when selecting a face / polygon in the Component List, SCAN2FX Mesh Modeler will enable this polygon tool.

8.1 Selecting a Polygon in the 3D View

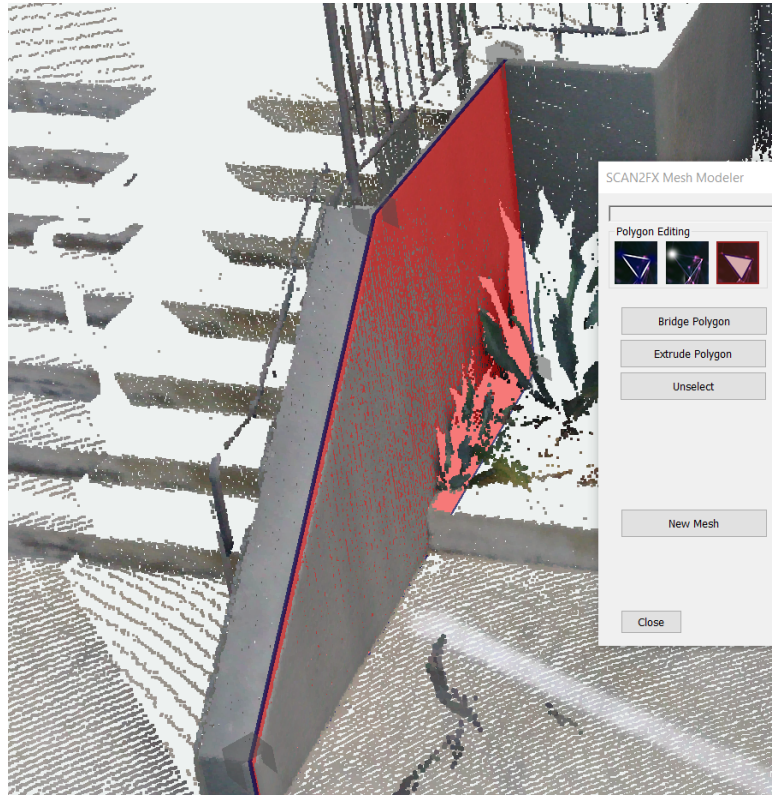
When this tool is active, simply click one of the blue polygons to select it. A selected polygon will appear red, while unselected polygons appear blue.

8.2 Selecting a Polygon through the Component List

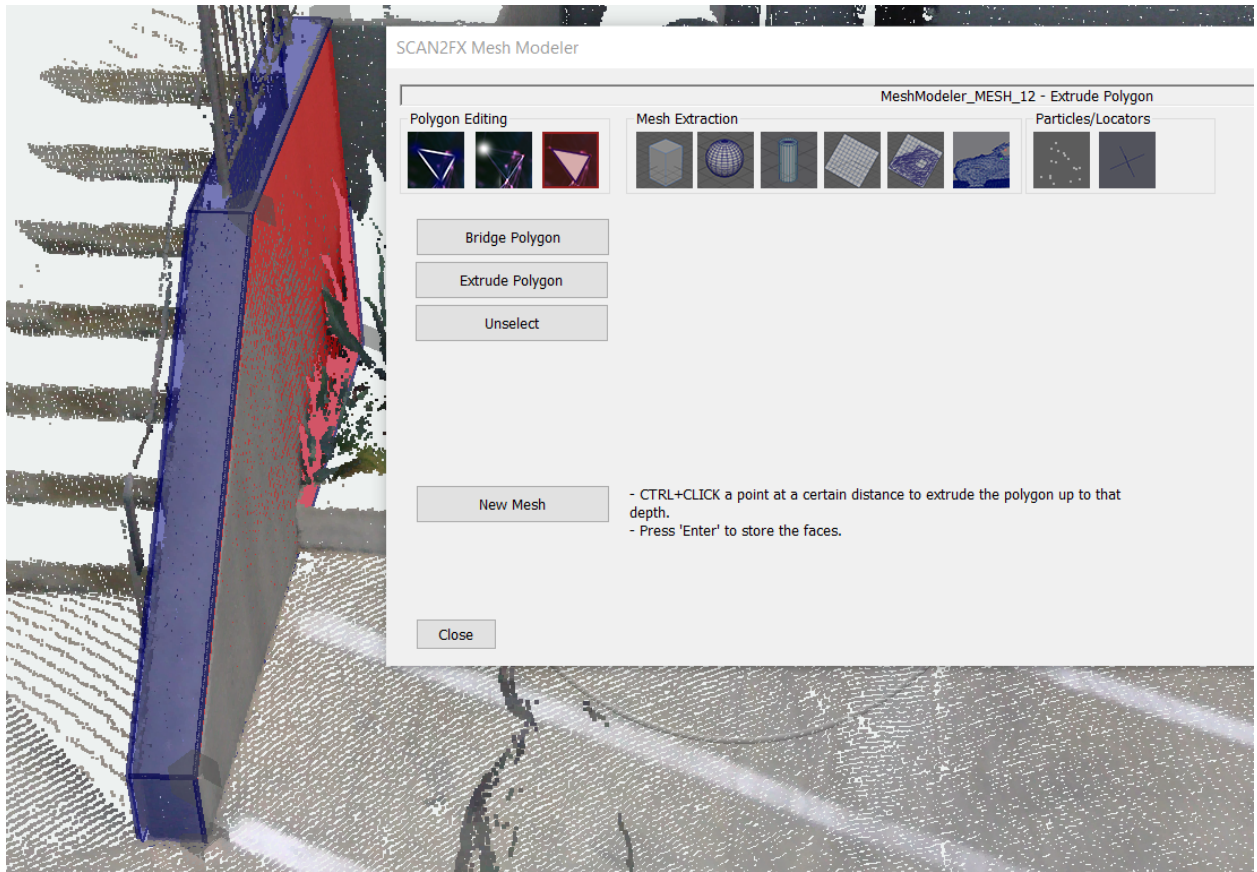
You can also select a polygon through clicking the name in the Components List. Clicking a polygon component will automatically switch to the “Polygon” tool.

8.3 Extruding a Polygon

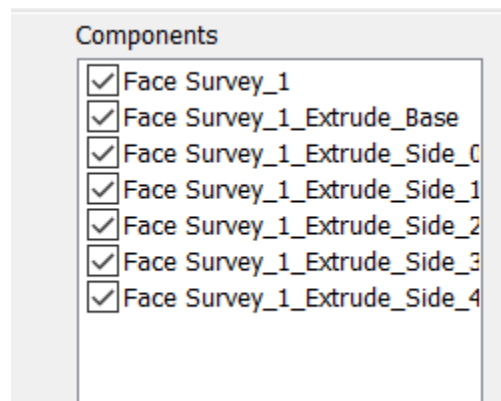
Select the existing polygon. The polygon will turn red.



Next, click the **“Extrude Polygon”** button. Now CTRL + click a point at the distance / depth you want to extrude to. A preview will show the extrusion:

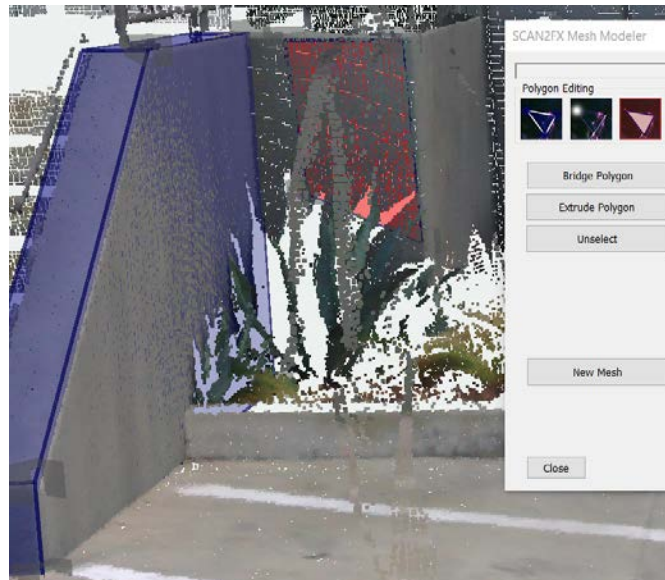


Hit the “enter” key to convert the extrusion to components. These components end up as normal polygons that can be modified with the “Move Vertex” tool as described in the previous chapter.

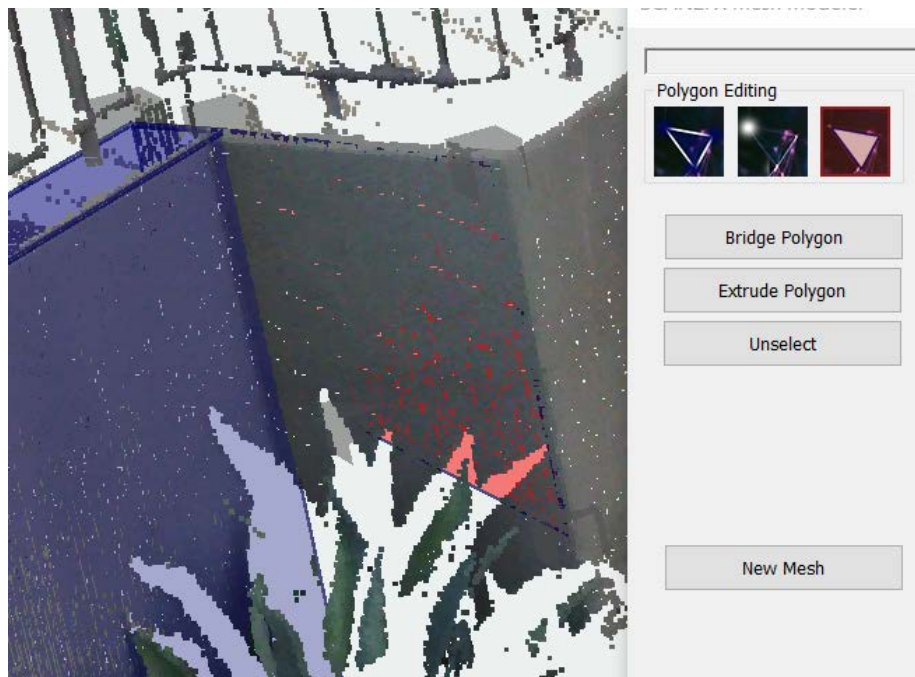


8.4 Bridging Two Polygons

SCAN2FX Mesh Modeler also allows “bridging” two polygons. Select the polygon that should be adjusted to bridge and connect with the other polygon. The red polygon is not connected to the blue polygon to the left.

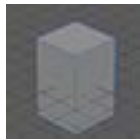


Then, click the “**Bridge Polygon**” button. Now, select the second polygon. The top corner vertex of the red polygon was close to the top corner of the blue polygon we clicked. So the top corner vertex got moved to bridge the two polygons:



SCAN2FX Mesh Modeler provides several tools to automatically extract primitive shapes without having to manually model all polygons. In particular, SCAN2FX Mesh Modeler allows extracting boxes, cylinders, spheres, planes as well as arbitrary shapes with the Survey Tool. The following chapters 9 through 12 cover those extraction tools.

9. Using SCAN2FX Mesh Modeler – Mesh Extraction / Box Primitives



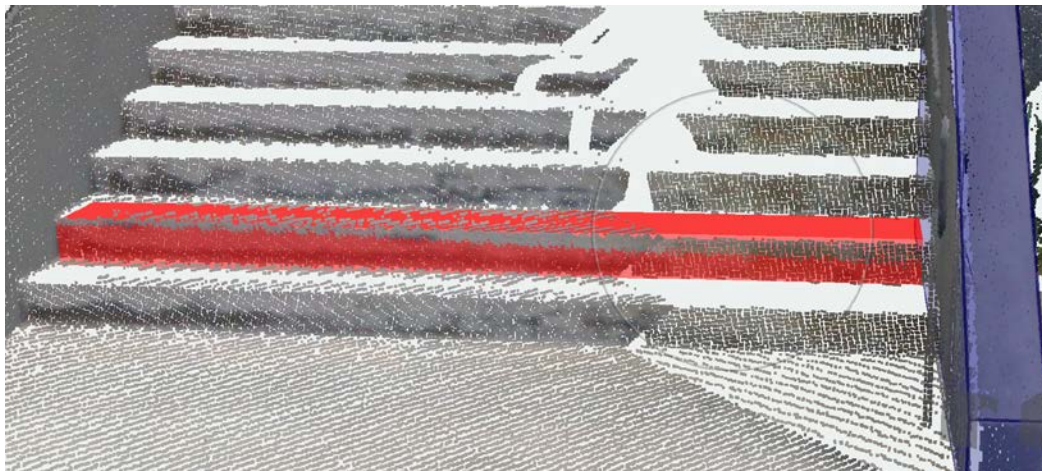
Click the “**Extract Box**” icon to activate the tool. The icon will appear slightly red when active. The “Extract Box” tool enables to quickly extract a box shape based on the point cloud.

9.1 Creating a new Box based on the Point Cloud

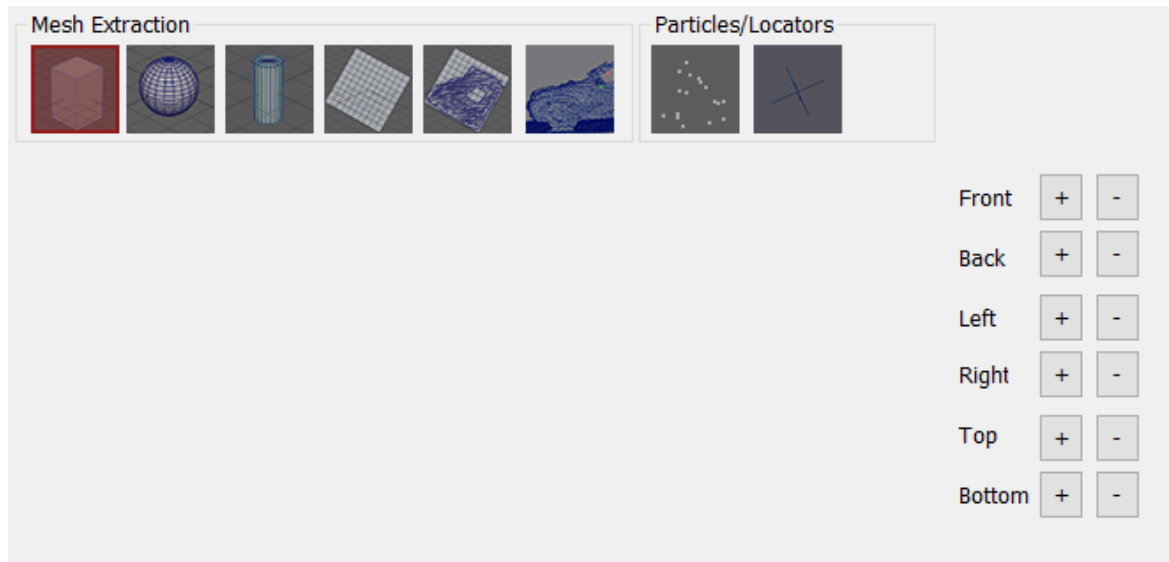
CTRL + click a point on the left top of the box you want to extract, then CTRL + click a point at the right bottom of the box you want to extract. A red highlight will showcase the extracted front plane:



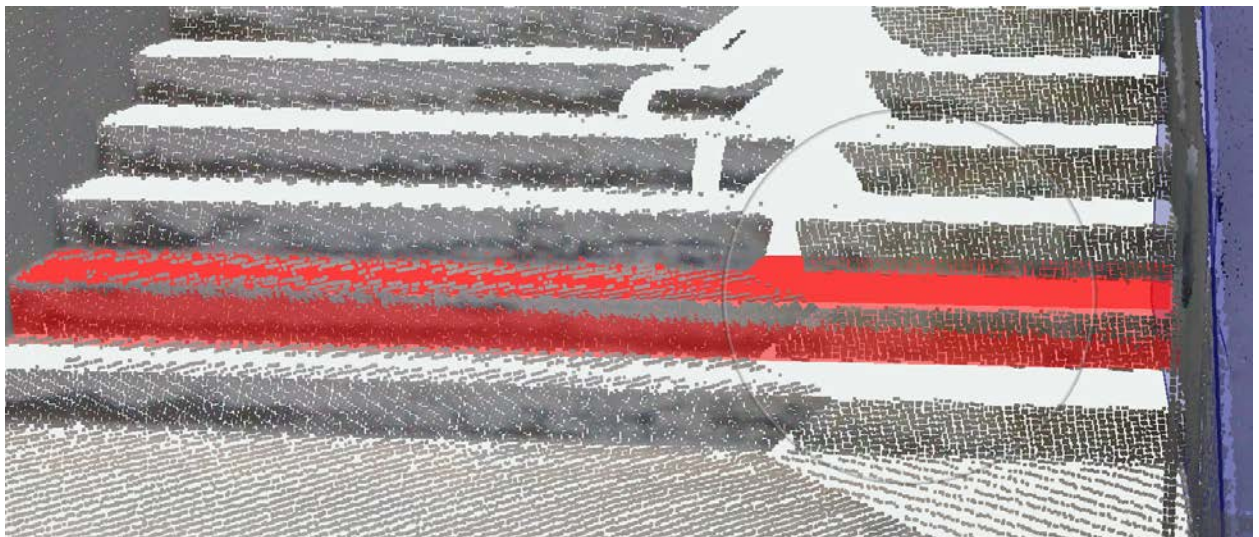
Now give your box depth by CTRL + clicking a point in the back.



You can modify the box further by CTRL + clicking points e.g. further to the left top or a point not on the front plan to modify the depth.



You can also use the arrows to make further adjustments to the box. Click the according +/- button e.g. to move the back of the box further away click the + Back button. You can see here how the box was extended to the left and further to the back to better fill in the missing step of the staircase.



Hit the "return" key to convert the box into a primitive and save it to the Components List on the right.

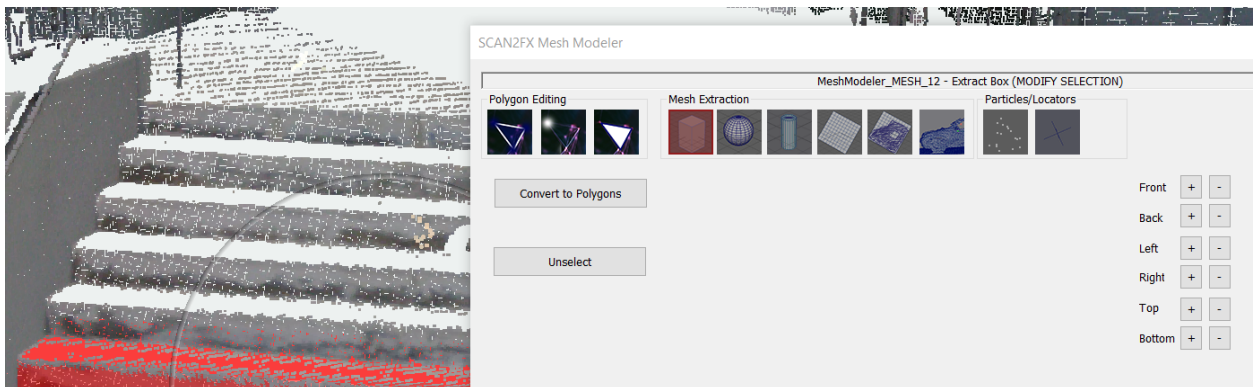


The resulting box will appear in the Components List and the box will now appear yellow since unselected.

You can immediately start creating another box now by CTRL + clicking points and start the process as described over (e.g. to fill in the remaining steps that weren't fully scanned).

9.2 Opening existing Box Primitives to Make Adjustments

Clicking an existing box in the 3D view or in the Components List will select the box and turn it red. You can now make small adjustments with the +/- buttons e.g. to make the box even deeper etc. These edits will get immediately saved into the Components List (Note though that you will need to save your SCENE project to permanently save all your edits/mesh components).



9.3 Converting Boxes to Polygons

For box primitives, SCAN2FX Mesh Modeler also allows the option of converting an existing box to polygons. Select the box by clicking it or selecting it through the Components List, and then click the "Convert to Polygons" button.

9.4 Considerations when Exporting Box Primitives

The standard SCAN2FX Mesh Modeler package exports all boxes as OBJ meshes (with or without triangulation or double-sided faces based on the export options). However, if you also have a valid license for SCAN2FX Exporter for Maya, SCAN2FX Mesh Modeler obtains native Maya MA files as an extra export file format option. SCAN2FX Mesh Modeler will then export boxes as native Maya box primitives rather than polygons, allowing immediate tweaks in Maya such as subdivision etc.

10. Using SCAN2FX Mesh Modeler – Mesh Extraction / Sphere Primitives



Click the “**Extract Sphere**” icon to activate the tool. The icon will appear slightly red when active. The “Extract Sphere” tool enables you to quickly extract a sphere primitive based on the point cloud.

10.1 Creating a new Sphere based on the Point Cloud

CTRL + click three points on the surface of the sphere. Make sure the points are not all on one “line.” A red highlight will showcase the extracted sphere:

Hit the “return” key to convert the sphere into a primitive and save it to the Components List on the right.

The resulting sphere will appear in the Components List and the box will now appear yellow since unselected. If needed, you can immediately start creating another sphere now by CTRL + clicking points and start over the process as described.

10.2 Considerations when Exporting Sphere Primitives

The standard SCAN2FX Mesh Modeler package exports all spheres as OBJ meshes (with or without triangulation or double-sided faces based on the export options). However, if you also have a valid license for SCAN2FX Exporter for Maya, SCAN2FX Mesh Modeler obtains native Maya MA files as an extra export file format option. SCAN2FX Mesh Modeler will then export spheres as native Maya sphere primitives rather than polygons, allowing immediate tweaks in Maya such as subdivision, tessellation, etc.

11. Using SCAN2FX Mesh Modeler – Mesh Extraction / Cylinder Primitives

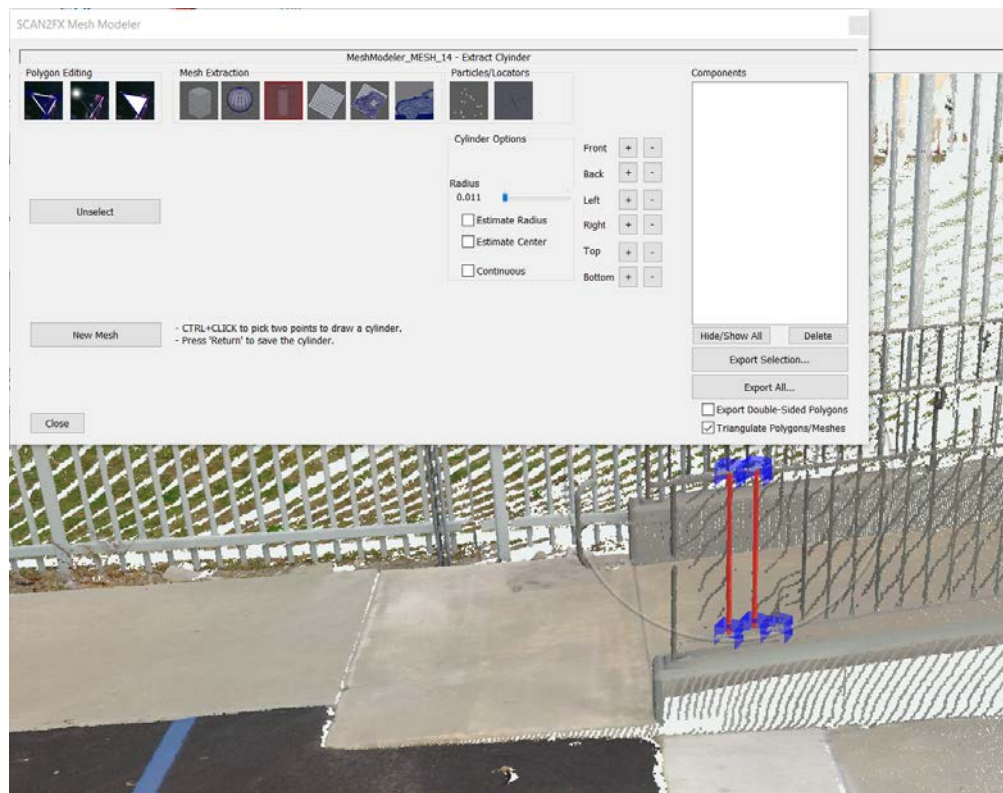


Click the “**Extract Cylinder**” icon to activate the tool. The icon will appear slightly red when active. The “Extract Cylinder” tool enables to quickly extract, or place cylinder primitives based on the point cloud.

11.1 Placing a Cylinder without estimating radius and center

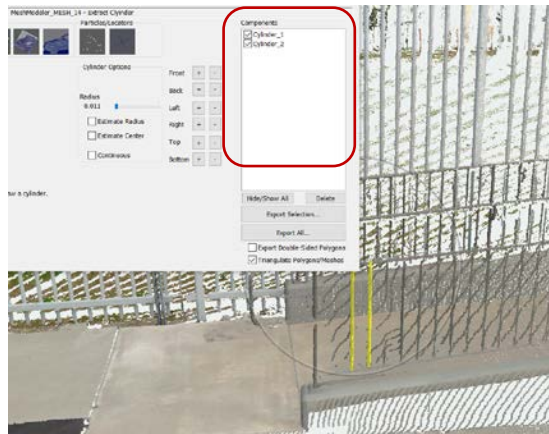
For very thin cylinders such as used in railings, or other objects with limited scan data, it may make sense to simply place cylinders instead of trying to estimate the radius and center of the cylinder. Uncheck “Estimate Radius” and uncheck “Estimate Center.” Then, CTRL + click a point on the point cloud to mark the top of the cylinder and then CTRL + click a second point to mark the bottom of the cylinder. Click on the Radius slider and use the keyboard arrow keys (left/right) to make a small adjustment to the radius. As the radius increased, the cylinder will appear in red as a thin “line.”

To place a second cylinder, CTRL + click the start of the second cylinder and then CTRL + click the end of the second cylinder.



All the cylinders will use the same radius until you commit them by hitting “return.”

Hit the “return” key to convert the cylinders into one or more cylinder primitives and save them to the Components List on the right.

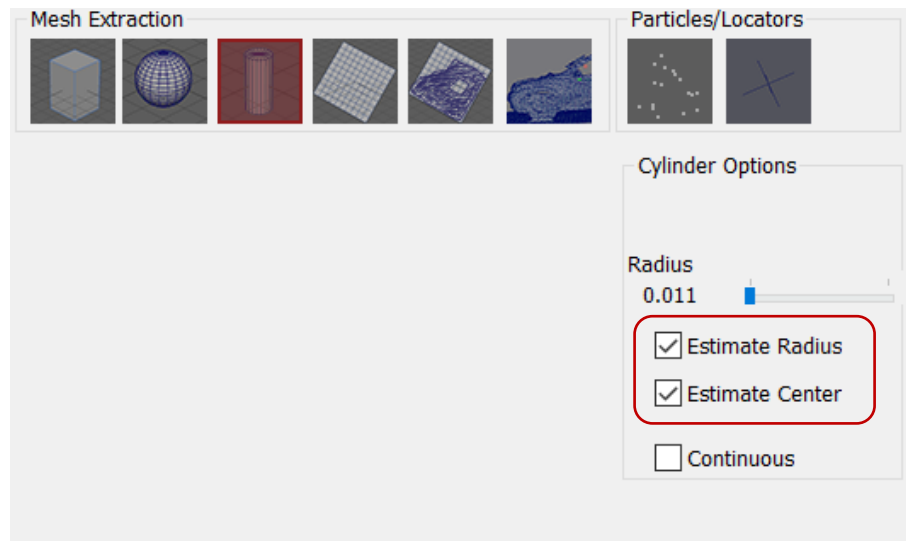


The resulting cylinders will appear in the Components List and the box will now appear yellow since unselected. If needed, you can immediately start creating more cylinders again by CTRL + clicking points and start the process as described over, however now you can use a different radius.

11.2 Extracting a Cylinder by estimating radius and center

Alternatively, one can have the software estimate the radius and center automatically. This capability is especially useful in the case of large “poles.”

This time make sure “Estimate Radius” and “Estimate Center” are checked. Then, CTRL + click the start and end points of the cylinder as before. Make sure that the end points are on a plane that can clearly identify the cylinder (otherwise the software may not be able to estimate the radius).



Once you place the second point, the software will compute an estimated radius and actual center of the cylinder. This approach may result in the start and end points you placed to slightly move

once the computation is done. Check if the computation was able to estimate the cylinder correctly. If not, press the “ESC” key or click the “Unselect” button to start over.

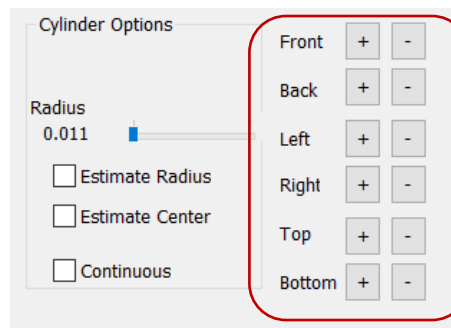
As before, to place a second cylinder, CTRL + click the start of the second cylinder and then CTRL + click the end of the second cylinder. Each cylinder will main a different, separate radius when “Estimate Radius” is turned on.

Hit the “return” key to convert the cylinders into one or more cylinder primitives and save them to the Components List on the right.

11.3 Modifying the Start or End Point of a Cylinder manually

SCAN2FX Mesh Modeler also allows modifying the start or end point of the last cylinder placed or of the currently selected cylinder (if already created in the Components List).

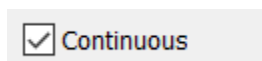
Simply utilize the +/- buttons shown in the “Extract Cylinder” tool:



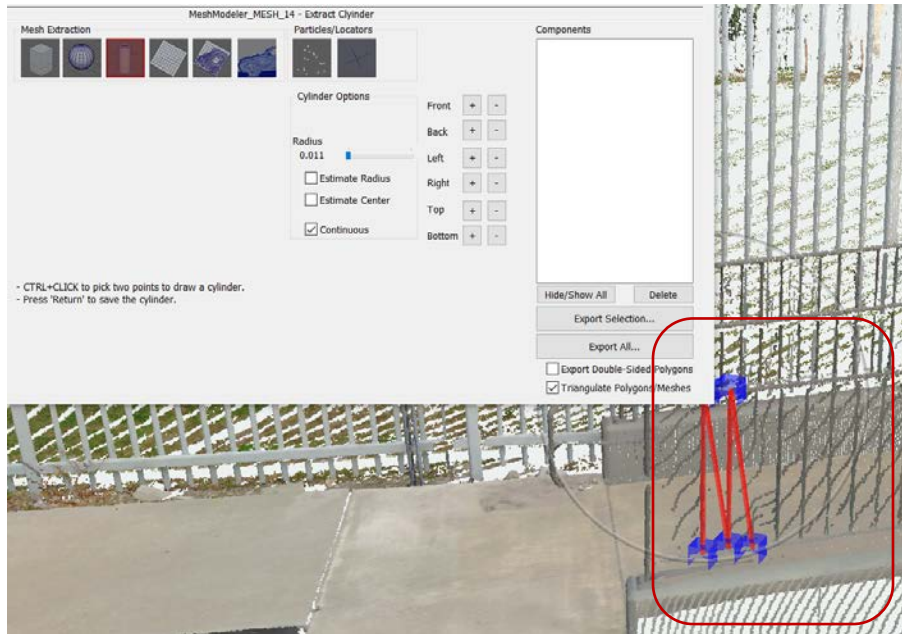
11.4 Placing continuous cylinders / pipes

The cylinder tool also offers the option to connect the cylinders automatically, so they create a kind of rough “pipe” or line. This tool can be used to model items such as ropes or piping by replacing them with cylinder primitives.

To get started, make sure to check off the “Continuous” mode in the “Extract Cylinder” tool.



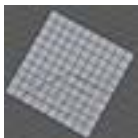
Any cylinders placed so far will automatically get connected:



11.5 Considerations when Exporting Cylinders Primitives

As with other primitives, the standard SCAN2FX Mesh Modeler package exports all cylinders as OBJ meshes (with or without triangulation or double-sided faces based on the export options). However, if you also have a valid license for SCAN2FX Exporter for Maya, SCAN2FX Mesh Modeler obtains native Maya MA files as an extra export file format option. SCAN2FX Mesh Modeler will then export cylinders as native Maya cylinders primitives rather than polygons, allowing immediate tweaks in Maya such as subdivision, etc.

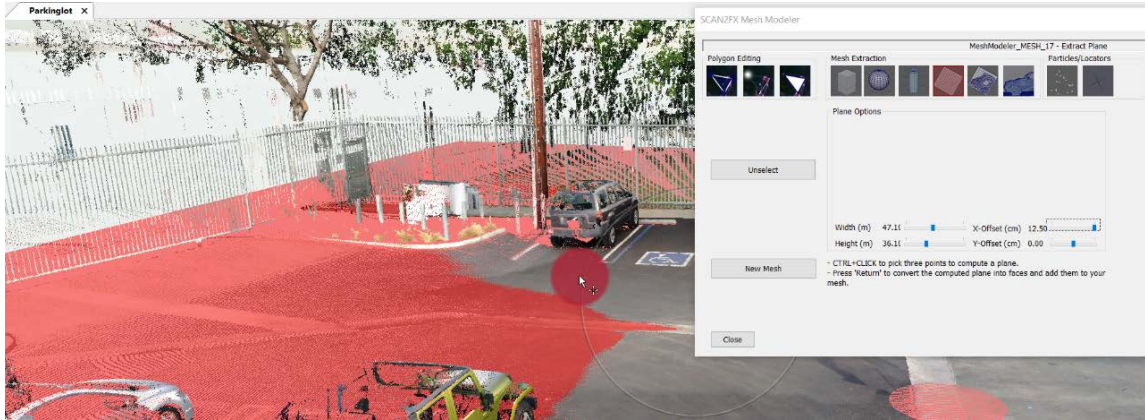
12. Using SCAN2FX Mesh Modeler – Mesh Extraction / Planes



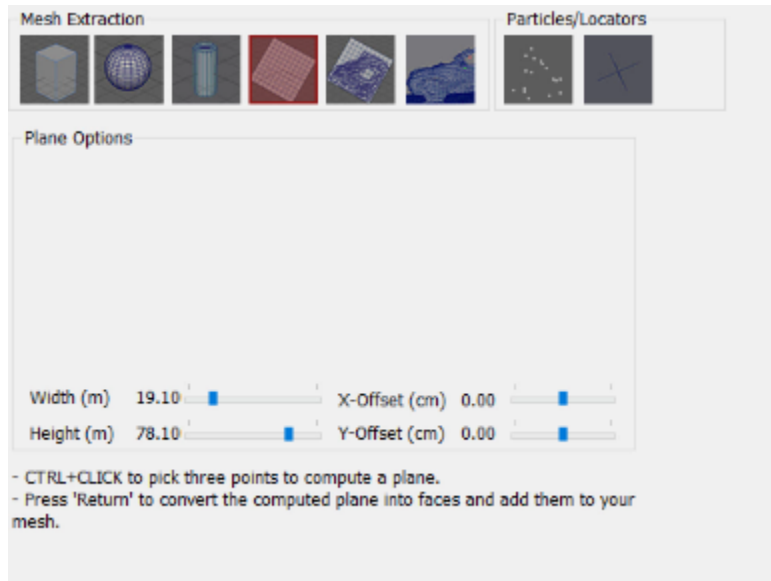
Click the **“Extract Plane”** icon to activate the tool. The icon will appear slightly red when active. The **“Extract Plane”** tool enables to quickly extract, or place an estimated plane based on the point cloud.

12.1 Creating a new Plane based on the Point Cloud

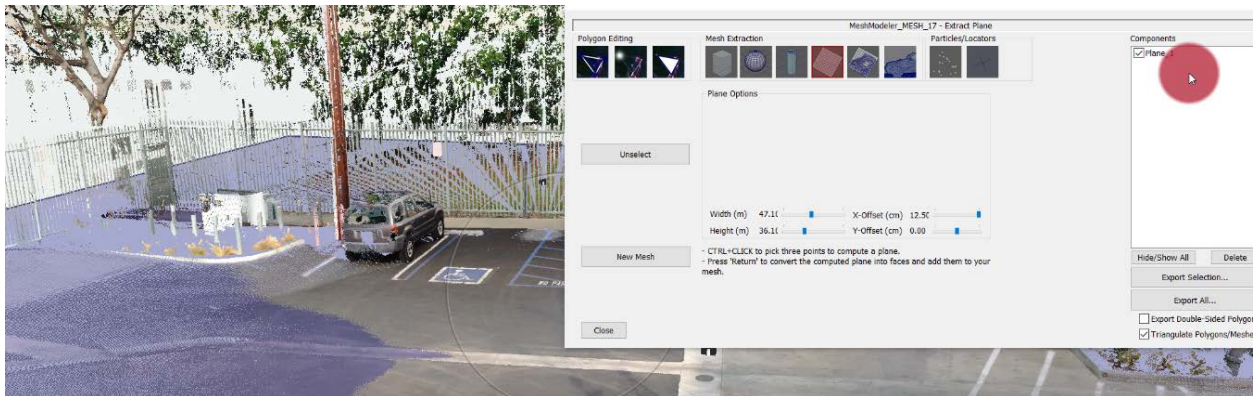
CTRL + click three points on a planar surface. Make sure the points are not all on one “line.” A red highlight will showcase the extracted plane. The first point is used as the center of the plane, so choose it accordingly. To start over, press the **“ESC”** key or click the **“Unselect”** button.



You can now modify the X- and Y-offsets from the plane center as well as the width and height of the 2D plane with the according sliders. For finer adjustments, you can utilize the keyboard cursors (left and right key).



Once satisfied with the estimate plane, hit the “return” key to convert the plane into a polygon and save it to the Components List on the right.



12.2 Modifying an Existing Plane Polygon

In contrast to other primitive type, planes will not get stored as a primitive, but get directly converted to polygons!

This way any vertices of the plane can be modified, just like with any other polygon, through the “Move Vertex” tool after the fact. So, one can keep the rough plane orientation, but further align the vertices to the 3D structure as and if needed.

The offset and width/height settings are no longer available once the polygon gets created, and the more flexible “Move Vertex” tool should get used to modify the plane polygon.

12.3 Considerations when Exporting Planes

SCAN2FX Mesh Modeler exports planes as polygons. These can be exported as part of an OBJ mesh or a Maya MA face (if you also have a valid license for SCAN2FX Exporter for Maya). Just like any other component, any plane polygon can be labeled in the Components List. These labels will carry over into another 3D software if compatible.

13. Using SCAN2FX Mesh Modeler – Mesh Extraction / Survey Tool

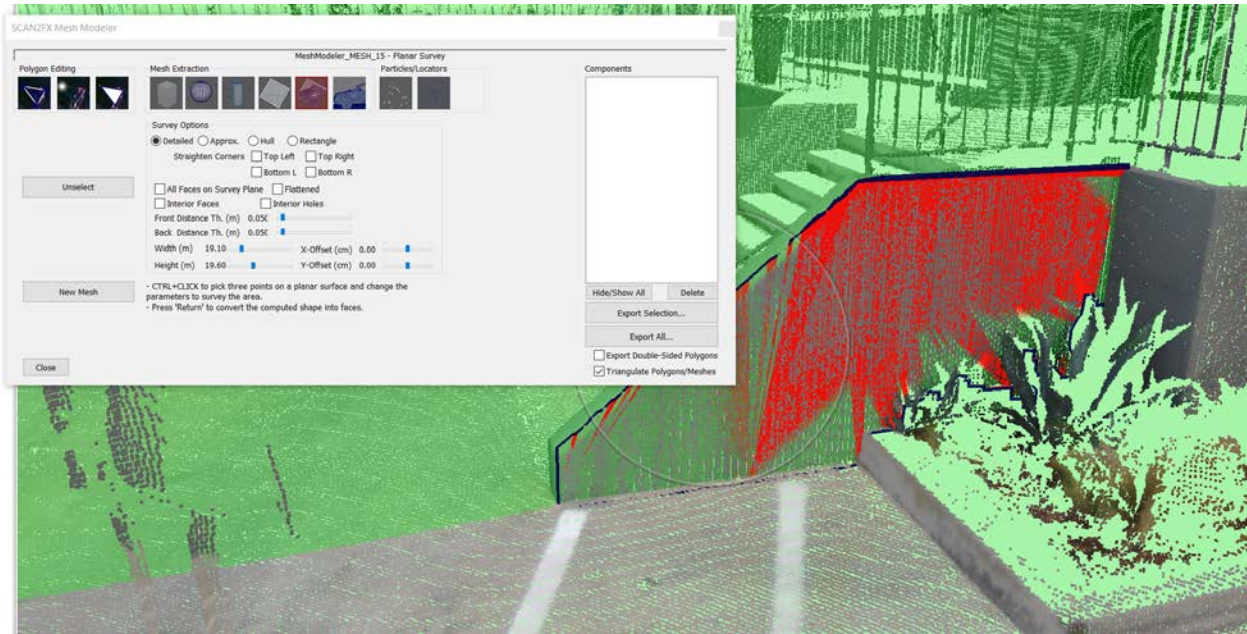


Click the “**Survey**” icon to activate the tool. The icon will appear slightly red when active. The “Survey” tool allows to extract polygons based on the shape of a planar surface. This tool is a more advanced tool to create polygons automatically based on point cloud shapes.

Some of the more advanced capabilities allows filling in corners/edges, approximation, holes and fill polygons.

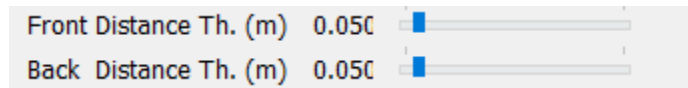
13.1 Survey a Surface

CTRL + click three points on a surface of the point cloud. Make sure the points are not all on one “line.” A green plane will appear to estimate the plane in which the picked points lie. And a blue line will outline any extracted polygons identified. The polygons will be filled in red, as visualized here:



If surface is not identified to your liking, press the “ESC” key or click the “Unselect button” to start over and CTRL + click three new points. Or you can just continue clicking three new points to start over.

To adjust what exactly gets extracted and how much latitude the software provides, one can alter the front distance and back distance thresholds. These parameters define how far points can lie behind or in front of the identified plane to still be considered part of the surface.



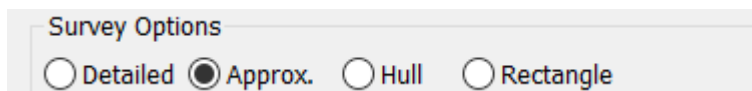
These parameters also enable some creative effects to collapse a 3D surface onto a plane.

When done, press the “return” key to convert the surface to a polygon.

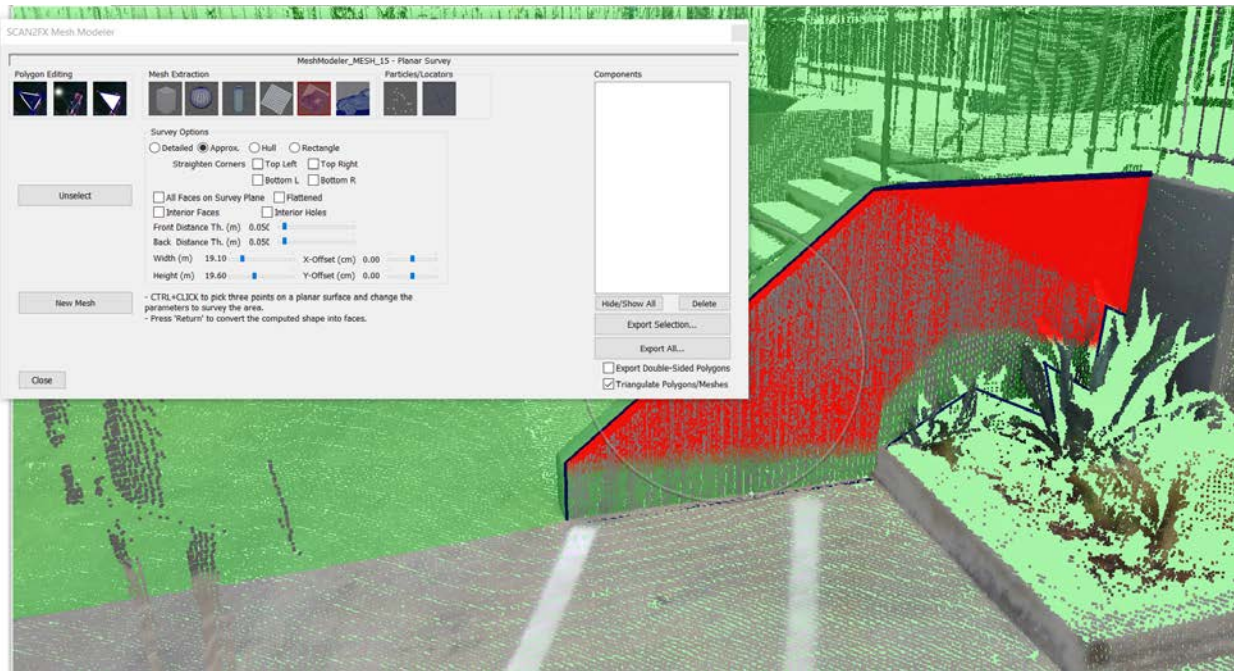
13.2 Approximation a Surface Shape

Once you identified a surface, there is an option to approximate the shape for a more “straight-line” exterior shape, ignoring e.g. bumps etc.

Switched from “Detailed” to “Approx.” in the settings before creating the polygon.

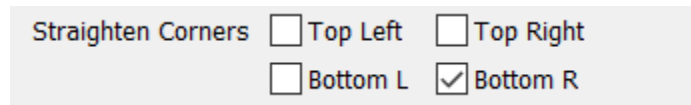


You can see how the exterior outline is now smoother:



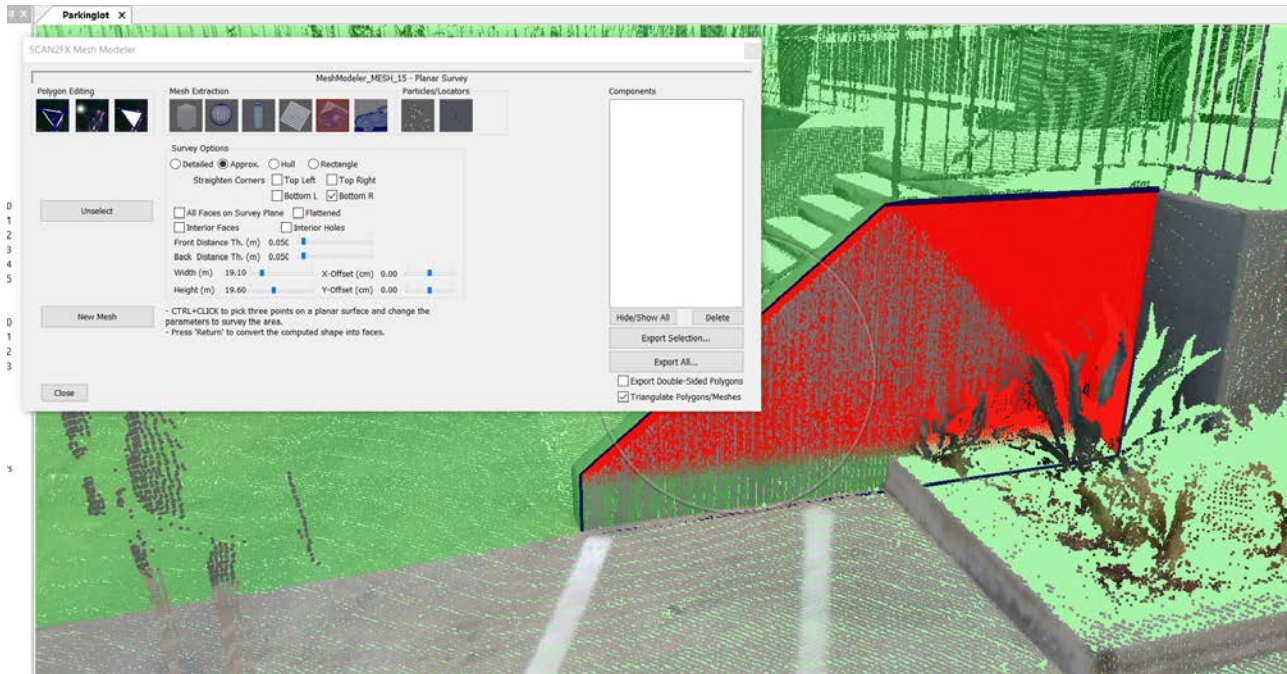
13.3 Straighten out Corners of a Surface

In the example from above you can see how the full wall could not be scanned where the plants were in front of it. We can straighten out the bottom right corner (overcoming the zig-zag shape) with the according setting in the “Survey Tool”:



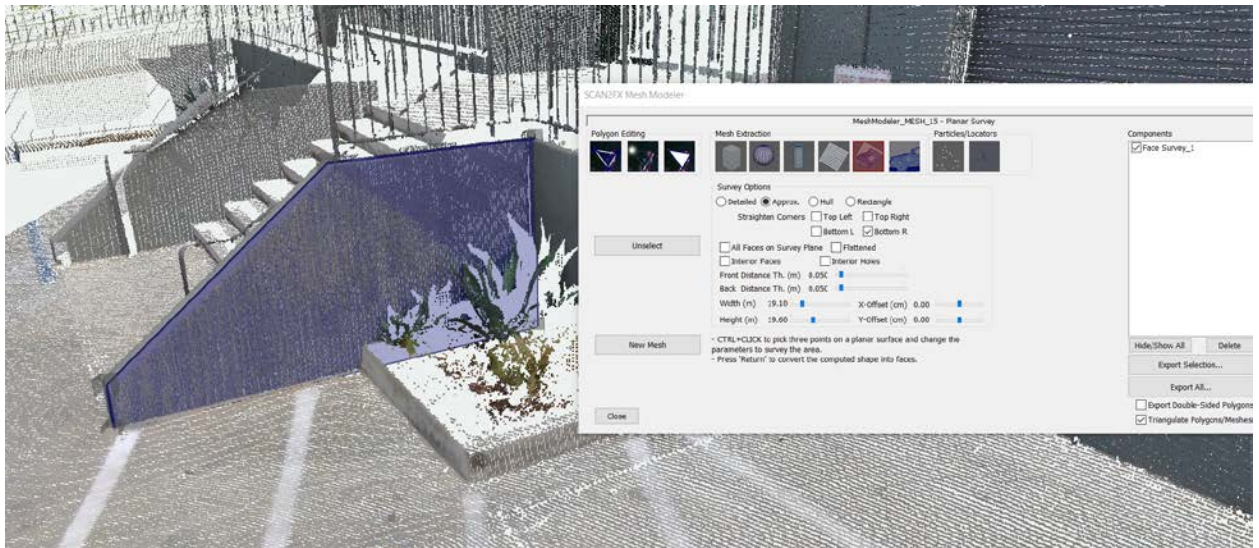
Note: Depending on the order of the selected points that were CTRL + clicked to identify the plane, note that left and right or top and bottom may be **flipped**. In case of flipping, just try the other corners until satisfied with the result.

The corner of the wall is now straightened out, even though it was not scanned given the corner is covered by the plants.



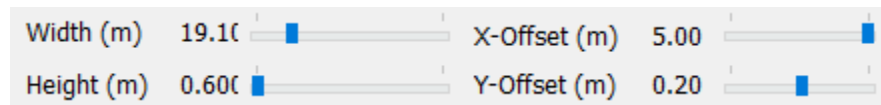
When you are satisfied with the polygon shape, hit “return” to create the polygon. (make sure to first click the 3D view). The resulting polygon gets save to the Components List on the right (as always make sure to save your Scene project to store these edits to disk).

The resulting polygon will appear blue (since not selected), and can now be modified, extruded, etc. like any other polygon before (see chapter 7 and 8).



13.4 Adjusting the Survey Plane

The plane that gets used to determine the surface to extract can be further adjusted through width, height and X- and Y-Offsets.



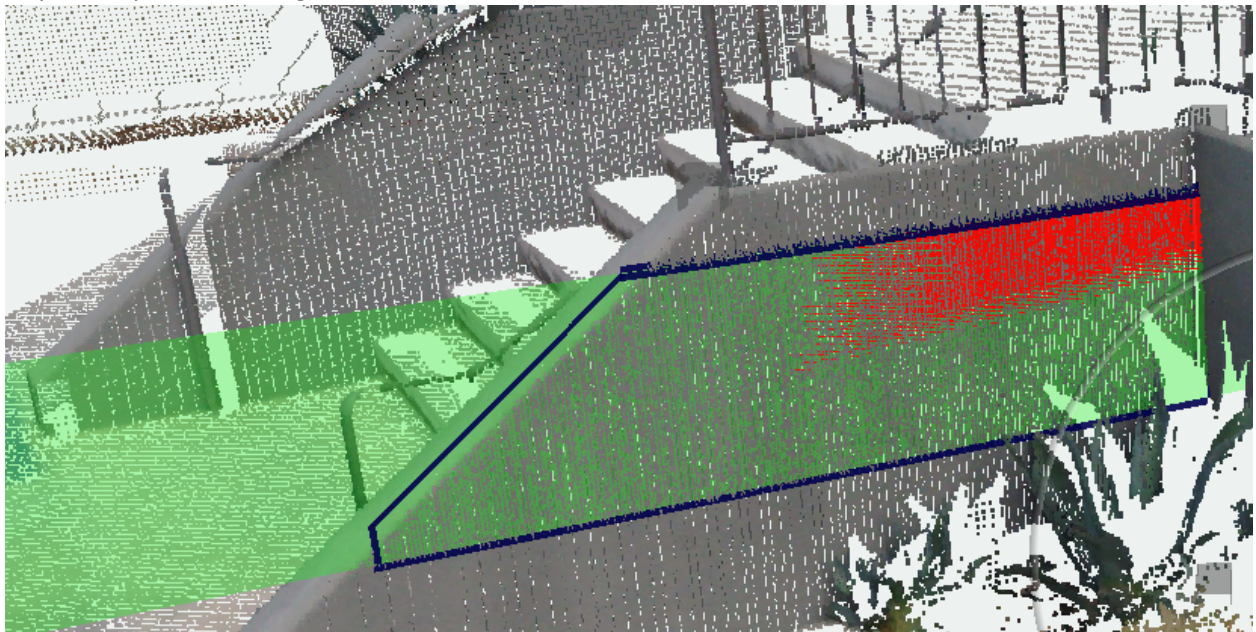
This approach enables to precisely cut off a surface at a starting point, or only extract surface up to a certain height or width.

The center of the plane is always at the first point CTRL + clicked, so offsets are relative to that 3D position on the identified plane.

The resulting polygon will appear blue (since not selected), and can now be modified, extruded, etc. like any other polygon before (see chapter 7 and 8).

With the settings above, we reduced the height of the survey plane to 0.60 meter, and we moved the Y-Offset by 0.20 meter.

Here we see the extracted surface. It starts a little bit lower and only covers a small strip of the wall as requested per the settings.

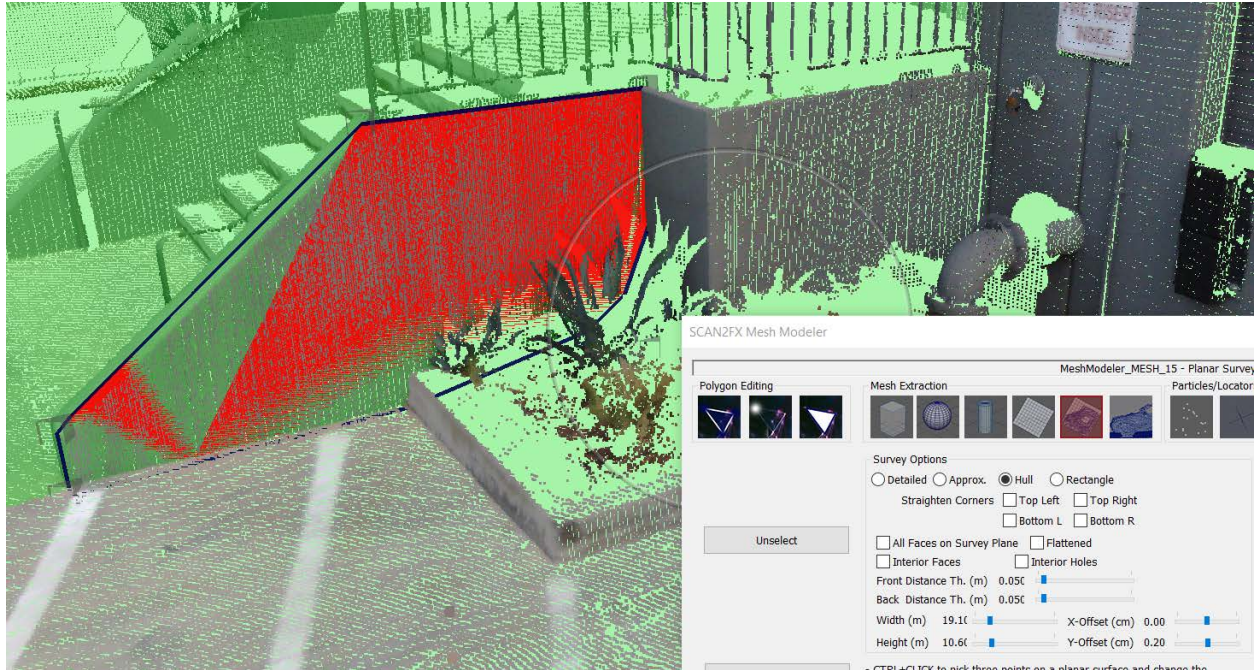


These settings are particularly useful to restrict the surface extraction to a particular area, or also to expand the area e.g. in case of a large building façade.

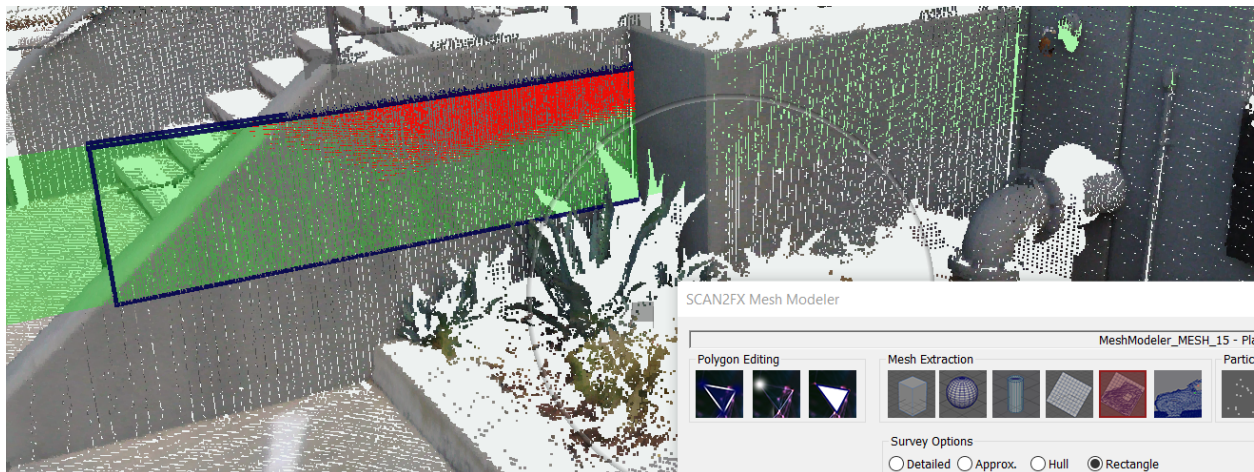
13.5 Other Survey Options

The “Survey” tool offers additional survey options (besides Detailed and Approx.) that may get less commonly used.

The **“Hull”** setting creates a convex hull of the extracted shape. Here’s the previous example without straightening the bottom right corner (and with the full survey plane from before), but with **“Hull”** option activated. You can see how around the plants, there is now an inward-bending, convex shape instead of the zig-zags.

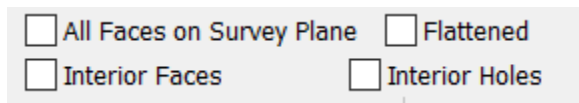


The **“Rectangle”** setting creates a rectangle around the extracted shape. Here’s an example (again with the survey plane adjusted like in 13.4). This feature may be handy to extract walls especially when part of the wall was not scanned, or hidden e.g. behind furniture.



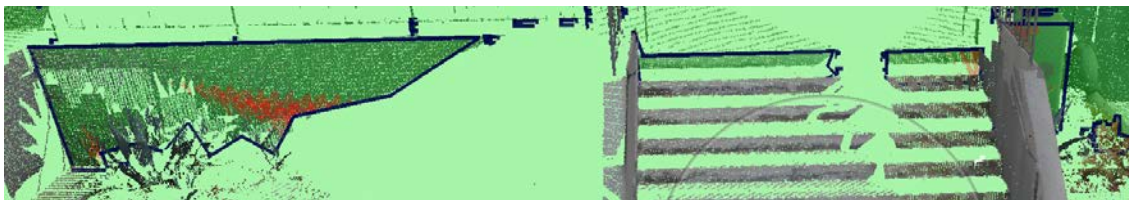
13.6 Advanced Surveying Techniques

The “Survey” tool provides additional advanced capabilities to extract surfaces.



In particular, “**All Faces on Survey Plane**” enables extraction of multiple, disconnected polygons that lie on the same plane. Imagine e.g. a set of columns. They are disconnected, but each column has a front facing face on the same plane. By turning on “All Faces on Survey Plane,” one can immediately extract all the polygons at once.

Here you can see how we extract multiple separate surfaces on one plane:



“**Flattened**” forces all vertices of the polygons to lie on the plane, instead of using the actual 3D coordinates of those points. This feature is useful to force a polygon to truly be “flat,” and lie on the surface even though there is unevenness in the surface.

The “**Interior Faces**” option computes faces for any holes that are found in a surface. Imagine e.g. a wall with inset windows. The wall is on one plane, but the windows are set backwards. By surveying the wall, we can extract the surface of the wall, and automatically create fitting interior faces for the windows that probably could not get scanned properly. We achieve a clean geometry this way and can use the simplified geometry to texture with SCAN2FX Texture and bring back also the texture for the windows.

When pressing the “return” key, you will obtain multiple polygon faces. One for the main surface shape, and then a polygon per hole identified in the surface.

Finally, the “**Interior Holes**” option puts holes into the main surface polygon where holes were identified instead of filling in the holes. So, if one turns on “Interior Holes” and “Interior Faces,” one gets a polygon with holes for the overall main shape and then separate polygons to fill in all the holes.

14. Using SCAN2FX Mesh Modeler – Mesh Extraction / Meshing



Click the “**Extract Mesh**” icon to activate the tool. The icon will appear slightly red when active. The “Extract Mesh” tool is a crucial tool and enables access to all of SCAN2FX Mesh Modeler’s automatic meshing capabilities.

The tool will automatically convert a section or all of the project point cloud to a mesh upon export (quads or triangles depending on the triangulation export setting).

SCAN2FX Mesh Modeler provides unique meshing algorithms designed in particular for sharp-edged man-made structures. The “Extract Mesh” tool can provide more detailed, precise meshes of scenes than the standard FARO Scene meshing capability, which is more optimized for organic and/or blobby shapes.

SCAN2FX Mesh Modeler’s “Extract Mesh” tools also provide several other unique models that can be handy if trying to create special effects.

All of meshing happens on the local machine and does not require a cloud service or uploading of point cloud data to a 3rd party service. Also, there are no restrictions on the size of the meshing region as long as an appropriately spec-ed computer is utilized.

14.1 Working with Mesh Boxes

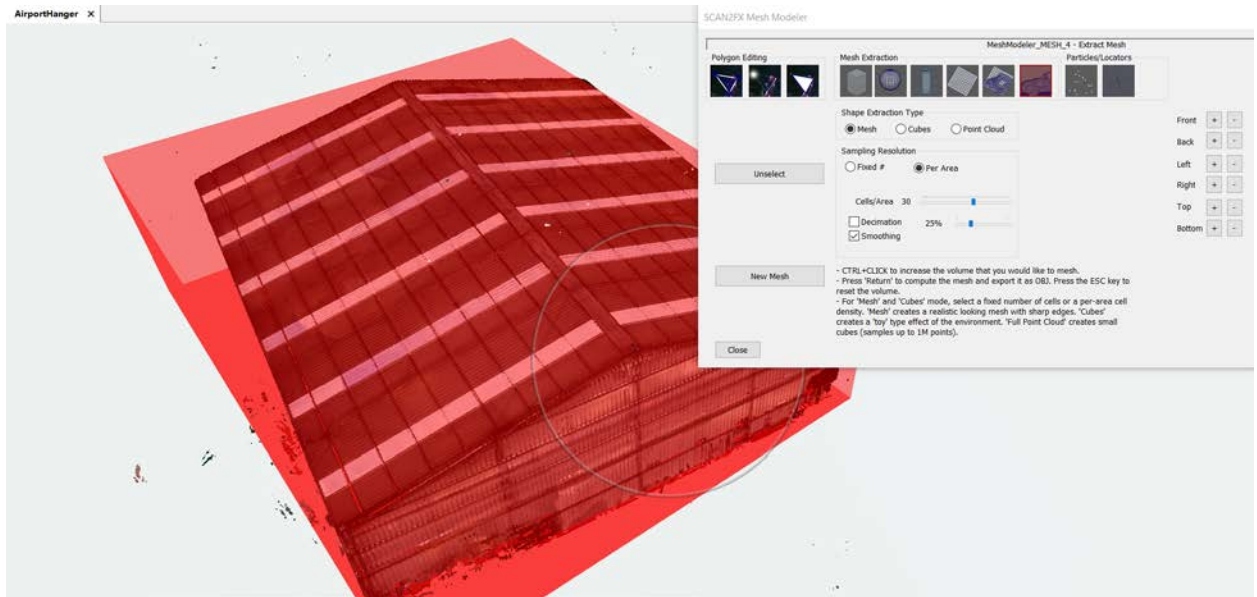
SCAN2FX Mesh Modelers previews meshing regions through boxes, so that you do not have to wait for meshing to complete while working with a scene or marking up different regions of a point cloud for meshing.

This way you can define multiple boxes with different meshing resolutions and settings, label these “meshing” boxes/regions, and then they will get meshed all at once during export (think of it as kind of a “batch” meshing).

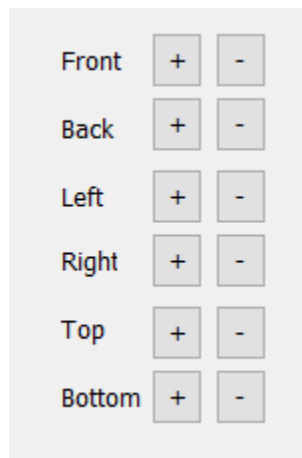
Each box will result in a separate mesh with a label, so that they can be treated as separate objects later.

14.2 Identifying a Volume for Meshing

CTRL + click on the point cloud at opposite ends of the volume. Starting with the second point, a volume box gets created to identify a rough area to mesh. Expand the volume until it completely encloses the part of the point cloud to mesh. Clicking points always increases the volume or keeps the volume the same if the new point is already enclosed by the volume.

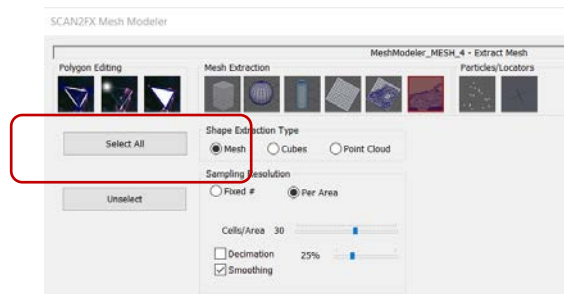


Fine adjustments can be made with the +/- buttons to the right.



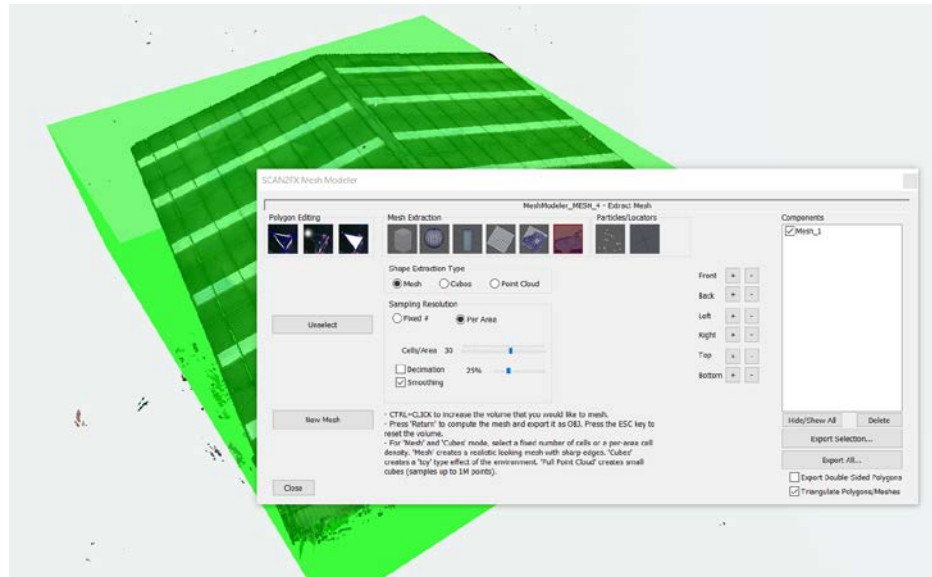
One can e.g. rotate the camera below the volume to see if the ground floor is completely enclosed and press the + button for “Bottom” until the ground is completely enclosed by the red box. The – buttons also allows shrinking the volume.

Alternatively, one can click “**Select All**” to create a rough bounding box of the entire point cloud. This option is not recommended as the area is usually too large for the scene as outliers are considered in determining the bounding box and this will result in extra compute time.



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Choose and double check the meshing **settings** (see 14.3 – 14.5 for details on the settings), and press the “return” key to save the mesh component to the Components list, so it can be later exported. Meshing of all identified meshing volumes will take place during export in a single, “batch” pass instead of having to wait for each individual mesh to complete.

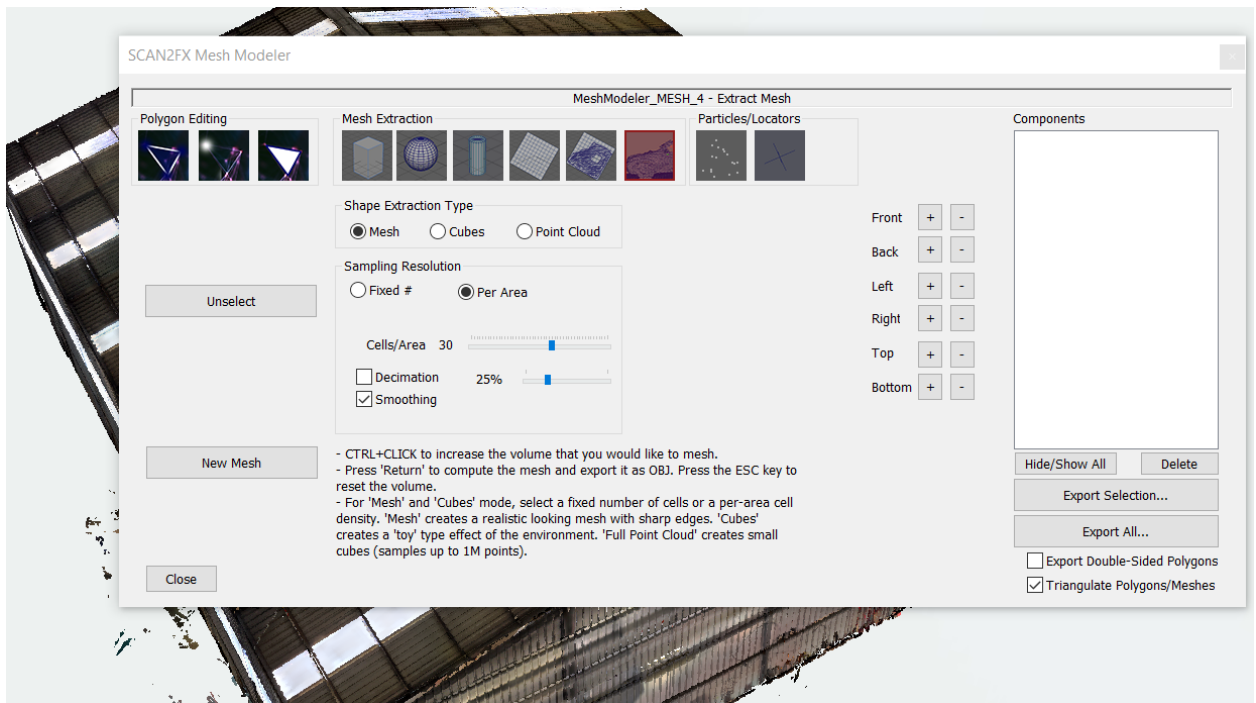


14.3 Standard Meshing Settings

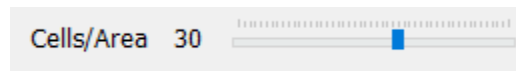
The main meshing has several settings that can be specified for each meshing volume separately. So e.g. you can have a higher mesh resolution for hero assets or the main area of a scene and use lower resolution for assets in the background.

First, make sure “**Shape Extraction Type**” to **Mesh**.

Now, the standard mode is “**Per Area**” under Sampling Resolution.

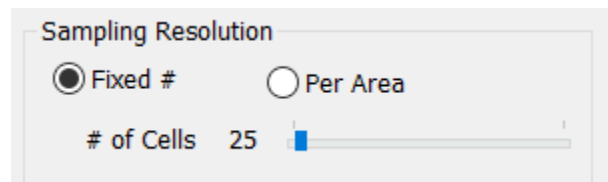


The **Cells/Area slider** defines the resolution per m^3 . A higher value means a higher resolution, however possibly also additional holes or gaps if the point cloud has gaps.



A lower value means a lower resolution, but possibly less gaps. Higher resolution does not always result in more triangles depending on the make up of the point cloud.

Alternatively, “Sampling Resolution” can be set to **Fixed #** which will mesh box with a certain resolution independent of the volume.



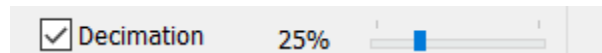
A larger volume will look coarser, while a small volume can be sampled very finely with a high fixed # setting.

In contrast to standard FARO’s SCENE meshing, SCAN2FX Mesh Modeler’s advanced proprietary meshing algorithms are designed to provide a very accurate mesh and can support hard edges. Additional fill (e.g. for holes, windows, etc.) can easily be put in place with the “Create Polygon” tools or Survey tools (Chapter 7 and 13) as well.

14.4 Decimation and Smoothing

The Mesh “Shape Extraction Type” also offers an automatic decimation option. The % slider defines to what % of triangles the mesh should be reduced. When exporting with decimation turned on, SCAN2FX Mesh Modeler will generate two meshes automatically: one high resolution mesh, and one decimated mesh. This is a great way to later decide whether to use the high resolution mesh or the decimated mesh.

Check “**Decimation**” and set the % with the slider before pressing “return” to generate the mesh component.

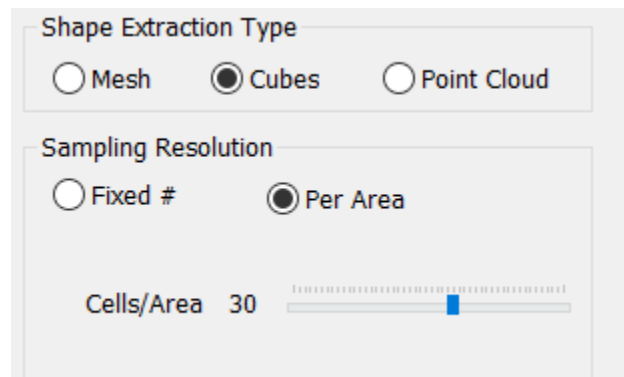


The “**Smoothing**” option will smooth out the mesh to make it less blocky.

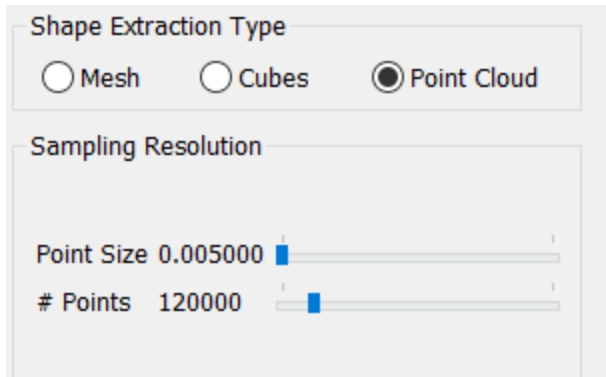
14.5 Additional, Less Common Shape Extraction Types

SCAN2FX Mesh Modeler also offers two additional Shape Extraction Types: “Cubes” and “Point Cloud.” These modes create less realistic meshes, but can be used to obtain certain “special effects.”

The “**Cubes**” Shape Extraction Type creates a blocky box world. This mode allows sampling “Per Area” or “Fixed #” with the according slider as before. There are no options for decimation or smoothing.



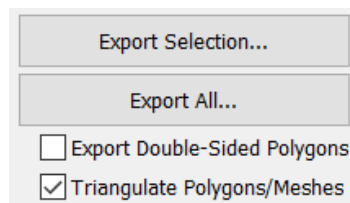
The “**Point Cloud**” Shape Extraction Type creates a mesh out of little points that emulates the look of a point cloud as an effect. There are two settings in this mode: “Point Size” and “# Points.” The point size allows controlling how large the mesh points should be and the # Points defines how many points should be sampled from the volume.



14.6 Meshing and Computation

As mentioned, SCAN2FX Mesh Modeler will compute all meshes at once during export. This way the computation happens all at once, rather than interrupting the workflow each time when extracting a single mesh. After a short computation (duration depends on the size of the volume and complexity of the scene), one can receive multiple meshes of all the volumes marked up in the scene (as well as optional additional, decimated versions). Also, this way components carry over with their label from the Components list to other 3D applications. The meshing is relatively fast compared to other traditional meshing software.

To later texture a mesh with the **optional SCAN2FX Texture** module, it is recommended to turn on "Triangulate Polygons/Mesh." Otherwise, SCAN2FX Mesh Modeler will create quads.



Note: Also note that the mesh generated by SCAN2FX Mesh Modeler does not include UV coordinates yet. This approach was taken so artists can fully control the UV layout before texturing with SCAN2FX Texture and decide how much of the texture image should be allocated to which area of the mesh. Most standard 3D applications in use provide automatic UV layout or unwrapping features that can be utilized to obtain a baseline UV layout before tweaking.

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14.7 Subdividing a Meshing Box

Once a mesh box has been created, there is also an option to subdivide a volume into multiple volumes. Make sure the mesh volume is selected and then click “Subdivide into Chunks.”

Move the sliders or use the left and right key on the keyboard to determine the number of subdivisions along the X, Y or Z axis. Click “Subdivide into Chunks” again to create the additional meshing volumes. SCAN2FX Mesh Modeler automatically hides the original volume.

To cancel the subdivision, click “Unselect” or press “ESC” (make sure to click the 3D view first).

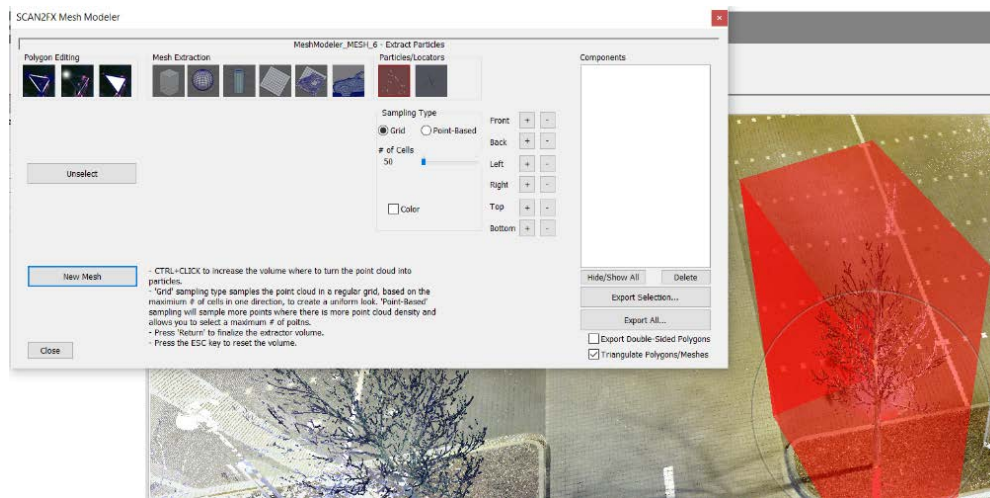
15. Using SCAN2FX Mesh Modeler – Particles



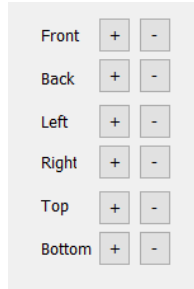
Click the “**Extract Particles**” icon to activate the tool. The icon will appear slightly red when active. The “Extract Particles” tool operates similarly to the “Extract Mesh” tool in that one defines a box. During export, SCAN2FX Mesh Modeler will extract particles from each selected region per the settings.

15.1 Creating a Particle Extraction Volume

Like before with the “Extract Mesh” tools (in Chapter 14), CTRL + click on the point cloud at opposite ends of the volume. Starting with the second point, a volume box gets created to identify a rough area to extract particles from. Expand the volume until it completely encloses the part of the point cloud that should be turned into particles. Clicking points always increases the volume or keeps the volume the same if the new point is already enclosed by the volume.

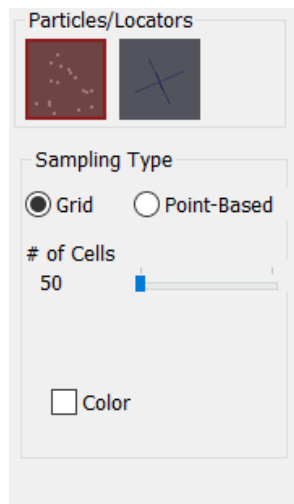


As before, fine adjustments to the volume can be made with the +/- buttons to the right.

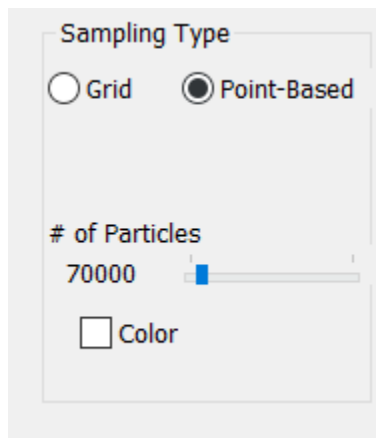


15.2 Particle Extraction Options

There are two different “Sampling Types” for particles. “**Grid**” sampling samples the point cloud in an evenly distributed grid.



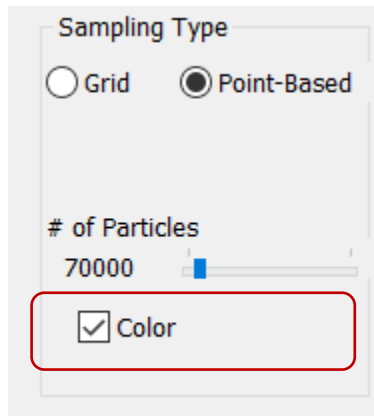
“**Point-Based**” sampling randomly samples a certain number of particles from the point cloud. Change the slider to determine the number of points.



15.3 Particle Coloring

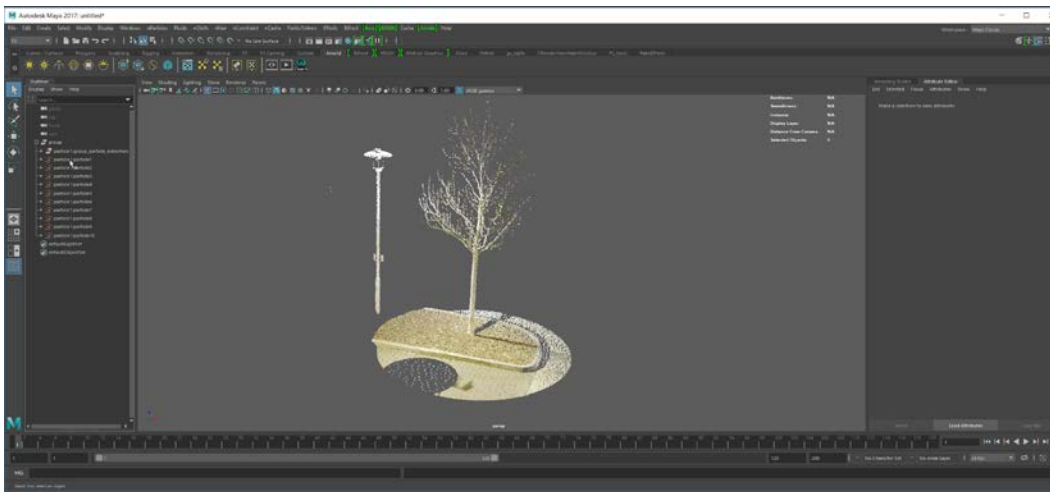
With the optional SCAN2FX Exporter for Maya, SCAN2FX Mesh Modeler obtains the additional capabilities to export native Maya files. With the Maya export, SCAN2FX Mesh Modeler can export native Maya particle systems, including color. SCAN2FX Mesh Modeler will export particles as part of OBJ meshes as well, but as mesh polygons and not supporting color.

Check “Color” to include color in the export, and make sure to sure Maya when exporting with SCAN2FX Mesh Modeler.

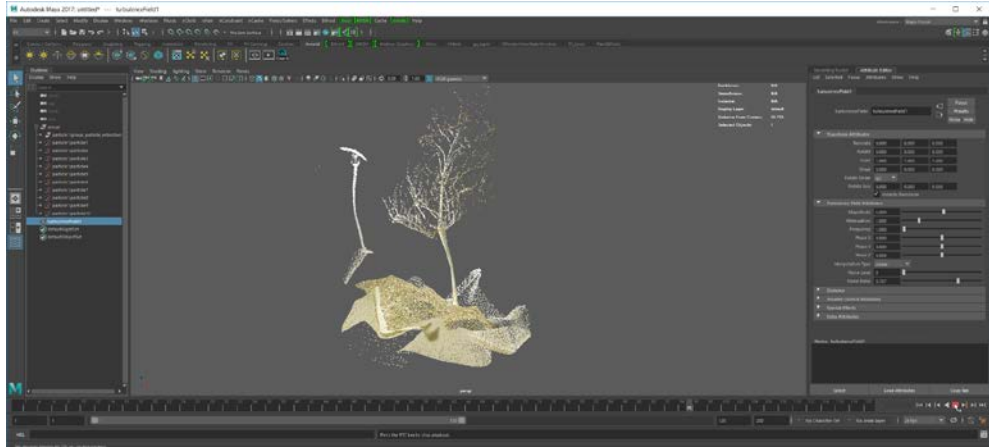


15.4 Sample Applications of Particles

Here is an example export of colored particles displayed in Maya:



One can now immediately apply any fields and dynamic forces in Maya, e.g. here we are adding a turbulence effect:

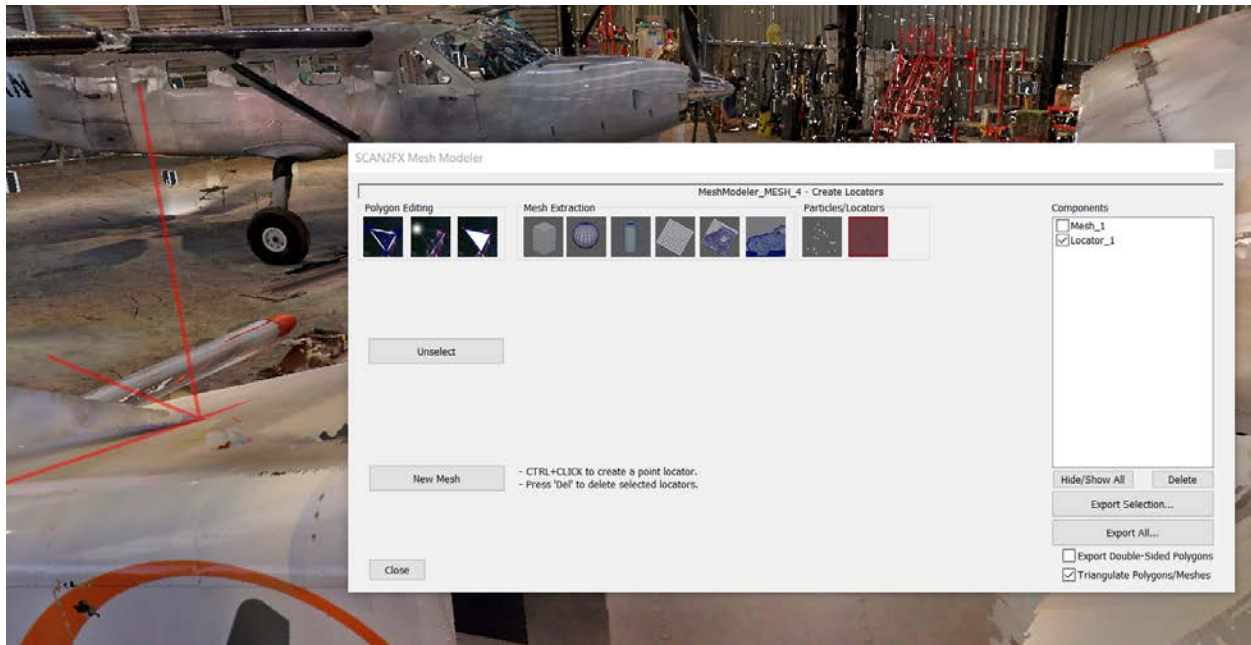


16. Using SCAN2FX Mesh Modeler – Locators



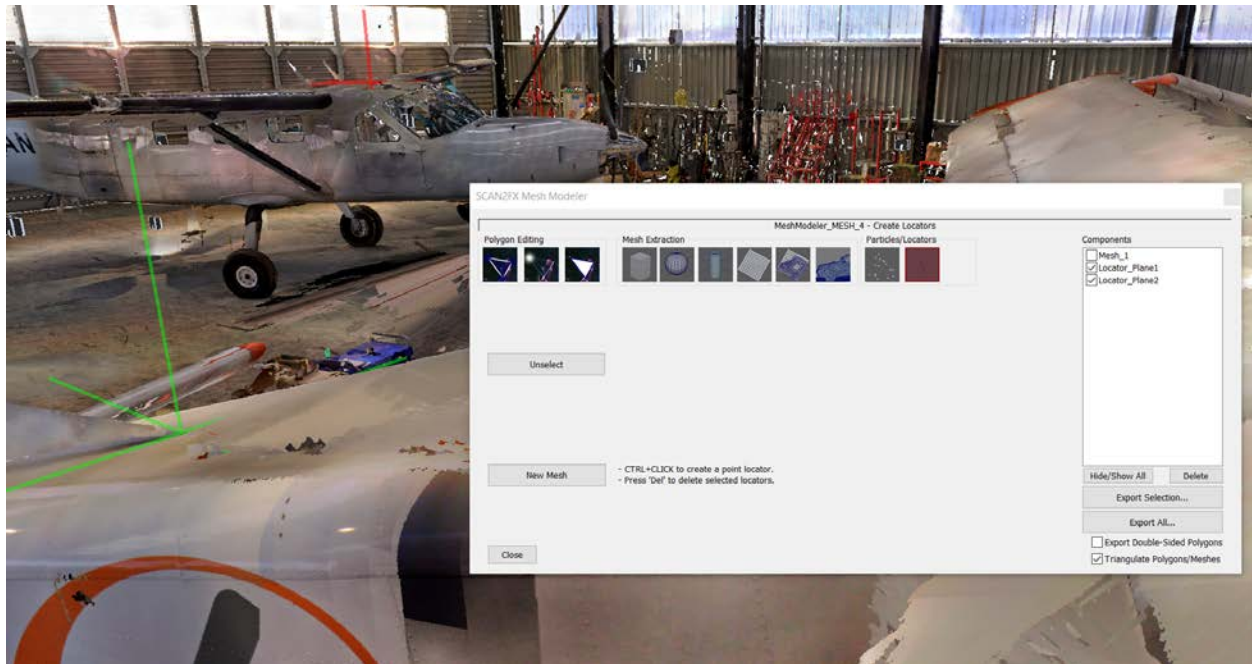
Click the “**Locators**” icon to activate the tool. The icon will appear slightly red when active. The “**Locators**” tool allows placing and labeling locators / markers to mark key interest points in your scene. These locators can serve as guides for motion tracking/match move, placing of virtual characters in a scene or, e.g., as reference points for modelling or compositing artists.

CTRL + click on the point cloud to place a locator.



The locator will get immediately added to the Components list on the right. You can now edit Components list by clicking the label.

CTRL + click to place additional locators.



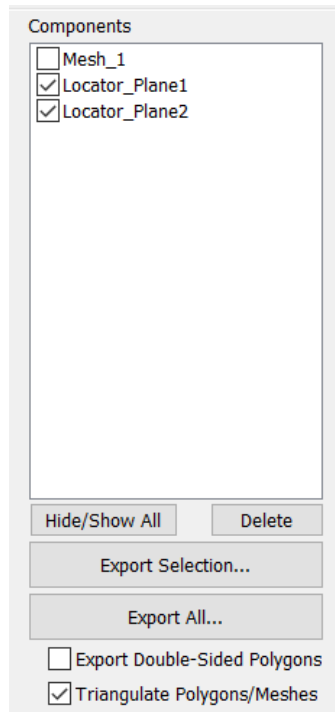
An existing locator can be deleted by pressing the “DEL” key (make sure to click in the 3D view first).

Locators can be useful to mark key points of a 3D scene e.g. to place virtual characters, provide guidance and simple measurements to other artists, or also to assist match move / motion tracking work.

17. Managing the Components List

17.1 Renaming Components

Click a Component in the Components List and enter a new text to rename the component. This component label will carry over in exports from SCAN2FX Mesh Modeler



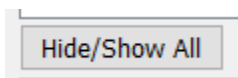
17.2 Hiding and Selecting Components for “Export Selection...”

Click the checkbox in front of a component to unselect it and hide the component. This feature can be useful e.g. when defining very large volumes/boxes for Meshing and then wanting to add smaller polygons later.

One can simply temporarily hide a component while continue working on the scene.

17.3 Hide/Show All

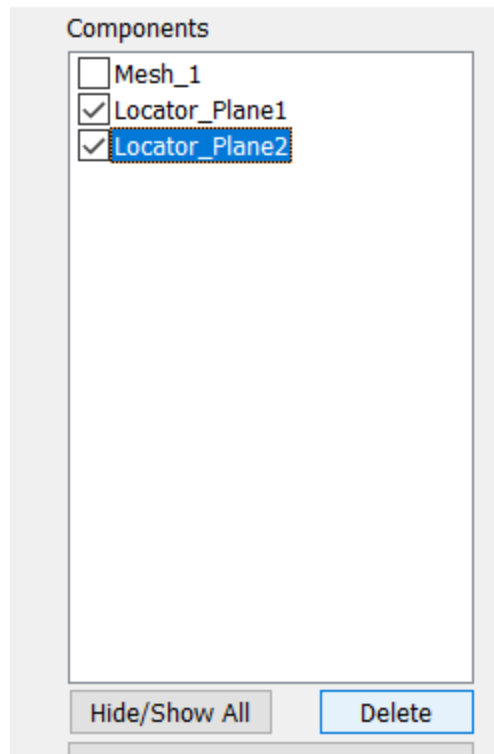
The Hide/Show All button will hide or show all components in the list. Remember that hidden components do not get exported with “Export Selection” (only with “Export All”).



17.4 Deleting Components

Click a component to select it. The according tool will get activated and the component will be selected in the 3D view per the color highlighting scheme appropriate for the selected tool.

One can delete components by pressing the delete key usually (make sure to click the 3D view first). Or one can simply click the “Delete” button if a component is selected in the Components List (identified by a blue bar).



17.5 Export Selection

SCAN2FX Mesh Modeler offers two ways to export: “Export Selection” or “Export All.”

Click “Export Selection...” to only export the currently visible components (i.e. where the checkbox is selected). A file dialogue will pop up that allows you to choose the file format and enter the filename. The standard SCAN2FX Mesh Modeler allows for OBJ mesh export. While with the optional SCAN2FX Exporter for Maya, native Maya MA export is also supported. Meshing of any mesh extraction components will take place during export.

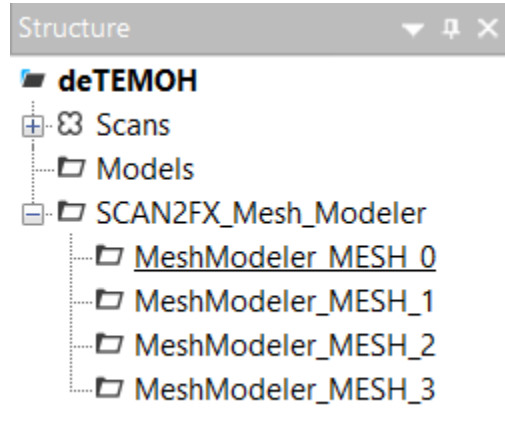
17.6 Export All

Click “Export All...” only in order export all components (i.e. regardless if hidden or not / independent of the checkboxes in front of the components).

As with “Export Selection,” a file dialogue will pop up that allows to choose the file format and enter the filename. As already mentioned, the standard SCAN2FX Mesh Modeler allows for OBJ mesh export. While with the optional SCAN2FX Exporter for Maya, native Maya MA export is also supported. Meshing of any mesh extraction components will take place during export.

17.7 Saving Meshes / Sets of Components to Disk / SCENE Project

Sets of Components are called a “Mesh” in SCAN2FX Mesh Modeler, and each such mesh node can consist of many components. Each “Mesh” creates a separate entry in the SCENE project structure under a SCAN2FX_Mesh_Modeler node as shown in this example:

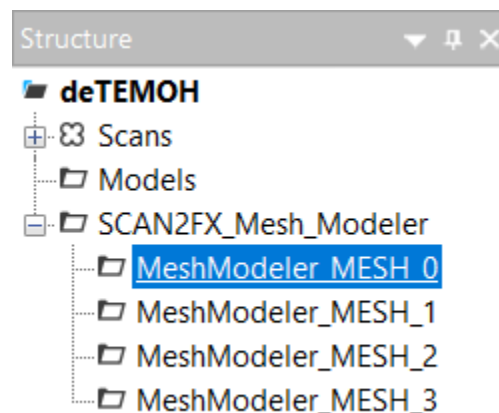


Each “Mesh” node stores the relevant data directly as part of the SCENE project but will only write the components to disk when the SCENE project is saved.

Important: Please make sure to save your SCENE project to actually save any “Mesh” nodes from SCAN2FX Mesh Modeler and all the components to disk!

17.8 Activating previously Saved Meshes / Sets of Components from SCENE Project

To activate a different “Mesh” node that was previously created in the SCENE project, simply clicking on the Mesh Modeler node in the SCENE project structure:



The node will get highlighted in blue, and the previously created Components List will get loaded and reactivated in the SCAN2FX Mesh Modeler pop-up. Make sure to have the SCAN2FX Mesh Modeler pop-up open before (as otherwise clicking the “Mesh” node will not do anything).

18. Tips and best practices for working with the data from SCAN2FX Mesh Modeler

18.1 Ensuring proper scale of the meshes

OBJ and MAYA MA files do not contain scale information. Make sure that the proper scale is set for your project in the 3D application. For example, when using SCENE in meter, in Maya you should use centimeter (cm) as your project working unit.

18.2 Filling Holes in a typical scanned environment

One common workflow is to create a master mesh with the “Extract Mesh” tool, and then identify any area that requires fill by reviewing the resulting mesh in a 3D application such as Maya, Houdini, Modo, or 3D Studio Max.

One then can utilize the “Create Polygon,” “Survey” and primitive extraction tools in SCAN2FX Mesh Modeler to create fill polygons and primitives. Using a separate SCAN2FX Mesh Modeler “Mesh” node can be useful to keep the fill separate from the main mesh so that the meshing does not have to be computed again or each time when additional fill should be exported.

In a 3D application like Maya, one can then combine the fill elements with the master mesh that was algorithmically generate (See e.g. the Mesh combine operation). You may want to check the normal direction or reverse the normal for select polygons if needed before combining.

Alternatively, projection painting can be used with the SCAN2FX Exporters and/or SCAN2FX Photo Projector modules (extra/separate modules available).

18.3 Getting meshes ready for texturing with SCAN2FX Texture

Once combined, one can create a UV map and then export the “tweaked” mesh as OBJ with the UV coordinates for texturing with the optional SCAN2FX Texture module.

The SCAN2FX Texture manual has an extensive tutorial on the creation of UV maps.

18.4 Creating simplified geometry from a scanned environment

Another application is to create simplified geometry from point clouds instead of just automatically meshing it. This approach allows you to reduce the overall triangle count to be used and allows the simplification of aspects that may not be important e.g. small imperfections in walls.

The “Survey” tool and “Create Polygon” tool are useful for this purpose. Also locking an axis and leveraging the “Move Vertex” tool makes it possible to even place geometry where no scan points exist.

18.5 Fixing up point clouds with mesh components and SCAN2FX Depth Fixer

SCAN2FX will be releasing a new application called **SCAN2FX Depth Fixer** that allows importing of mesh components e.g. create with SCAN2FX Mesh Modeler (with or without textures) straight into SCENE as point clouds. These imported “components” can then be merged into the project point cloud. This workflow enables filling specific holes or areas in the project point cloud, even if very odd shapes need to be filled.

Thinking in this direction further, the modified project point cloud can then be used to run a new meshing process with SCAN2FX Mesh Modeler without those holes or missing areas resulting in a single new, filled mesh without having to worry about re-combining fill components anymore with automatically created meshes.

This approach is a creative / advanced technique for hole filling. Rather than combining different meshes or polygons to fill holes, we would modify the point cloud with the mesh generation, and then create a single mesh from the new unified project point cloud without any overlap between fills.

SCAN2FX Depth Fixer will also offer other tools to modify point clouds e.g. by fill in windows, water areas, or similar holes straight in a scan, before any meshing.

18.6 Making the most of SCAN2FX by utilizing the full suite of SCAN2FX modules

SCAN2FX Texture offers an automated way to generate a baseline texture for your mesh from the panorama scans. It also offers unique layer capabilities that allow recombining different scans to modify the overall textures.

SCAN2FX Exporter for Maya and **SCAN2FX Exporter for Mari** enable each a break-through direct integration with 3D paint workflows for additional touchup, modelling or compositing work.

SCAN2FX Exporter for Nuke and **SCAN2FX Exporter for Flame** enable direct integration for VFX especially around projections for 3D compositing and matte painting.

The photos and cameras computed with **SCAN2FX Photo Projector** can add additional detail on top of the baseline texture generated with SCAN2FX Texture where needed. SCAN2FX Photo Projector requires one of the SCAN2FX Exporters to export the resulting cameras.

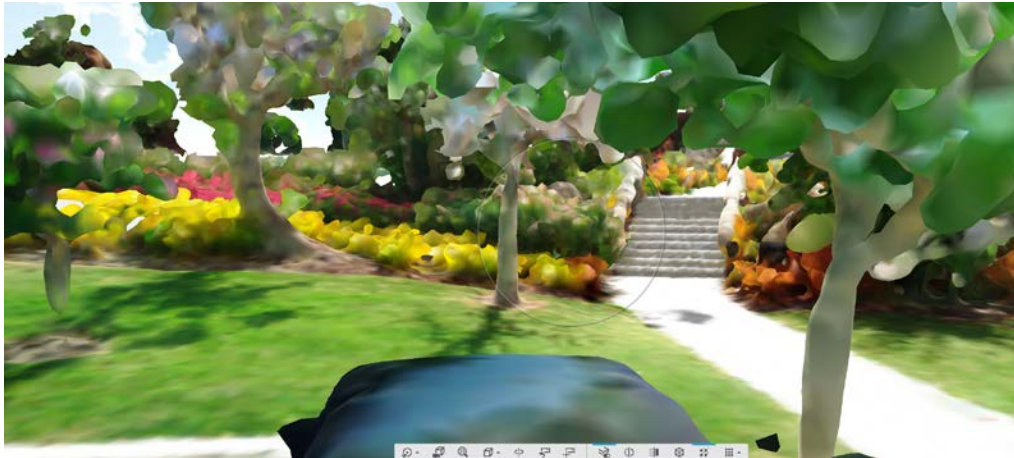
Each module is available separately so that one can choose precisely those capabilities that match the requirements of a project or pipeline.

Contact us today at sales@scan2fx.com to inquire about upgrading to the full SCAN2FX suite, or adding additional modules to your license.

19. Quality Achievable with SCAN2FX

SCAN2FX Mesh Modeler can generate very realistic looking meshing.

As a comparison, you see here a mesh generated with standard FARO Scene meshing and vertex coloring:



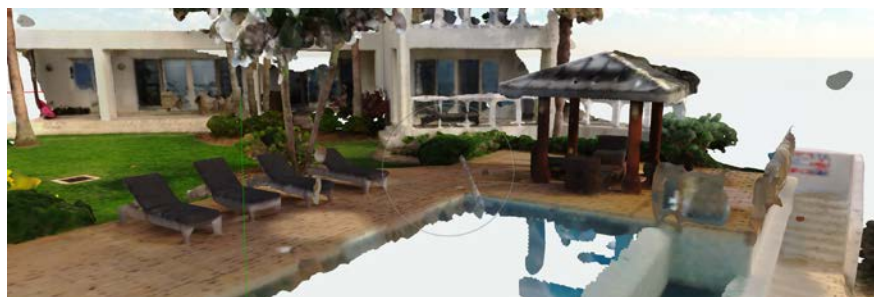
And here, with SCAN2FX Mesh Modeler and SCAN2FX Texture, the same mesh with textures applied generated with SCAN2FX Mesh Modeler (Maya Viewport 2.0 preview):



A renderer can add additional effects such as depth of field, and lighting simulations:



In contrast to other solutions, SCAN2FX can bring back also elements where no scan data existed. Here's a standard FARO Scene mesh:



You can see how windows, sky, and the water are missing.

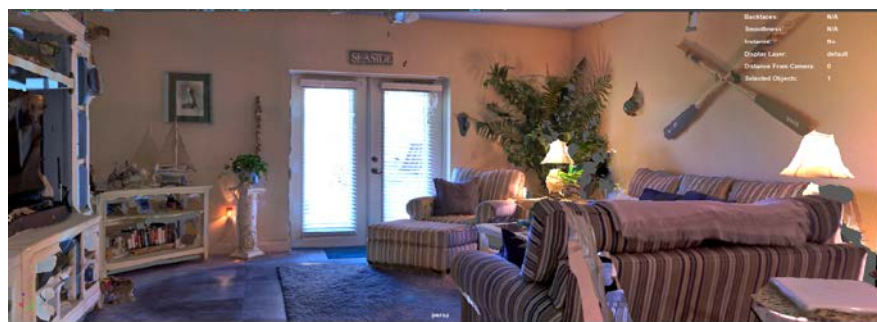
And now here is the result with SCAN2FX Mesh Modeler and the automatic texturing from SCAN2FX Texture applied:



We then applied some small touch-ups with SCAN2FX Exporter for Maya and Maya's 3D paint functionality. We also selected the water face to increase the reflectivity of the shader:



Here's another example of an interior, solely using the automatic meshing and texturing from SCAN2FX Mesh Modeler and SCAN2FX Texture:



20. Known Limitations or Considerations

20.1 FARO® SCENE Version

SCAN2FX Mesh Modeler has only been tested and qualified with FARO® SCENE and SCENE LT 2018.

Please email support@scan2fx.com if you think you may have identified an issue as we would love to hear from you.

20.2 Hardware Recommendations

Most functionality does not require a lot of RAM or CPU, except for an average GPU to visualize the point cloud or meshes.

However, SCAN2FX Mesh Modeler's meshing requires a decent amount of RAM and ideally a high-clock speed CPU for best performance. SCAN2FX recommends at least 32GB of RAM (64GB RAM better). You will also need sufficient drive space for meshing. Fast disk drive technologies such as NVME can be helpful to accelerate data retrieval and computations.

SCAN2FX was designed to not have any area / volume restrictions. However, a certain amount of memory is needed for complex scenes.

20.3 Type of 3D View

Make sure to utilize a perspective 3D view instead of orthographic view.

20.4 Working in Teams and Workflow Recommendations

SCAN2FX Mesh Modeler runs also on SCENE LT, which provides a cost-effective way to have multiple artists or engineers working with data, even those that historically have not worked with the point cloud data directly and have not used SCENE in the past.

The main SCENE operator can create a project point cloud and then share the project with the SCENE LT users. SCENE LT users can utilize SCAN2FX's application such as SCAN2FX Mesh Modeler, SCAN2FX Texture, SCAN2FX Photo Projector, or the SCAN2FX Exporter to create their own meshes, fill or texture as needed.

This way a company can empower multiple artists (also at customers or suppliers) to work with the data. E.g. modelling artists can model with SCAN2FX Mesh Modeler, and a texture artist or paint artist could work with the SCAN2FX Exporters or Texture module.

20.5 How to best utilize SCAN2FX Mesh Modeler

SCAN2FX Mesh Modeler is designed as a quick tool to create fill polygons, mesh a point cloud or create simple polygon structures, mainly for VFX, games, simulation/training, VR/AR content, and similar. The tools are not intended as a full-on modelling package e.g. to model for engineering purposes, ship building or similar tasks. So there may be some limitations when trying to manually model very complex models with these types of tools.

20.6 Older Versions of Windows

During our testing, the SCAN2FX suite has been mainly used on Windows 10. There may be certain issues or layout problems under previous versions of Windows we may be unaware of. We have decided to focus our development on the most current versions of software and operating systems instead, so we can get more functionality implemented faster rather than trying to test with too many versions or older operating systems.

20.7 Internet Connection Requirement for Licensing

If you intend to use SCAN2FX without Internet connection, please authorize SCAN2FX when connected to the Internet and keep FARO® SCENE open. Please note that SCAN2FX will authorize all previously entered licenses on each application start. If SCAN2FX licensing servers are not reachable at the time of authorization, SCAN2FX will disable the according SCAN2FX menus.

20.8 Subscription-based Licenses

Please note that all licenses in SCAN2FX are subscription-based, i.e. they will expire after your service term and a renewal subscription needs to be purchased to continue using SCAN2FX. When a licensing key gets entered the first time in SCAN2FX, this particular license key will be node-locked to the particular hardware and cannot be reused on another machine.

20.9 Significant Changes in Hardware / No Transferability of License

Licenses are not transferable and once associated with a particular computer hardware are not transferable. Unfortunately, in some case where you purchase a new computer or change computers you may have to purchase a new subscription early while not getting a discount for the existing subscription. We hope you appreciate this policy and limitation in order to protect our work and intellectual property, and at the same time by purchasing your subscription you enable us to better support you and also to continue development of the SCAN2FX plug-in applications and modules for FARO® SCENE. Laser scanning add-on software is a small, highly specialized market as of now, and we need sufficient revenue to keep innovating and provide additional solutions.

20.10 Other Issues or Needs

If you have ideas for, or need particular solutions or enhancements, feel free to email us at sales@scan2fx.com to discuss options on how to support your business. We would love to hear from you.

21. Support & Training

If you have **questions or feedback**, please email us at support@scan2fx.com. Or contact us via our website at <http://scan2fx.com/?id=contact>. Additional premium support may be available at an extra cost.

If you have **additional requirements or special projects** you would like us to support, please contact us at sales@scan2fx.com with your requirements to discuss a possible collaboration and pricing.

To request a quote for **training**, please contact us at sales@scan2fx.com with your requirements and/or training needs for yourself or your team.

support@scan2fx.com