Objective

Learn how to create a qualified polygonal model from point clouds. Use the Point Cloud to Mesh function to triangulate point clouds. Use the Fill Hole and Unify Normal functions to repair meshes. Use the Decimation and Smoothing functions to reduce the number of triangles and increase the smoothness of meshes while keeping an accurate geometric shape. Introduce a few mesh editing tools to fix irregular boundaries.

Import File

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Click the **Import** command from the File menu or in the Quick Access Toolbar to import a file into the current project. The imported file name is shown in the Object Tree Window.

Step 1: Point Cloud Processing

It may be necessary to clean up the point cloud data before triangulation. For example, use the **Denoise Point Cloud** command to remove noise from point clouds. Use the **Decimate Point Cloud** command to reduce the size of point clouds.

Step 2: Triangulate Point Clouds

Click the Point Cloud to Mesh command in the Point Clouds menu.	Press the [Apply]
button in the Parameter Window to start the triangulation process.	

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Original point clouds



Triangle meshes

Step 3: Repair Meshes

1. Extract floating parts

Click the **Extract All Parts** command ^{IVIII} in the Mesh Editing menu. Specify the **Minimum Triangles**. The program removes all parts that contain fewer triangles than the defined amount.

2. Fill small holes



Click the **Fill Holes** command in the Mesh Repair menu. Specify the **Hole Radius** to define the maximum area that a hole will be filled. Select the **Simple** mode to fill holes. Please note that filling small holes before unifying normals is an important step to produce a better result.

3. Unify normals

Click the **Unify Normals** command in the Mesh Repair menu. Select the **Fix Errors** checkbox. The program will detect and delete ill-connected triangles while unifying the normals.

4. Fill holes again

Click the **Fill Holes** command in the Mesh Repair menu. Adjust the value of **Hole Radius** to fill remaining holes.

For big holes, you can fill them individually. First, click the **Pick Boundary** command in the Surface Curve menu, and then click near a preferred hole to generate a boundary

curve. Second, click the **Fill Boundary by Curvature** command in the Mesh Repair menu. The program fills the hole smoothly using the curvature-based method.

Step 4: Decimation

Click the **Decimation** command in the Mesh Editing menu. Select the **Quadric** type, specify the **Remaining Percentage**, and press the [Apply] button to reduce the number of triangles.



927,019 triangles



Decimated 70% off

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Click the **Smoothing** command in the Mesh Editing menu. Select the **Remesh** smoothing type, specify the **Smoothing Iteration** at around 12, and press the [Apply] button to remove noises from the meshes. Please note that the preservation of important surface features such as sharp edges and corners is controlled by the **Smoothing Weight** parameter. This value defines the degree of the smoothing for sharp edges.



Remesh smoothing

Step 6: Edit Meshes

VRMesh provides users comprehensive mesh editing tools. In this example, you will learn how to fix an irregular boundary.

1. Align work plane. Click the **Align Plane to Object** command in the Transform menu. Place three dots on the surface near the irregular boundary. Specify the **Parallel** type to place the plane direction along the surface normal direction, and adjust the plane to align to Y-axis. Press the [Apply] button to align the work plane.



2. Clip meshes. Click the **Clip by Plane** command in the Mesh Editing menu and press the [Apply] button in the Parameter Window. The program clips the meshes along the normal direction of the work plane.

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3. Create a boundary curve. Click the **Pick Boundary** command in the Surface Curve menu. And then, click near the boundary to generate a boundary curve.



4. Extrude the boundary. Click the **Extrude Boundary** command in the Mesh Editing menu. Select the **Contour** as the extrusion direction, specify the **Extrusion Length**, and press the [Apply] button. The program extrudes the boundary along the specified normal direction. The final model is shown below:

