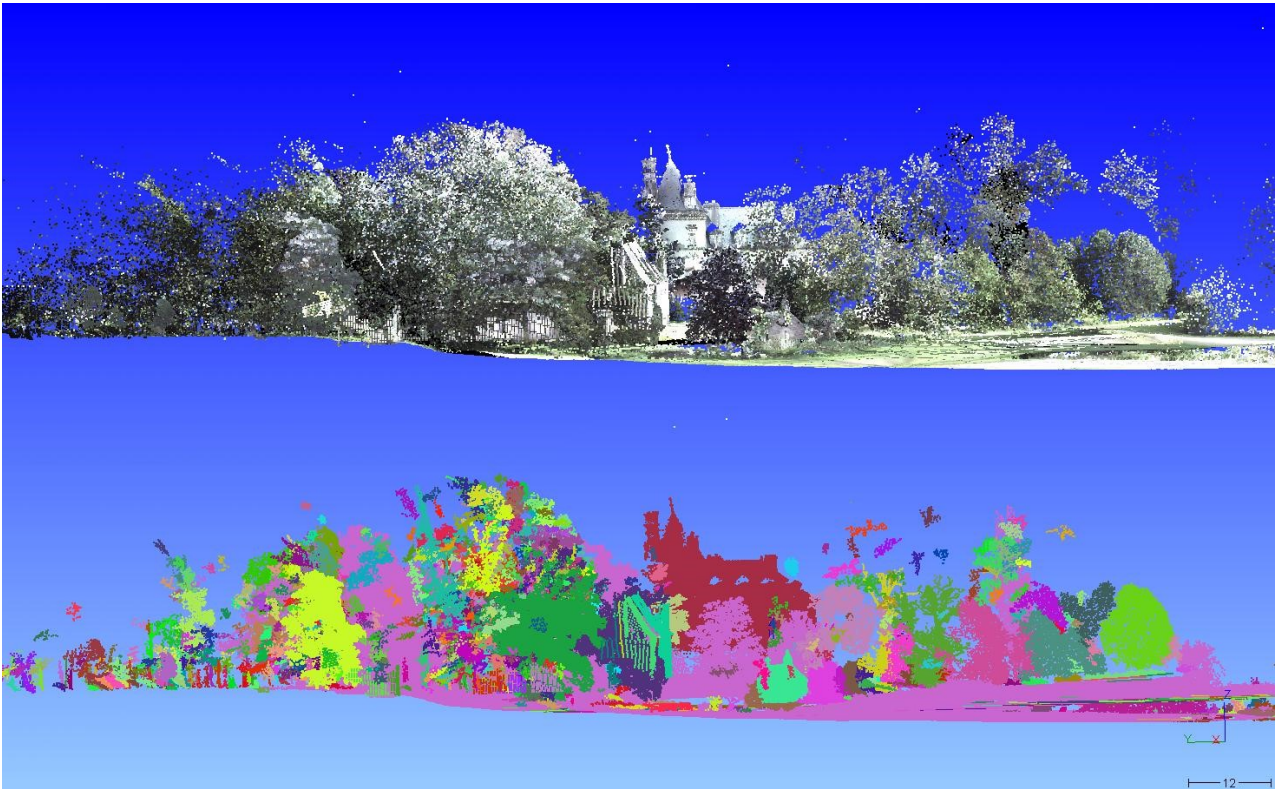


3DReshaper Meteor Practical Exercise

Ex1 - Point Cloud filtering



Introduction

It is sometimes necessary in a point cloud to split the points, which are not relevant or which can be separately processed in your application, (e.g. monuments and trees on a DTM). In the software, there are several ways of processing the point clouds (bad points removing, point or cloud selecting, etc.)

- Manual selection (in the menu **Cloud \ Clean / Separate**)
- Automatic selection (in the menu **Cloud \ Separate with \ Object**)
- Automatic segmentation or filtering (in the menu **Cloud**):
 - **Noise**
 - **Distance**
 - **Inspection Colors**
- Sampling (in the menu **Cloud**):
 - **Reduction**
 - **Regular Sampling**
- Rendering and selection (in the **Measure \ Color along a direction**).



Exercise overview

In this exercise, we will see how to split or explode a point cloud in different parts manually or according to a distance parameter. The 3D meshing will be also presented while keeping all points.



The file used in this tutorial is **Golf.rsh**.

1 Getting familiar with the aspect of your point cloud

- Zoom on the model scrolling the mouse wheel.
- Make a pan by pressing the mouse wheel and moving the mouse.
- Rotate your model by pressing the mouse's right button and moving the mouse.
- Select the point cloud with the left button on your mouse
- Reset selection by pressing on ESC key.
- Display the contextual menu by clicking the right button on your mouse.

You can change the representation mode of your point cloud:

- Smooth representation.
- Flat representation.
- Inspection representation. In this case, the color applied to each point depends on the level of intensity obtained by the measurement device when measuring the point. Note that the colors may be adjusted using the command [Measure \ Edit Colors](#).
- Real Color representation. In this case, a particular color is applied to each point as if the point cloud was a 3D picture (RGB colors).



The display is made according to the zoom factor in order to see the points which are in the camera frame. If your magnification is high and if you are in a static view (right button released), you will see all the points of your cloud. If your magnification is low, the application will not display all the points in order to avoid the graphic board saturation.

The maximum number of points that you can see is set by the command [Home \ Colors and Aspect](#) . You may, sometimes, need to change this parameter, however, most of the time, the default value works fine as the software automatically adapts the number of points displayed.

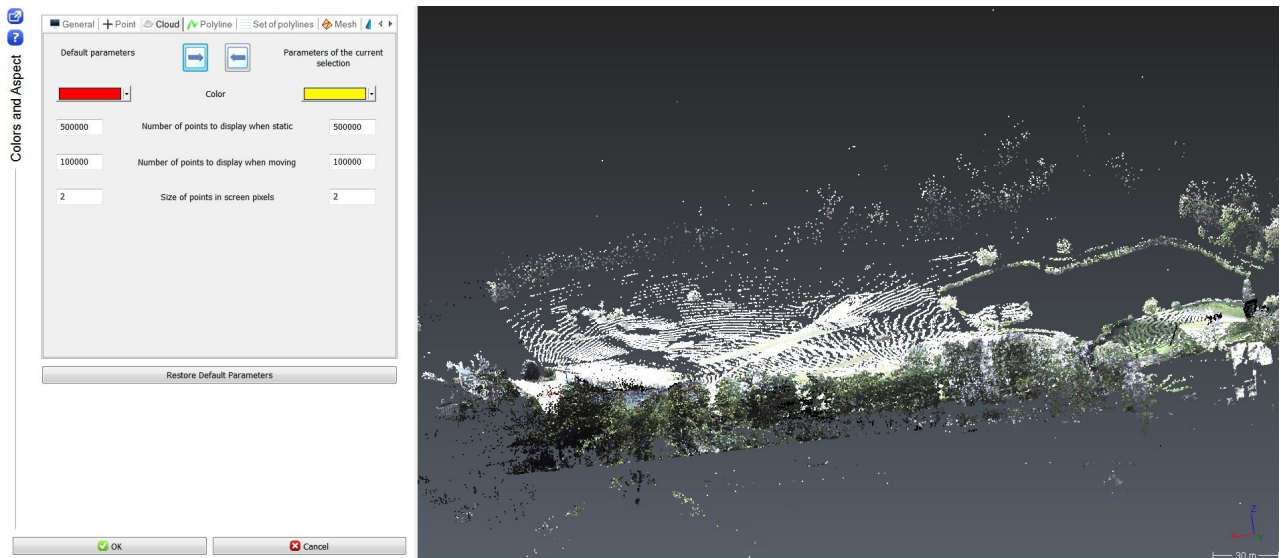


Figure 1: Adapt the display of the point cloud

2 Changing the view of the 3D point cloud (and other objects)

You can swap from:

- An **orthographic** view. In this case you are always in front of the objects because you are looking from a point to infinity. The scale is only drawn in **orthographic** as the pixel distance is the same for every depth and area on the screen in this mode.
- A **perspective** view. In this case the view is similar to what you see with your eyes because the camera is located in the 3D environment. The objects that are close to your eyes are bigger and those that are far are smaller. You can also move inside the objects.

Use the icon located at the bottom right corner of the graphic zone to swap between orthographic and perspective view.

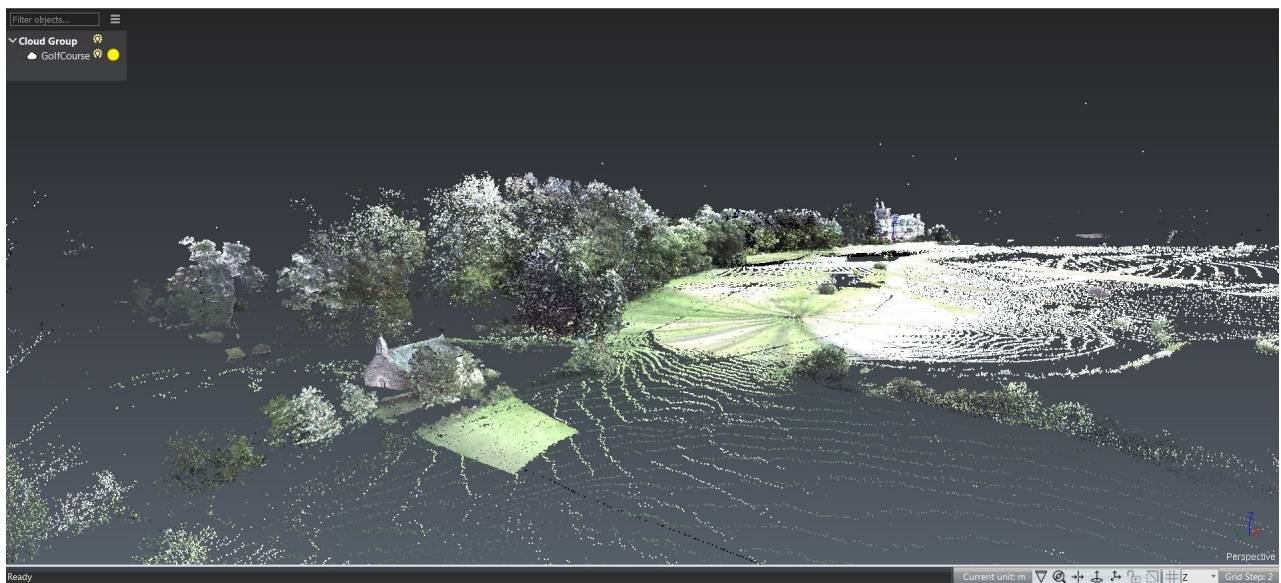
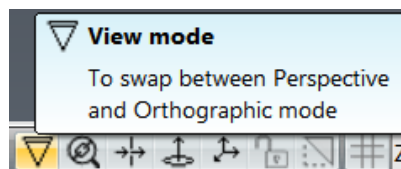


Figure 2: Swap between Orthographic and Perspective view

When you work in a landscape view, like in this golf course, it may be relevant to activate the reference vector so that the vertical axis of the 3-D scene corresponds to the Z axis. It looks more natural to see a landscape with the vertical head and then with the Z axis going from the bottom to the top. This aspect of the view is less important for mechanical design.

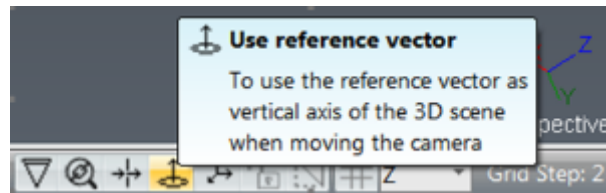


Figure 3: Use reference vector

3 Cleaning or splitting manually the cloud

- Select the point cloud
- Launch **Cloud \ Clean / Separate**.

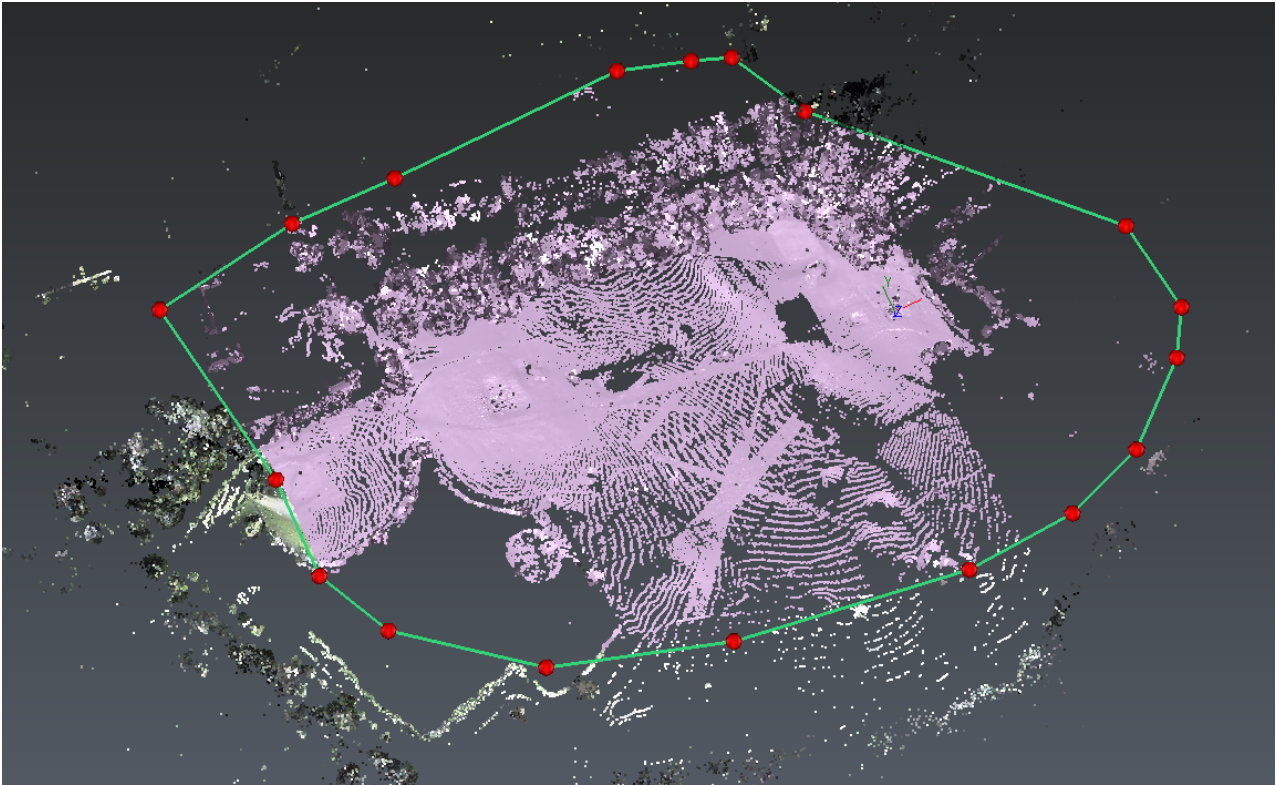


Figure 4: Manually keep the central points

- Draw a contour, like the one on the picture, to remove the wrong points around the scene. Note that during the contour drawing the view is locked and cannot be rotated.
- Press **ENTER** to validate your contour, which is considered as an extruded contour in the view direction.
- You can now rotate again the 3D view.

4 Coloring the cloud according to a direction

- Select the point cloud.
- Choose the command **Measure \ Color along a direction**.
- Choose the desired direction, here **Z**.
- Click **Preview**. Then, click **Edit Color** if you want to change the colors, drag the arrows or enter precise values as threshold. Several levels can be set to get fixed colors instead of smooth color variations.
- Click **Ok** to validate.

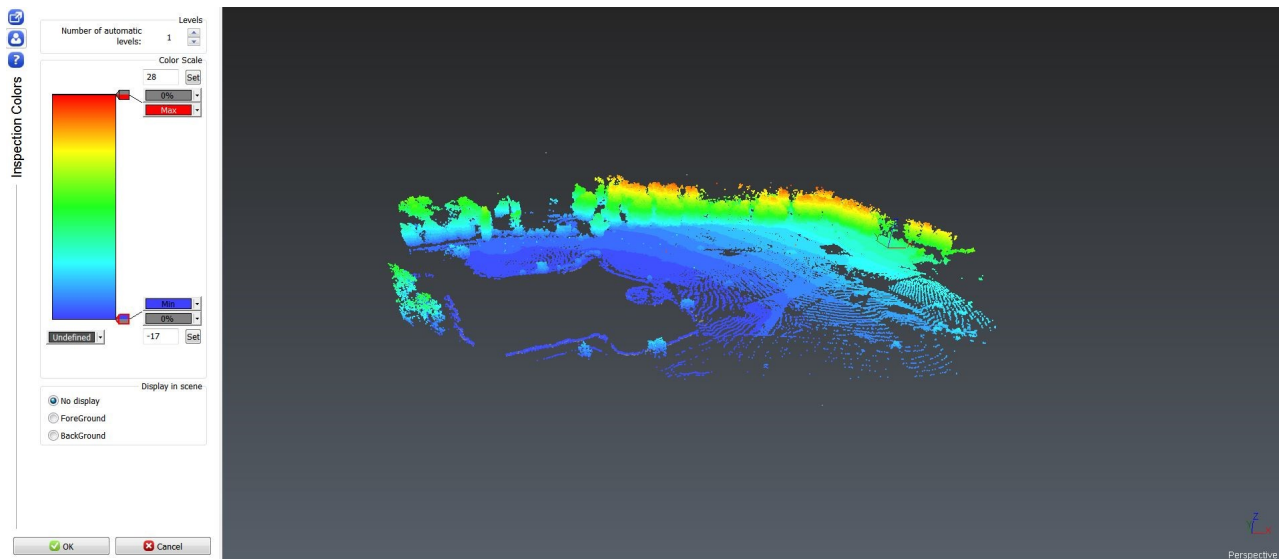


Figure 5: Gradient color along the Z axis

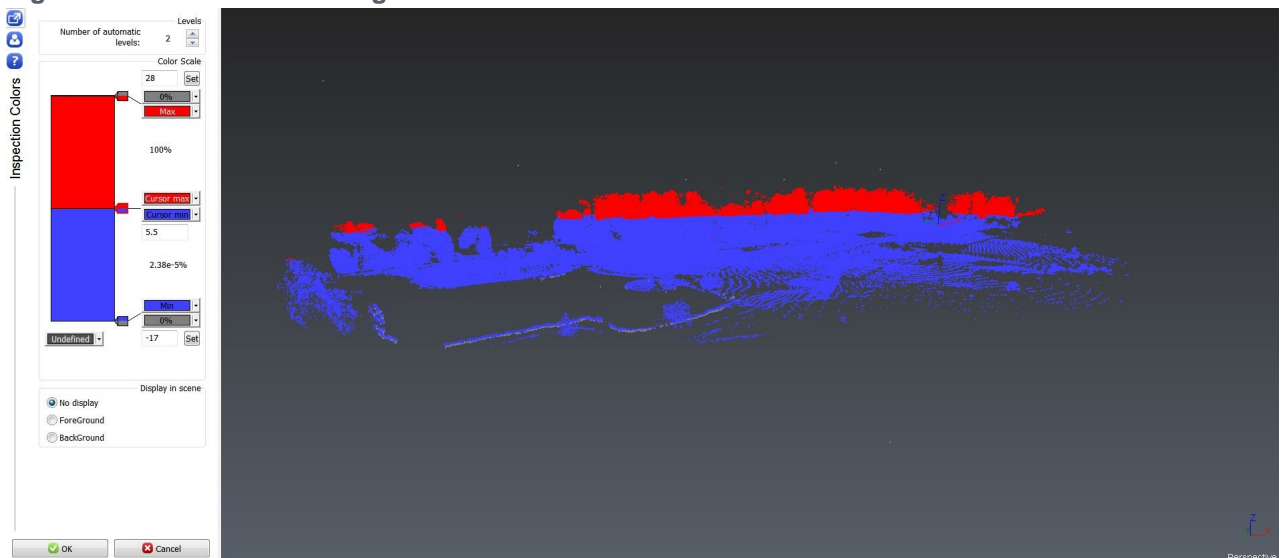


Figure 6: Two levels set in the point cloud

This colored cloud could be used to separate the cloud into 2 parts with the command **Cloud \ Inspection Colors**. However, in this tutorial, we will use another method to explode.

5 Cleaning or splitting automatically the cloud (explode the cloud in small pieces)

- Select the point cloud.
- Launch **Cloud \ Distance**.
- Enter for instance 0.5.

This means that the software will try to split the cloud according to a maximum distance between points or a minimum distance between clouds of 0.5 (in meters if the digitization was done in meters).

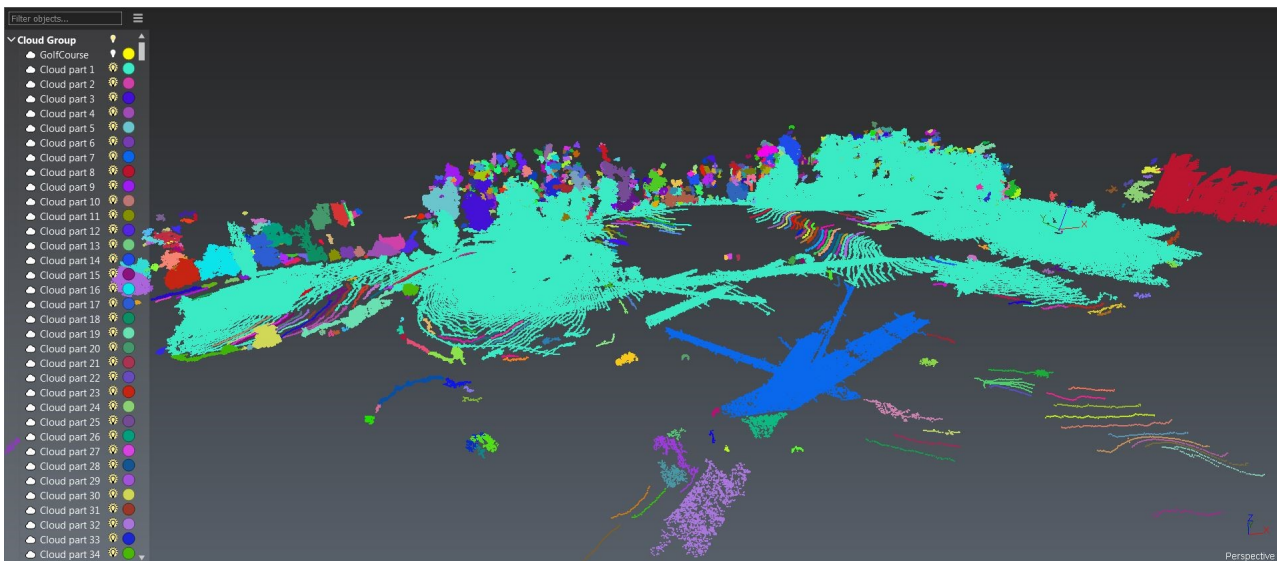


Figure 7: Explode the cloud in smaller pieces according to a distance

This command automatically sorts the sub-clouds by number of points and keeps only the 1000 biggest clouds. You can see all of them in the object explorer sorted from the largest to the smallest in number of points.

Now, you can select the little church which corresponds to the GolfCourse 2.

In the graphic scene, use the right click to display only the church (**Show only**). Or in the tree click on the **bulb + Ctrl key** to show the object.

6 Create a 3D Mesh

- Select the church (corresponds to the cloud "GolfCourse 2").
- Launch **Mesh \ 3D Mesh**.

In the advanced parameters, an option is available to mesh all points (only for less than 400 000 points). Meshing all points can be useful to keep all the information from the digitization, only if the cloud does not contain points too noisy or measurement errors. This process can also result in a heavy mesh due to the high number of triangles (see the Meshing Exercise).



3D Mesh Creation

Point cloud property

Nb of points	137422
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Noise reduction

☐ Meshing in two steps

☐ Regular sampling

☐ Sampling and details

☐ No noise reduction; deviation error

☒ Keep all the points

Hole management

☒ Hole detection

Triangle size

☐ Try to keep only the external border

☐ Try to create a watertight mesh



The option **Try to keep only the external border** enables you to automatically fill a certain number of holes.

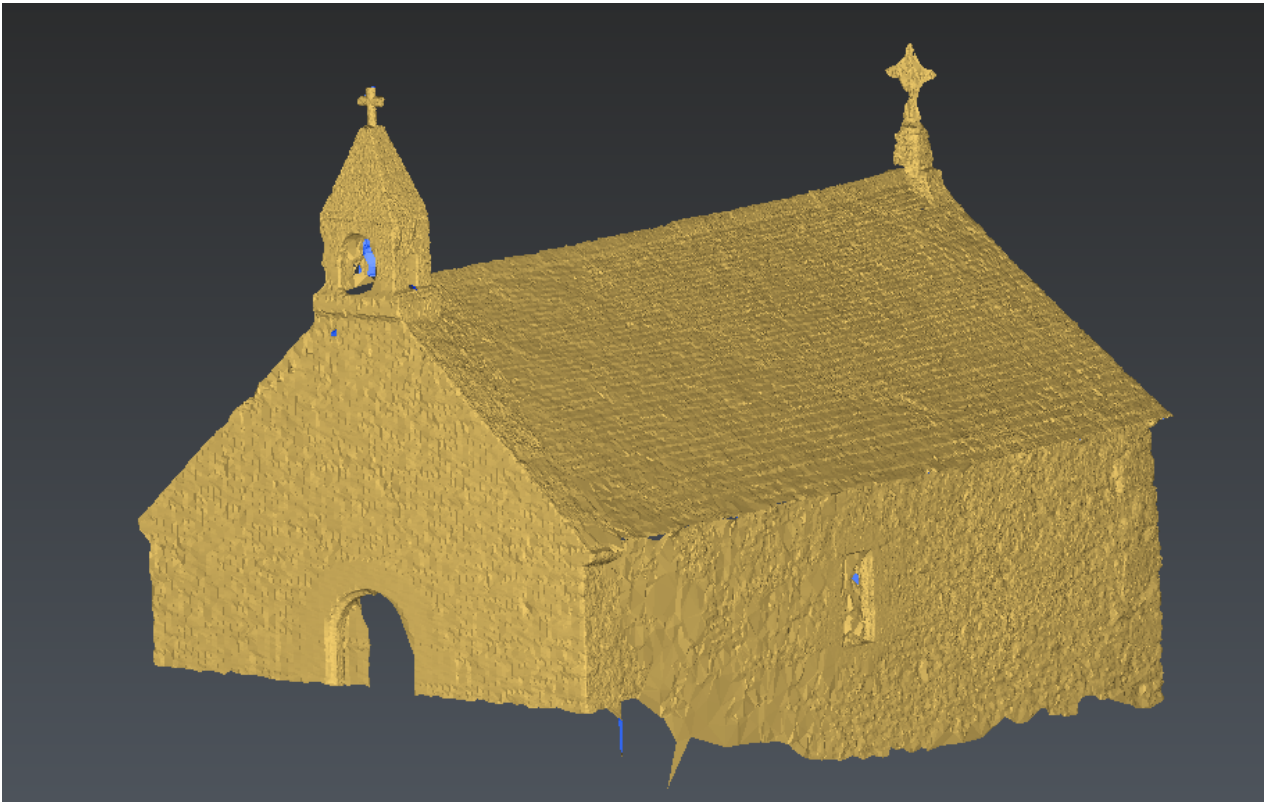


Figure 9: Final 3D model of the church