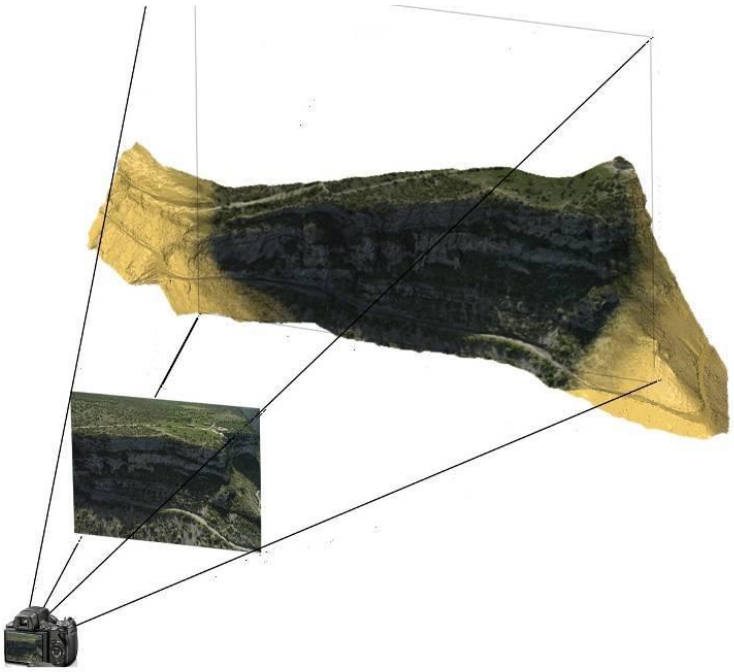
Exercise 4: Texture Mapping

Reshaper V7.



This module allows you to map a photographic picture of an object on the corresponding 3D model. According to the data you have, there are two correlated ways to apply the image or texture onto the 3D model.

❖ **Reference points:** The position, the orientation and the optical parameters of the camera are determined with some point couples. Each couple is made of one point on the 3D surface and the corresponding point on the image that you select by simply clicking (3 to 5 points are sufficient).

❖ **Camera definition:** You can fill in the photogrammetric parameters (origin and orientation of the camera, internal camera geometry, lens distortion...) whether it is for aerial photogrammetric convention (OPK and KOP references) or terrestrial convention. You will get a very accurate mapping of the texture onto the 3D model.

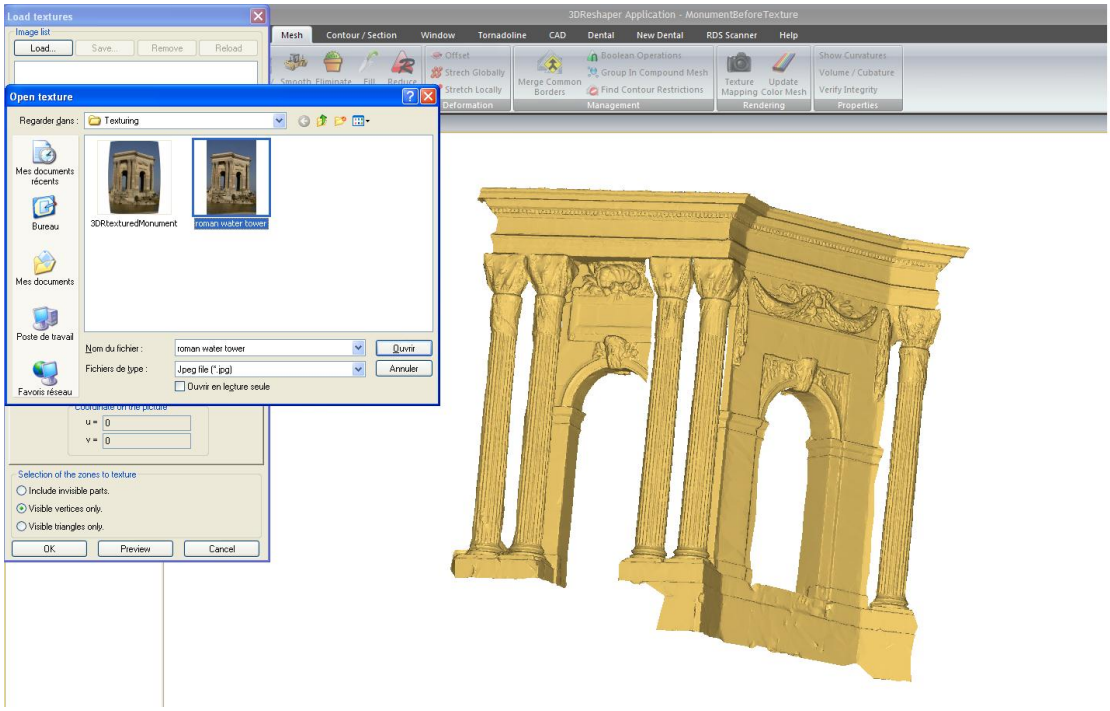
In the texturing module, you can:

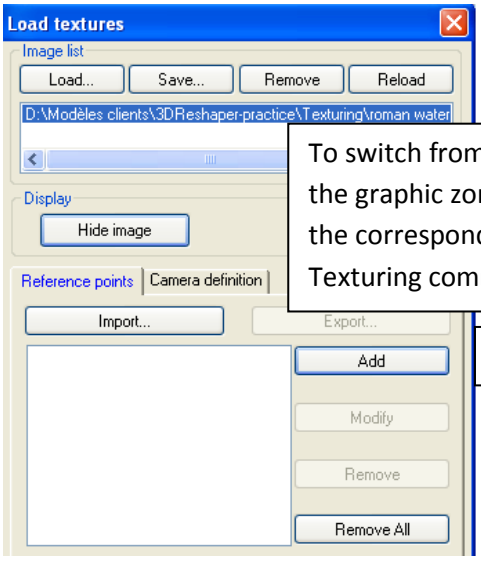
❖ Preserve the projection data so that the texture mapping can be replayed if the 3D model changes.
❖ Use more than one image to texture one 3D object. Reshaper automatically chooses the right image according to the camera orientation and zoom factor.
❖ Export the 3D textured models to other applications.
❖ Export calibrated ortho-images with the command "*File -> Export Ortho-images*".

In this exercise, we will see:

- How to map a 2D picture on a 3D mesh model by reference point method.
- How to adjust manually the textures in the case of multi-textured objects.

- **Open the file***: 3DReshaper-Practise/Texturing/MonumentBeforeTexture.rsh*
- **Select the 3D model / Go to Mesh Menu and Texture Mapping**
- **Load the image *"roman water tower"* in the same folder (see the thumbnail)** – Use "Reload" if the picture is not displayed**.** You can move and zoom the image.





To switch from 2D picture to 3D scene or use the multi-view mode to split the graphic zone in two parts and display side by side both the picture and the corresponding digital model (split the 3D scene before launching the Texturing command.

To define new reference point -

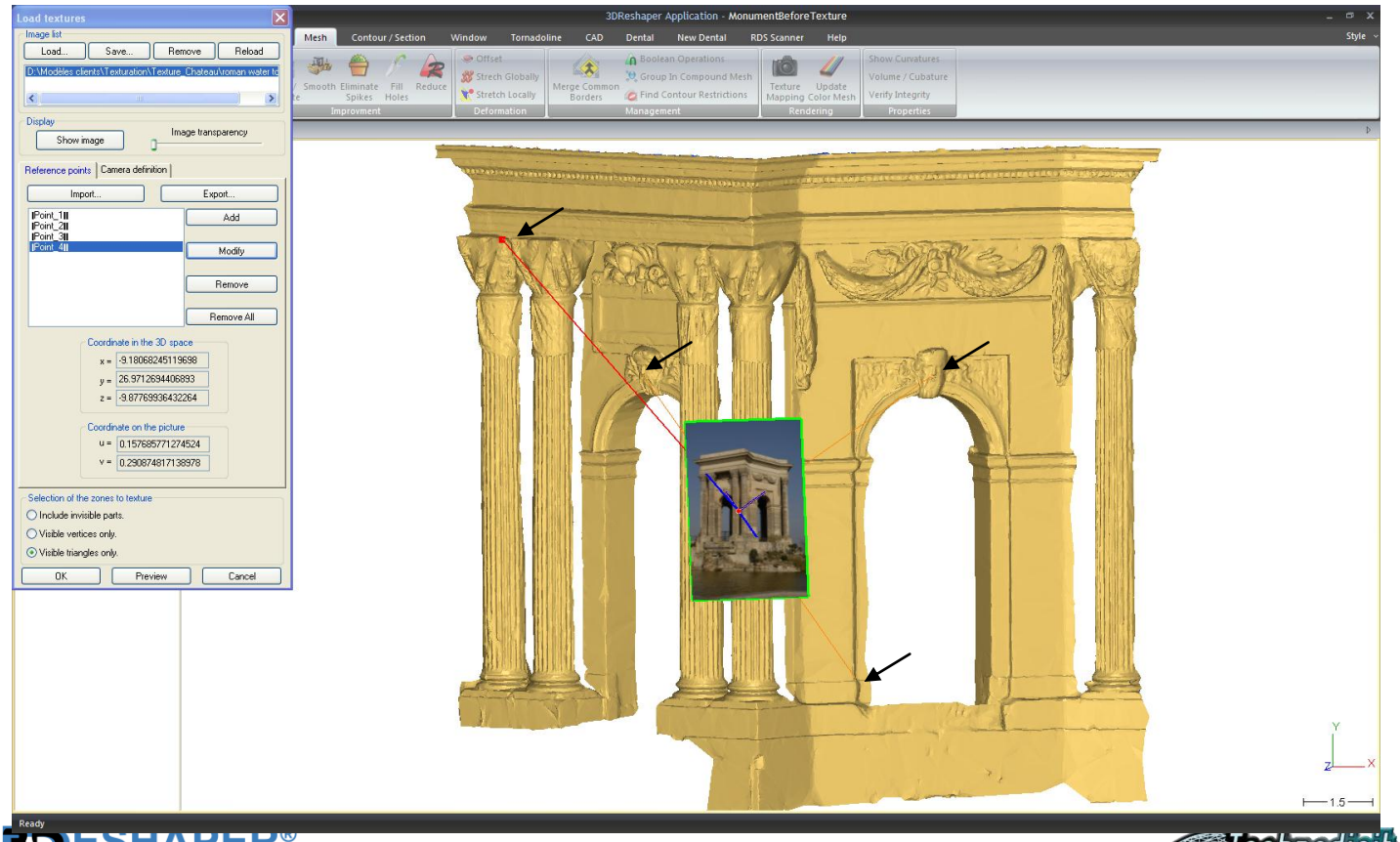
- **Press the button "Add" first to click all your point couples**. 3DReshaper waits 2 points: one on the picture and one on the 3D model, but the order is indifferent. We advise to choose landmarks such as the nose of the statue to make easier and more accurate the points coupling and the projection. The landmarks should also be scattered all over the model.

Same point selected on the image *Point selected on the 3D model*

Reshaper is waiting a click in the graphic scene. If you want to interrupt this point input, you can press the DEL or Backspace key until the cursor becomes an arrow.

As soon as you have 2 couples of points you will see the location of the camera in the 3D scene and you can directly click on the image inside the 3D scene. If needed, you can adjust the transparency of this picture with the “image transparency” slider.

- **Select for instance 4 reference points**:
  - # 1 nose of the left statue
  - # 2 nose of the right statue
  - # 3 right lower part (lower angle)
  - # 4 left upper part (between the columns)

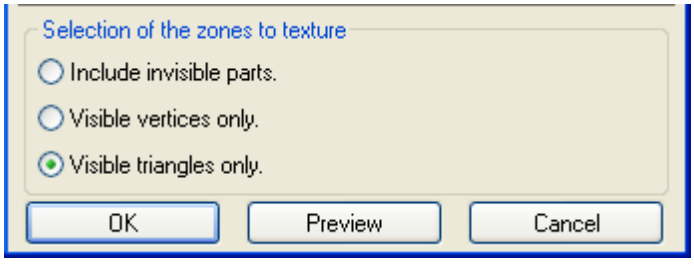


You can import the file *Texture_RefPoints-Practise.txt* if you want to retrieve these reference points.
You can export your reference point list if you want to save and use it later.

Four or five points are usually enough. You may couple additional points if you need to improve or correct the texture mapping especially in case of high image distortion.

After the preview, you can continue to enter other point couples. Press the right mouse button to display the contextual menu and choose a non-textured representation mode which is most often the best mode to enter points.

- **Apply the texture on the model** according 3 types of projection when you think that your reference point definition is correct.



1« **Include invisible parts** »: The picture is projected on all triangles that are in the frame of the camera (watch out potential blurry effect).

2« Visible vertices only »: The picture is projected only on the triangles having at least one vertex that is visible from the camera point of view

3« **Visible triangles only**»: The picture is projected only on the triangles that are visible from the camera point of view. “Visible” means that the 3 triangle vertices are all visible.

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You can also click the **button “Remove” or “Modify”** to delete or change the coordinate of a point couple. Do not hesitate to modify the coordinate in order to improve the quality of the projection.

You can import or replay the reference point list after having exported it.
You can save or export in OBJ or VRML format the textured mesh model.

➢ Adjusting manually a texture mapping

Sometimes, you need more than one image to texture an object. In this case, Reshaper chooses automatically which image should be textured on which part of the object using some criteria like:

- The angle between the surface and the camera direction.
- The zoom factor of the picture,
- Etc.

However it necessary sometimes to modify manually which texture is applied on which zone.

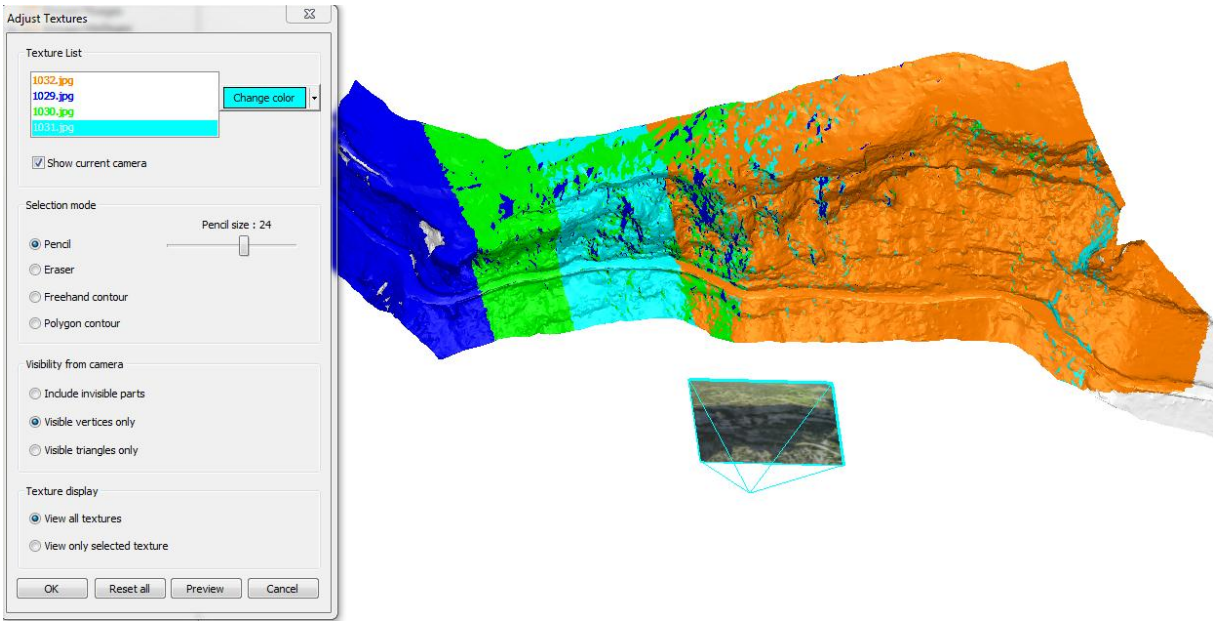
➢ Open the file: *3DReshaper-Practise/Texturing/CliffAfterTexture.rsh*

This project represents a cliff.

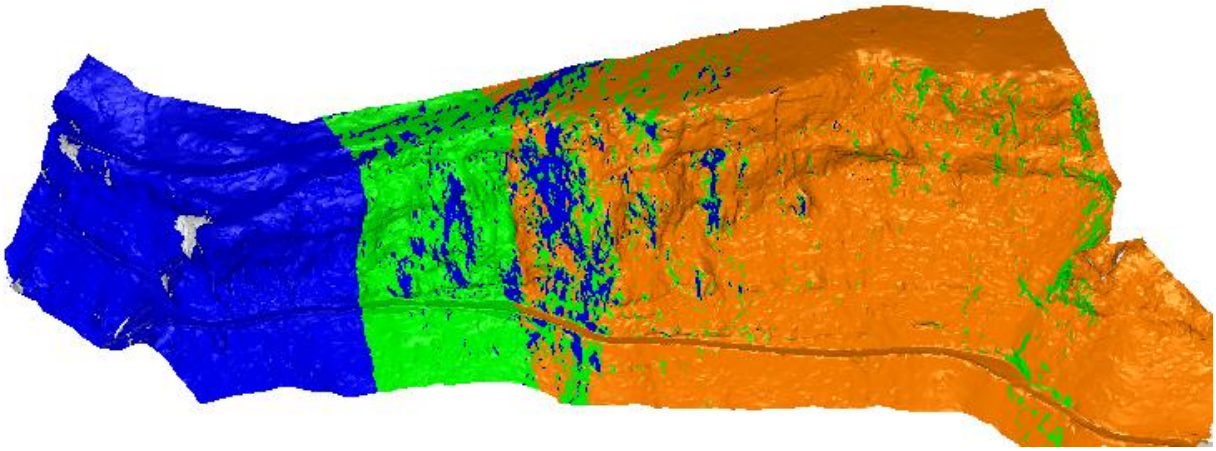
- Select this surface and launch the command "**Mesh -> Texture mapping**" to see how the texture was applied.
- As you can see, the texture is done with 4 images 1029.jpg, 1030.jpg, 1031.jpg and 1032.jpg.
- You can see also that no point couple was entered because we used directly the photogrammetric definition and orientation of the camera.

➢ Looking at the texture structure.

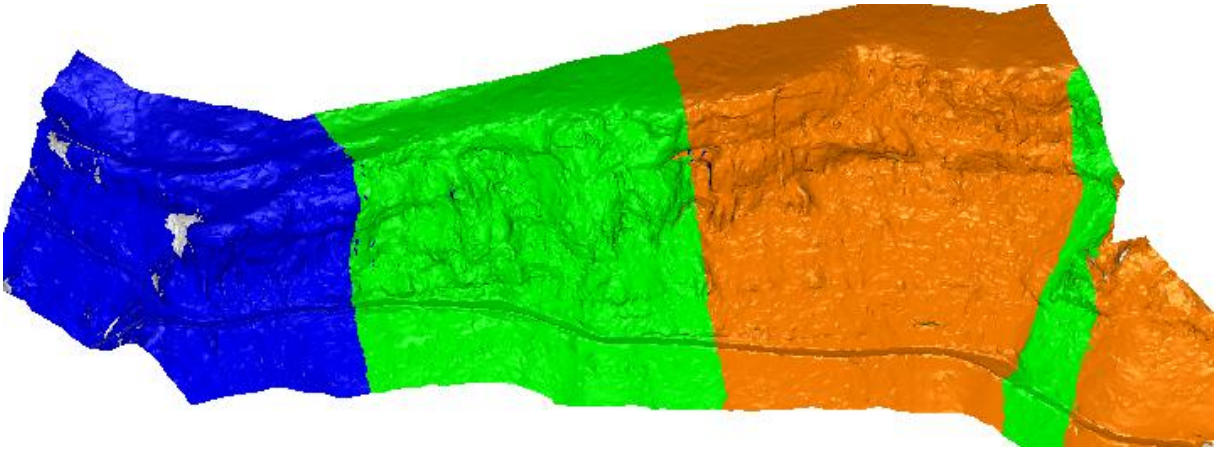
- Cancel the previous command.
- Select the surface and launch the command "**Mesh -> Adjust Textures**" to see how the texture was applied.



- You can select the option "**show current camera**" to show which picture textures which part of the object.
- A color is affected to each taking shot and you can see triangle by triangle what is the source camera used.
- You can see for example that the camera 1030.jpg is not really useful for this texture mapping. Then we will suppress this camera from the list.
- Cancel this command.
- Select the surface and launch the command "**Mesh -> Texture mapping**".
- Select the picture 1030.jpg and press "remove" to delete the corresponding camera. Note: you could also just deselect the picture in the list to keep the camera definition and make only a temporary suppression.
- Press "Preview" to see your new texture mapping. The result should be very similar.
- Press "OK"
- Select the surface and launch the command "**Mesh -> Adjust Textures**".



- Apply the color of each image like on the picture below. Note that during the triangle selection, the triangles are really selected only if they fit with the option "**Visibility from camera**".



- Click "OK" to preview your result and "OK" to validate.