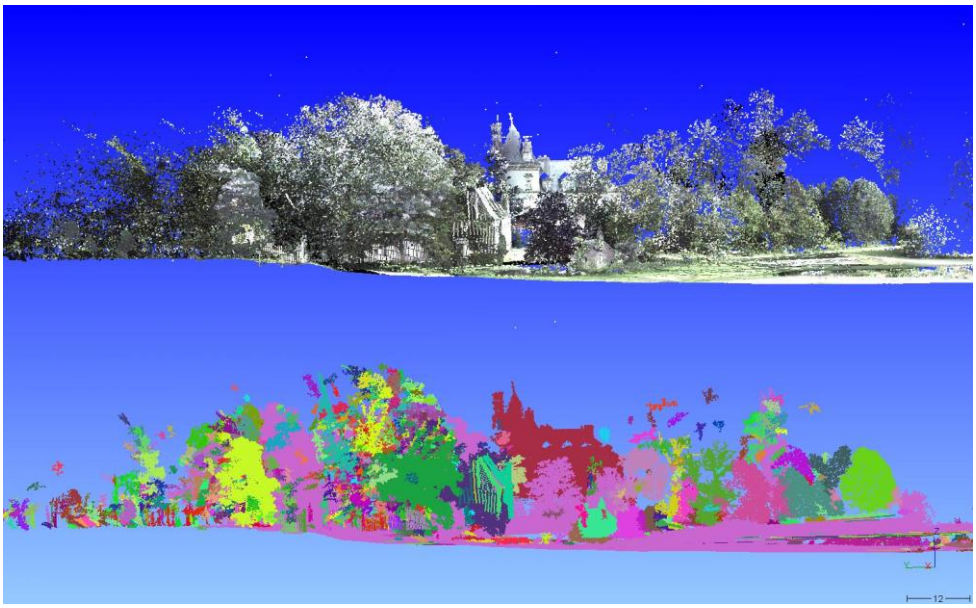
Exercise 1: Point Cloud Filtering

Reshaper V7…



Sometime, it is necessary in a point cloud to split the points that are not relevant or must be separately processed in your application (e.g. monuments and trees on a DTM). In 3DReshaper, there are several ways of processing the point clouds (bad points removing, point or cloud selecting, etc.).

- Manual selection (in the Cloud Menu – Clean / Separate Cloud(s))
- Automatic selection (in the Cloud Menu – Clean / Separate with object
- Automatic filtering (in the Cloud Menu – Filter / Explode Cloud(s)):
  - ✓ Noise reduction
  - ✓ Explode with distance
  - ✓ Explode with color
  - ✓ Reduce point cloud according to a constant density
  - ✓ Keep best points evenly spaced
- Rendering and selection (in the Cloud Menu – Color along a direction).

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 while keeping all points will be also presented.

➢ Open the file*: 3DReshaper-Practise/PointCloudFiltering/Golf.rsh*

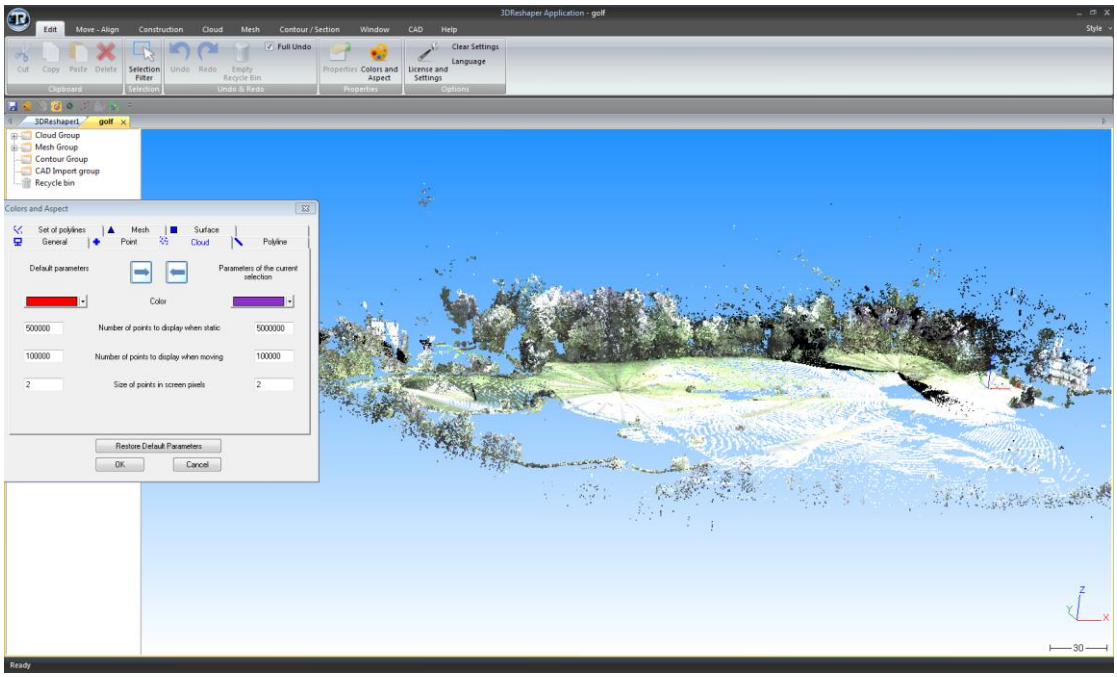
➢ Get familiar with the aspect of your point cloud:

- Zoom of the model with the rotation of the mouse wheel.
- Make a pan with the pressure on the mouse wheel and moving the mouse.
- Rotating your model with the pressure on the mouse right button and moving the mouse.
- Select the point cloud with the left button of your mouse.
- Make a click with right button of your mouse in order to display the contextual menu.

You can change the representation mode of your point cloud, we suggest you to try the following representation modes:

- Flat representation.
- Wire representation.
- Inspection representation. In this case the color affected to each point depends on the level of intensity that the measurement device got to measure the point. Note that the colors may be adjusted using the command “Measure ➔ Edit colors”.
- Textured representation. In this case a particular color is affected to each point as if the point cloud was a 3D picture.

Note: the display is made according to the zoom factor in order to see the points that are in the camera frame. If your magnification is high and you are in a static view (right button released), you will see all the points of your cloud.



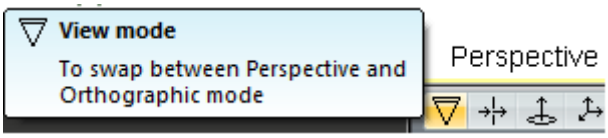
If you magnification is low, the application will not display all the points in order to avoid the graphic board saturation. The maximum number of points that you can see is set by the command “Edit -> Colors & Aspect”. You may need sometimes to change this parameter, however, most of the time, the default value works fine as the software adapts automatically the points to be displayed with the view.

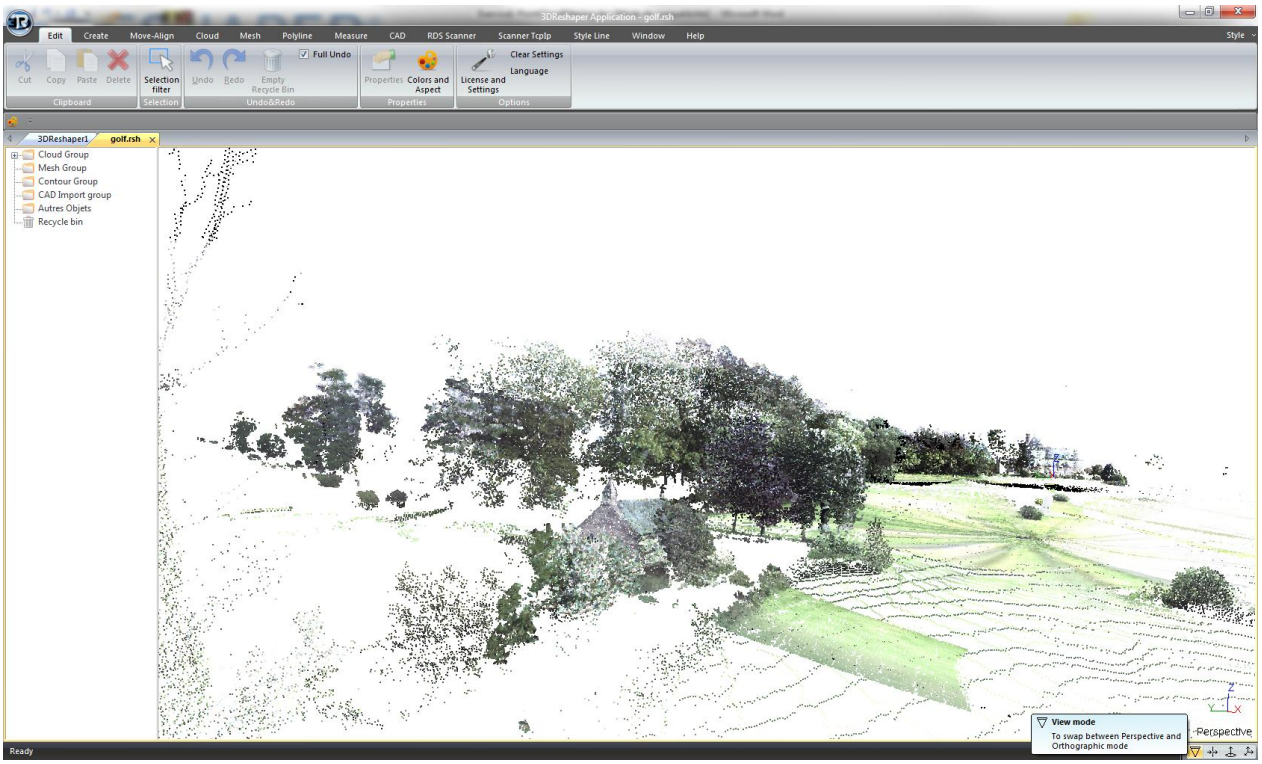
➢ Change the view of the 3D point cloud (and other objects):

You can swap from

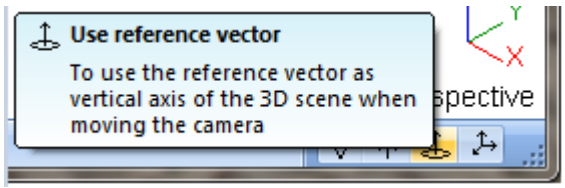
- An **orthographic** view. In this case you are always in front of the objects because you are looking from an infinite distance point of view. The scale is only drawn in **orthographic** as the pixel distance is the same for every depth and area on the screen in this mode.
- A **perspective** view. 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.

Using the icons located at the bottom right corner of the graphic zone to swap from orthographic to perspective view and reciprocally.



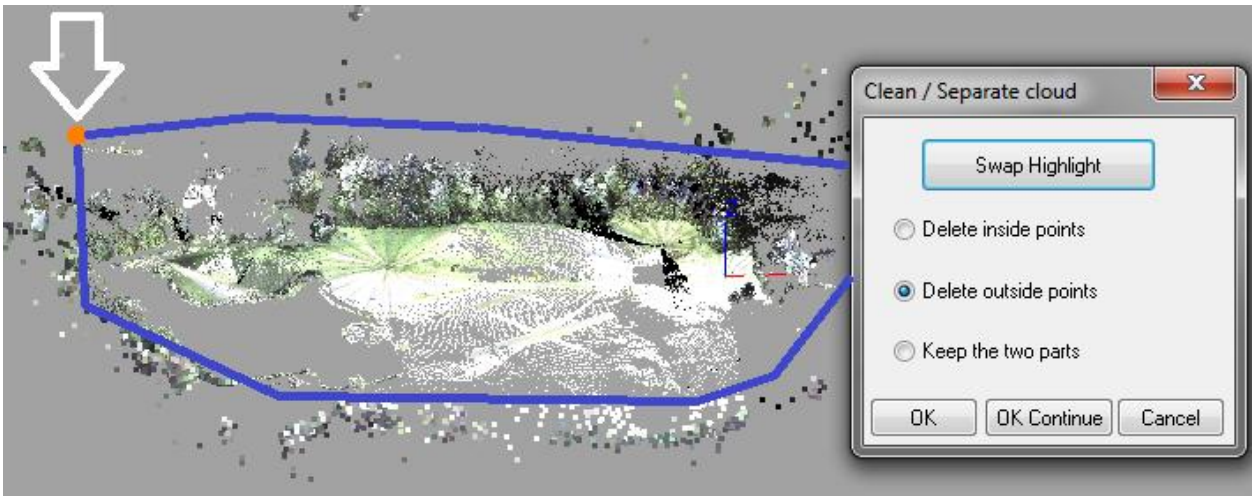


When you work in a landscape view like in this golf terrain, it may be relevant to activate the reference vector so that the vertical axis of the 3-D scene corresponds to the Z axis. It looks more natural to look at a landscape with the vertical head and then with the Z axis going from the bottom to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



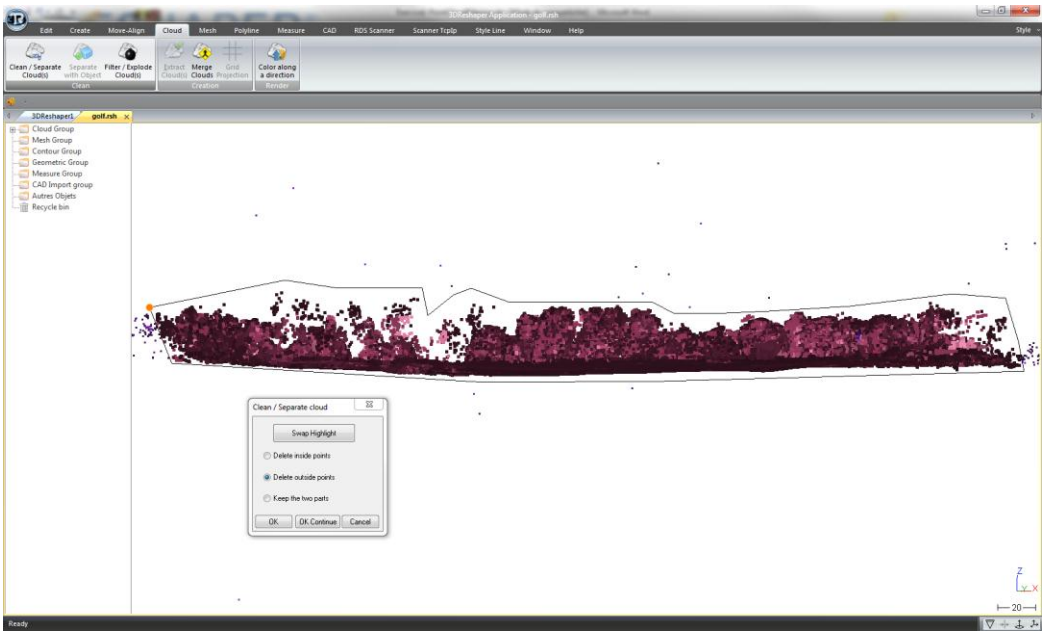
➢ Clean or split manually the cloud:

- Select the point cloud,
- Go to the Cloud Menu – “Clean / Separate Cloud(s)”.



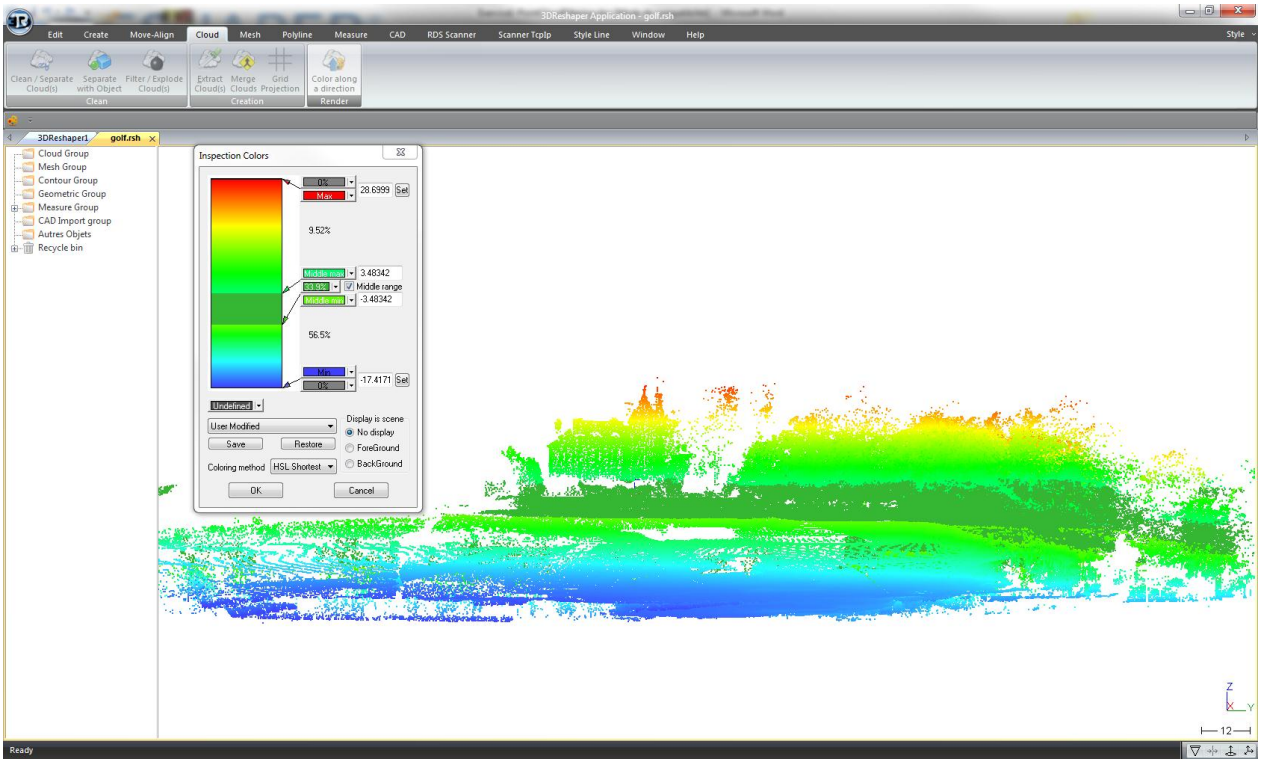
- Draw a contour like on the picture to remove the wrong points around the scene. Note that during the contour drawing, the view is locked and cannot be rotated.
- Click “OK” to validate your contour, which is considered as an extruded contour in the view direction.
- You can now rotate again the 3D view and also drag the orange ball to limit the extrusion depth.

Delete for instance the scattered points located far below and above the point cloud.



➢ Color the cloud according to a direction:

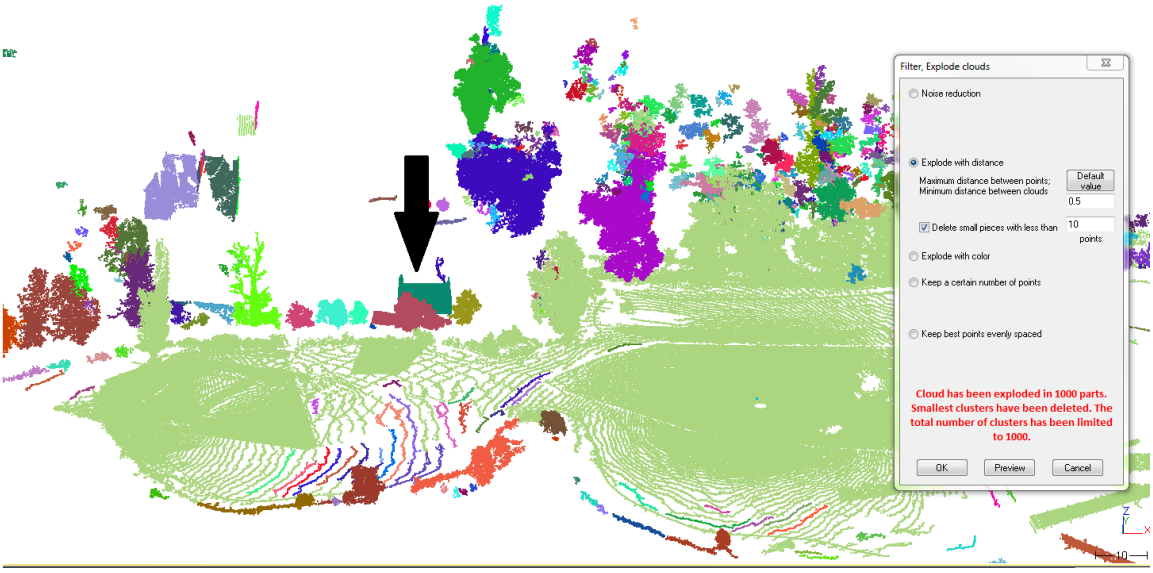
- Select the point cloud,
- Choose the command “Color along a direction” (here the Z axis)
- Choose the desired direction (preview or ok)
- Change the colors (you can also fix 5 colors maximum instead of having color gradient. Then you can explode the cloud according to its defined colors). The values indicate the minimum and the maximum elevation point on the Z axis.



➢ Clean or split automatically the cloud (explode the cloud in small pieces):

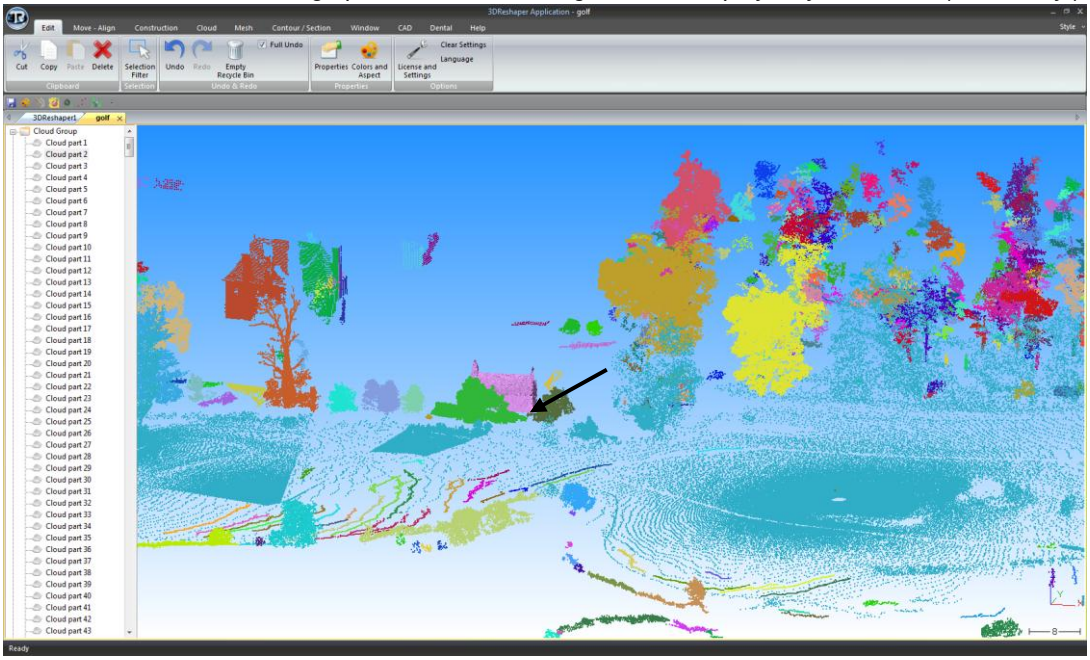
- Select the point cloud,
- Go to the Cloud Menu – “Filter / Explode Cloud(s)”.

Use Explode with distance. Enter for instance 0.5 (which 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 meter if the digitization was done in meter).



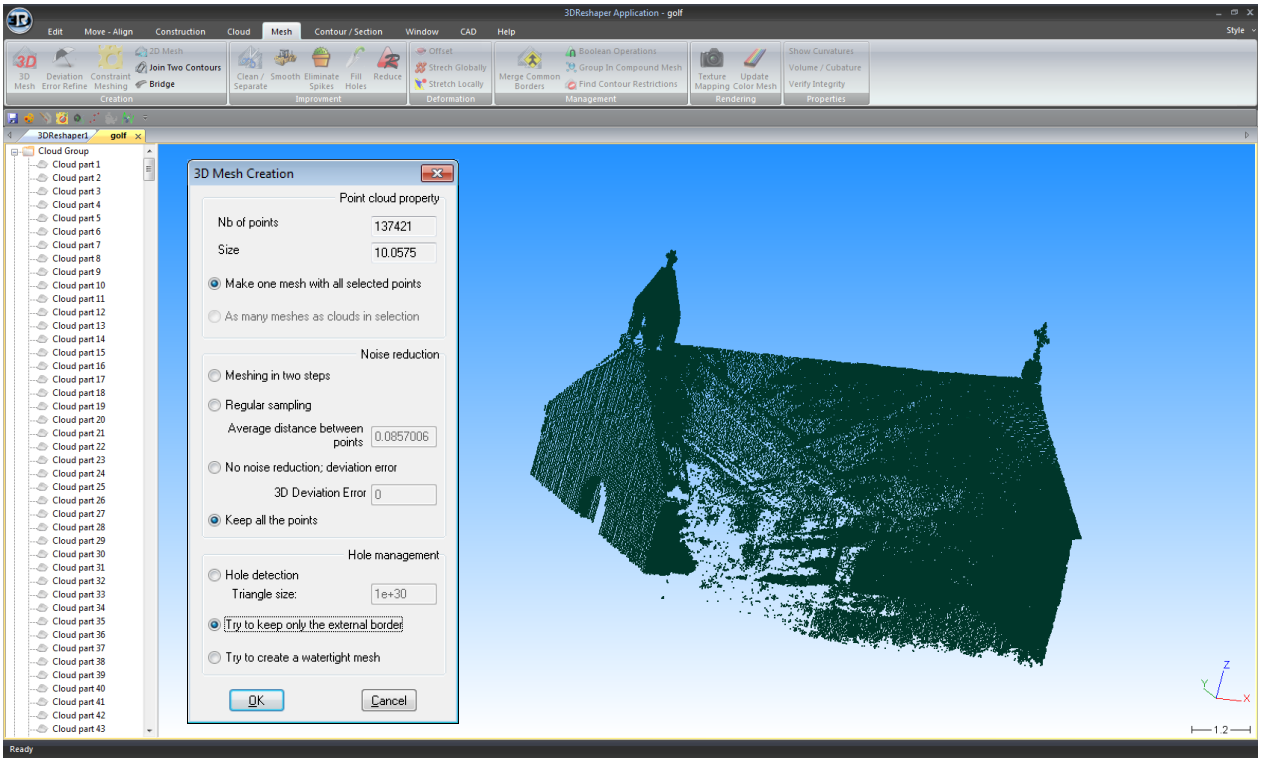
This command automatically sorts the sub-clouds by number of points and keeps only the 1000 biggest clouds. You can see all of them in the object explorer sorted from the largest to the smallest in number of points.
Now, you can select the little church which corresponds to the Point Cloud #2.
Note that is also possible to automatically separate a cloud according to a geometrical shape extracted or created beforehand. This possibility is not presented in this exercise (you can try with a best shape in the menu Measure).

In the arborescence or in the graphic scene, use the right click to display only the church ("show only").

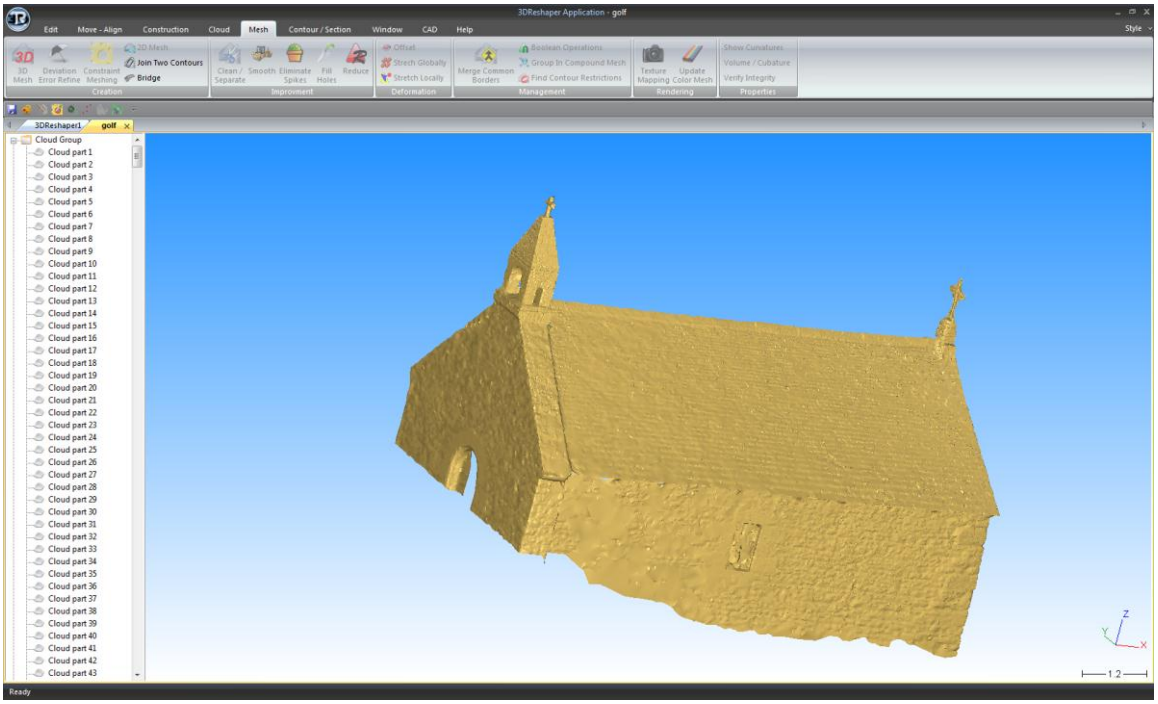


➢ 3D Mesh : Mesh Menu – 3D Mesh

Below 444,444 points, there is no problem to mesh all points. Meshing all points can be interesting to keep all the information from the digitization, provided that the cloud doesn't contain too noisy points or measurement errors. This process can also result in a heavy mesh due to the high number of triangles (*see the Meshing Exercise*).



"Try to keep the external border" enables you to automatically fill a certain number of holes.



3D meshed model - Right click on the 3D model – Reverse the normal