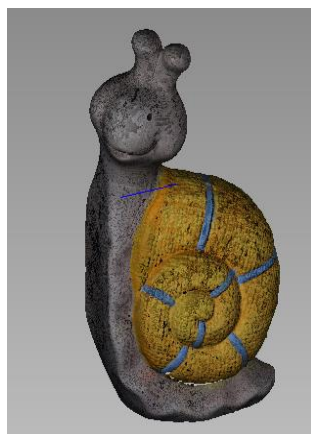


SMARTTECH3Dmeasure v2019

Tutorial

- Data Loading
- Raw Data Processing in SMARTTECH3Dmeasure
- Generating a triangle mesh
- Triangle mesh export



Group of points



Triangle mesh

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The following tutorial was created to show you step by step the basic functions of Smarttech3Dmeasure software. To obtain a good result of your work you should go through all the described operations. They are required to create a colorful triangle mesh from point clouds which in the final stage will be used for 3D printing.

The process consists of following steps:

1. Loading data to the software.
2. Cleaning point clouds from the noises.
3. Automatic point clouds fitting.
4. Creating a triangle mesh model.
5. Patching holes in the mesh.
6. Texturing the mesh.
7. Exporting the triangle mesh.

Good luck!

1 Loading data to the software

In order to open the S3DM project in the SMARTTECH3Dmeasure, select the „**Open Project**” icon from the bar or select this option from the main Menu. The program enables you to open files saved as „*.S3Dm” format.

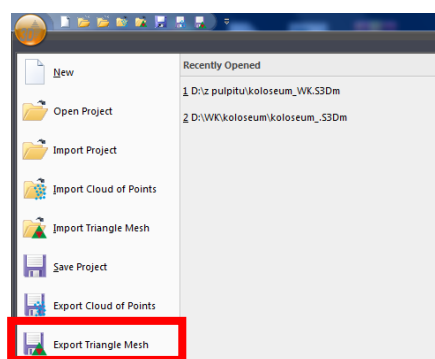


Fig. 2.1.1.1 Loading data from the main Menu.

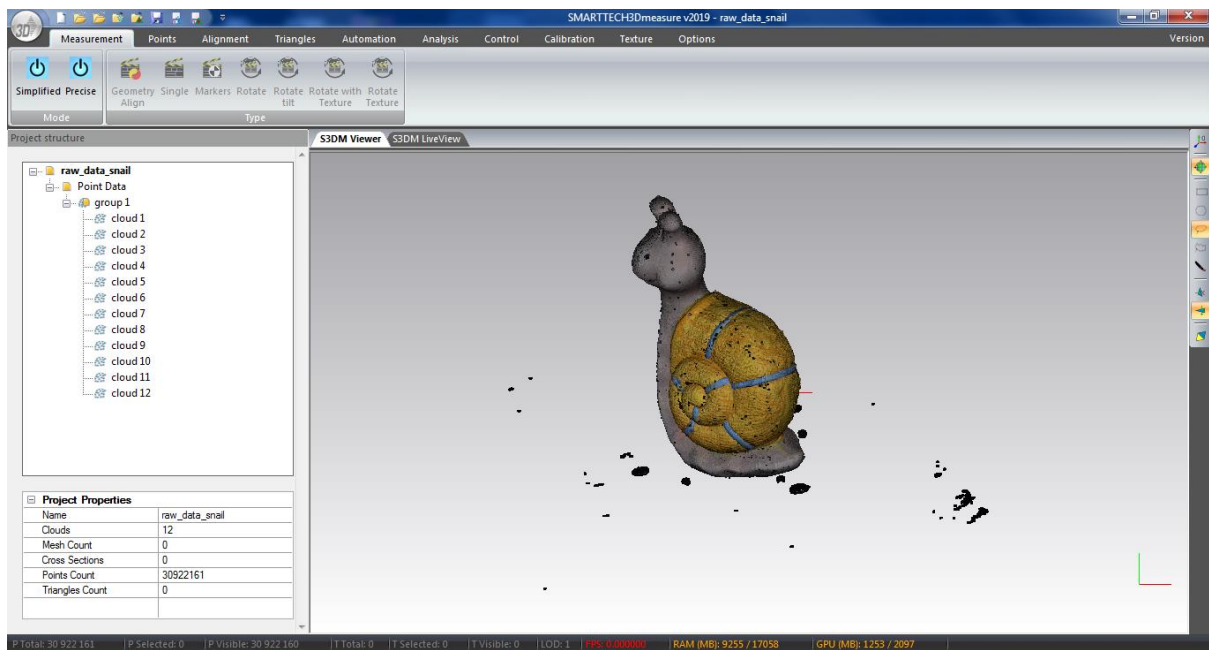


Fig. 2.1.1.2 Loaded project of 3D scanned snail figure

2 Manual data processing

2.1.1 Selection options

To change the method of selecting data you can choose the wanted tool from the bar which you can see on the right side of the screen.

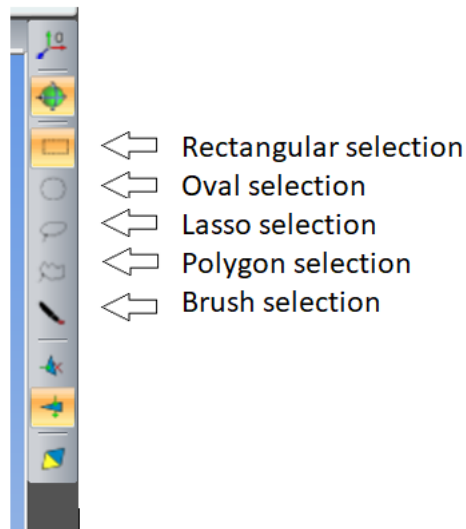


Fig. 2.1.1.1 Selection tools

Rectangle, Oval – press the left mouse button and start selecting. After choosing all of the wanted data release the mouse button.

Lasso – press the left mouse button and start selecting. The edges of the selected area follow the mouse. After choosing all of the wanted data release the mouse button.

Polygon – After every click of the left mouse button you choose vertices. To end the selecting press right mouse button.

Brush – hold the left mouse button and pick all the wanted data. Brush follows mouse moves.

2.1.2 Deselecting points

To deselect marked points go to „Points” -> **Deselect** or press the combination of **CTRL+C** buttons. All of the selected data will be deselected.

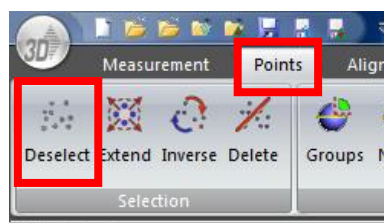


Fig. 2.1.2.1 Deselecting points

2.1.3 Removing selected points.

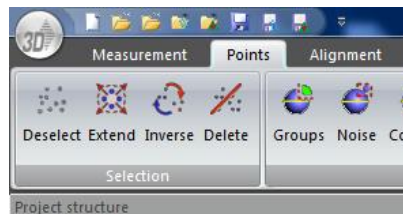


Fig. 2.1.3.1 Deleting points

To Delete selected points go to **Points** → **Delete** or press the **Delete** button on the keyboard.

2.2 Automatic data processing in the SMARTTECH3Dmeasure

2.2.1 Groups

To remove all the noises use function **Groups**. It enables to select all the free groups of noises around the main group of points. To trigger this operation click the button **Group**. Then use the sliders to set the parameters.

Slider **Group size** helps to select the data to remove. Setting the slider for a specific value select groups which have a less or equal number of points.

Slider **Distance** is responsible for the distance of the groups of points from the main group. While increasing the value the further groups from the main group will be selected.

Press the **OK** button to accept changes and exit the operation. You must remember not to select too many points because the important data required to make a triangle mesh can be deleted. To delete selected points go to **Points** -> **Delete**.

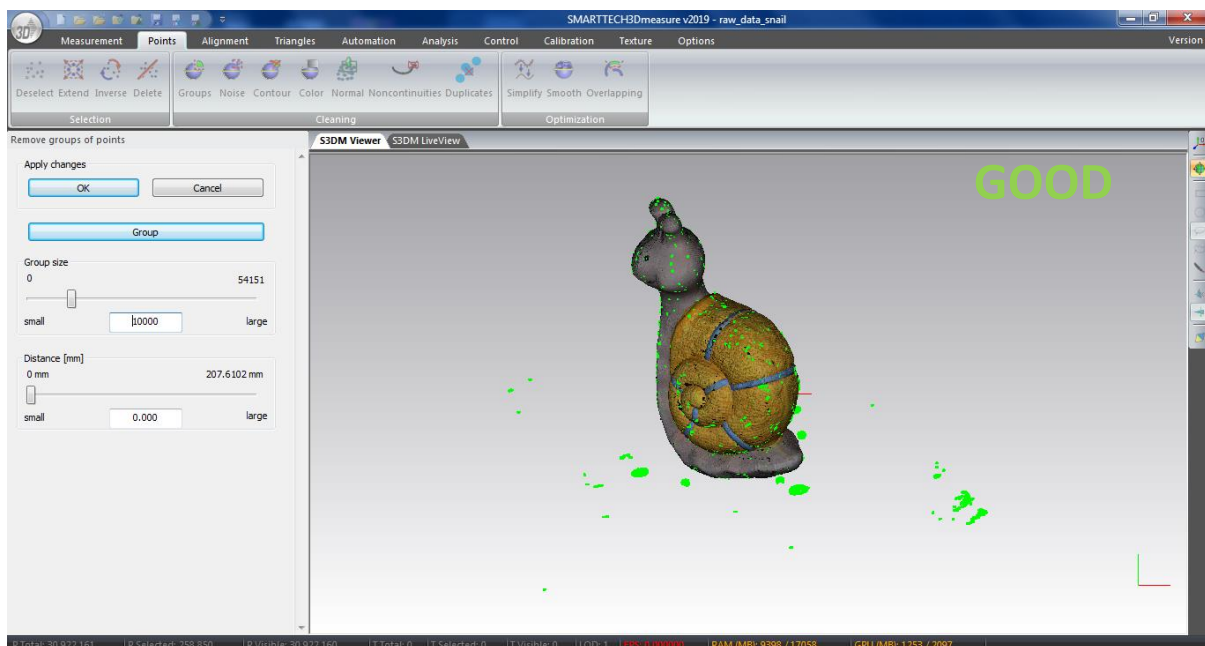


Fig. 2.2.1.1 Correct parameters values for the operation Groups

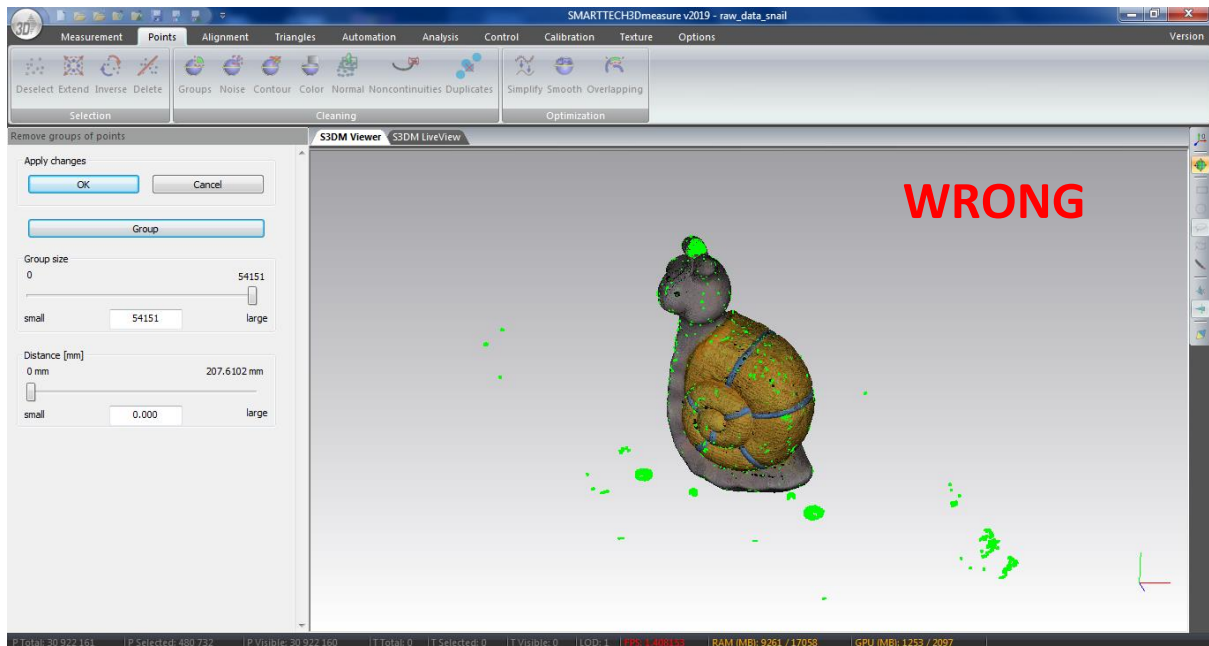


Fig. 2.2.1.2 Incorrect values of the parameters. Important data will be deleted.

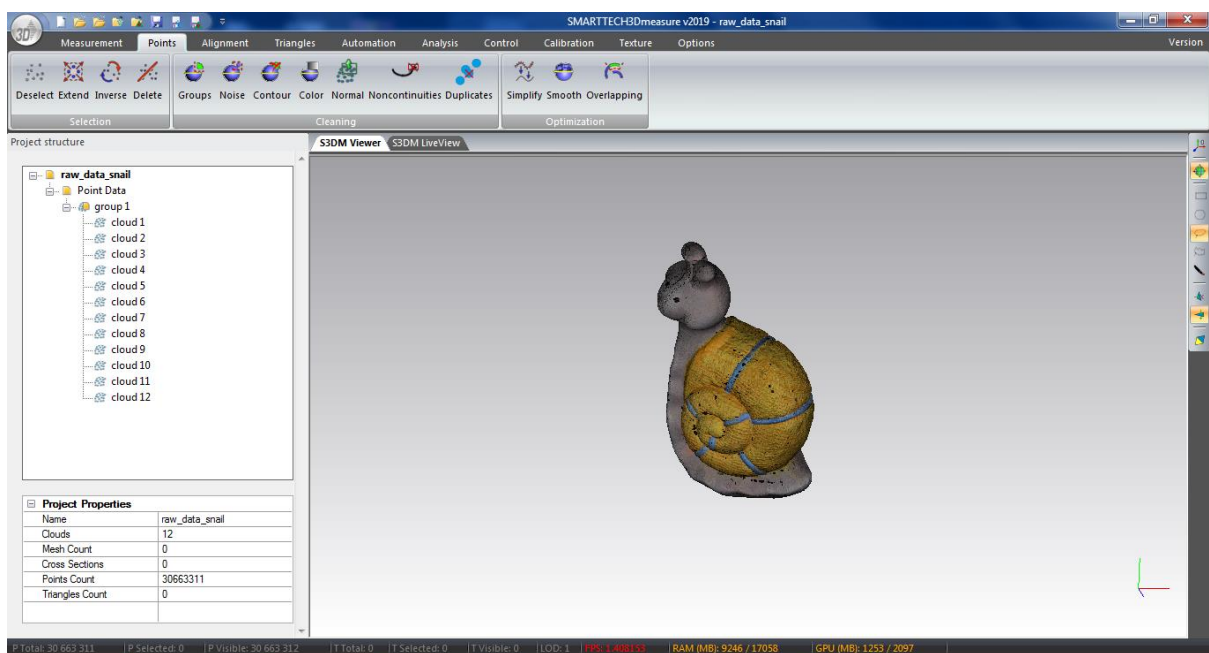


Fig. 2.2.1.3 Group of points after removing noises.

2.3 Fitting point clouds

To fit the point clouds from different directions received during 3D scanning, you must go to tab **Alignment**.

To align the clouds of points you can use the function:

Manual – this function is used for the initial fitting of clouds of points and it is using the „3 points” method (It is dedicated to a couple of groups of points coming from different directions).

Global- this function is used for precise automatic fitting of the clouds of points.

In order to make an alignment every cloud must be set to visible mode.

In this tutorial, only global fitting will be discussed.

2.3.1 Global fitting

Measurement was made on a rotary stage which means that scans are initially fitted to each other.

In this case, we have only one group of clouds so we can go straight away to global fitting. An algorithm in the software sets the clouds in their best position.

To perform this operation go to **Alignment -> Global** and click „**Align**”. At the end of the calculation, the program will show a report with the cloud’s positioning. Click Ok to exit.

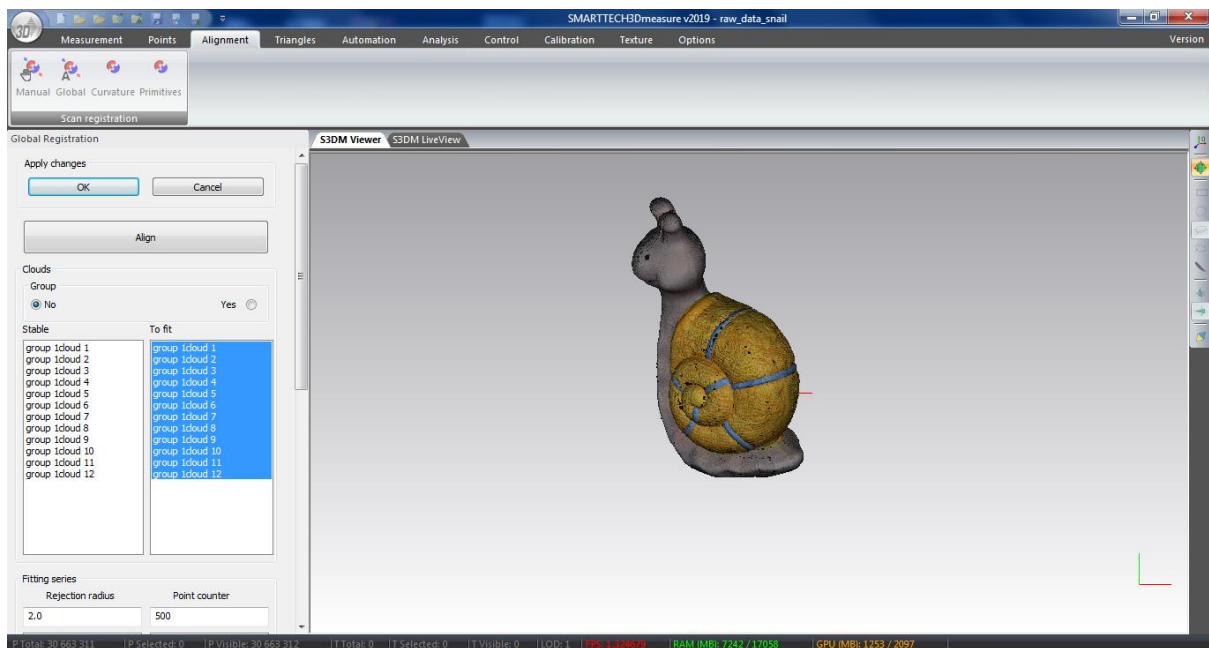


Fig. 2.3.1.1 Global fitting

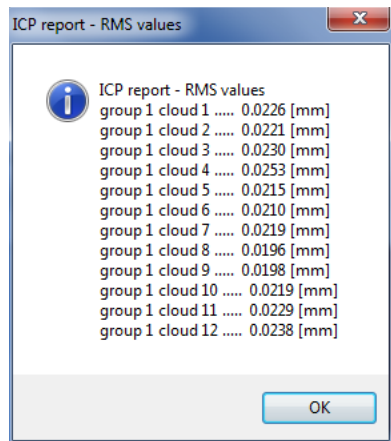


Fig. 2.3.1.2 Report

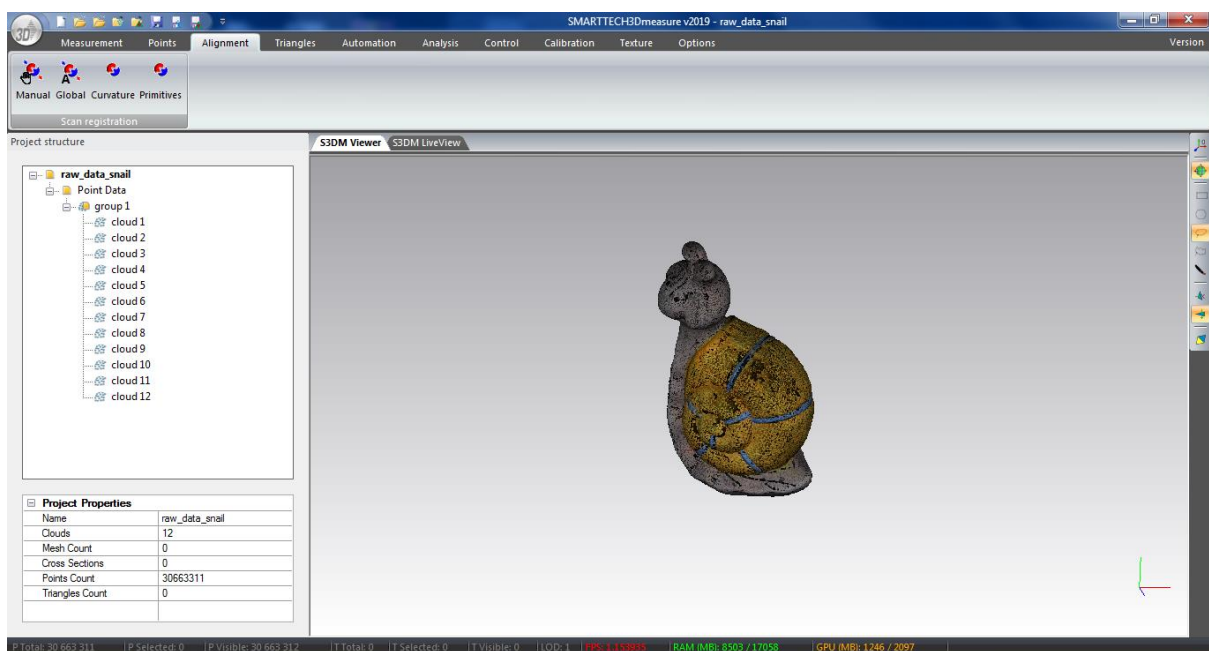


Fig. 2.3.1.3 Automatically fitted point clouds.

3 Generating a triangle mesh

3.1 Creating a mesh from point clouds

To use our point cloud for 3D printing, we have to create a triangle mesh from it and save it as one of the popular formats such as „*.STL”, „*.OBJ”, „*.PLY”.

To make a triangle mesh, first mark all the clouds in the operation tree and then go to **Triangles>Create** and press the button „**Create**”.

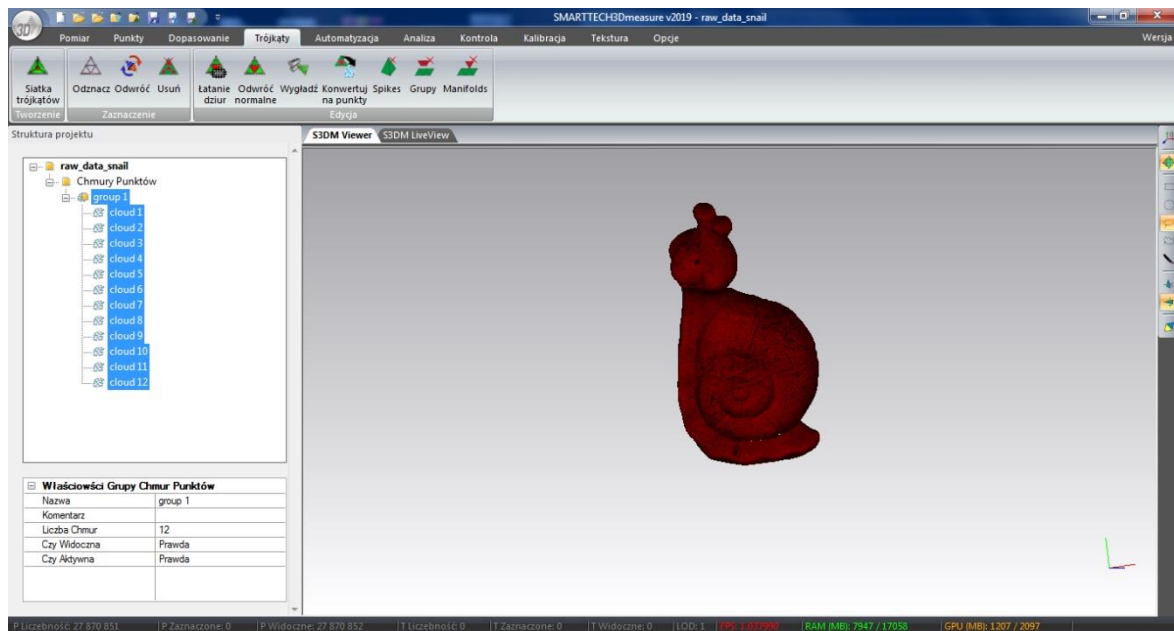


Fig. 2.3.1.1 Marking all the point clouds to make a triangle mesh

In the software there is a function that automatically removes groups of triangles not belonging to the main mesh model. By setting the default value of this parameter as 10%, groups of triangles whose size is less than 10% of the size of the main mesh are deleted.

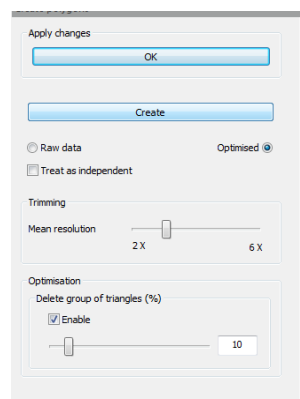


Fig. 2.3.1.2 Parameters values used to create a triangle mesh

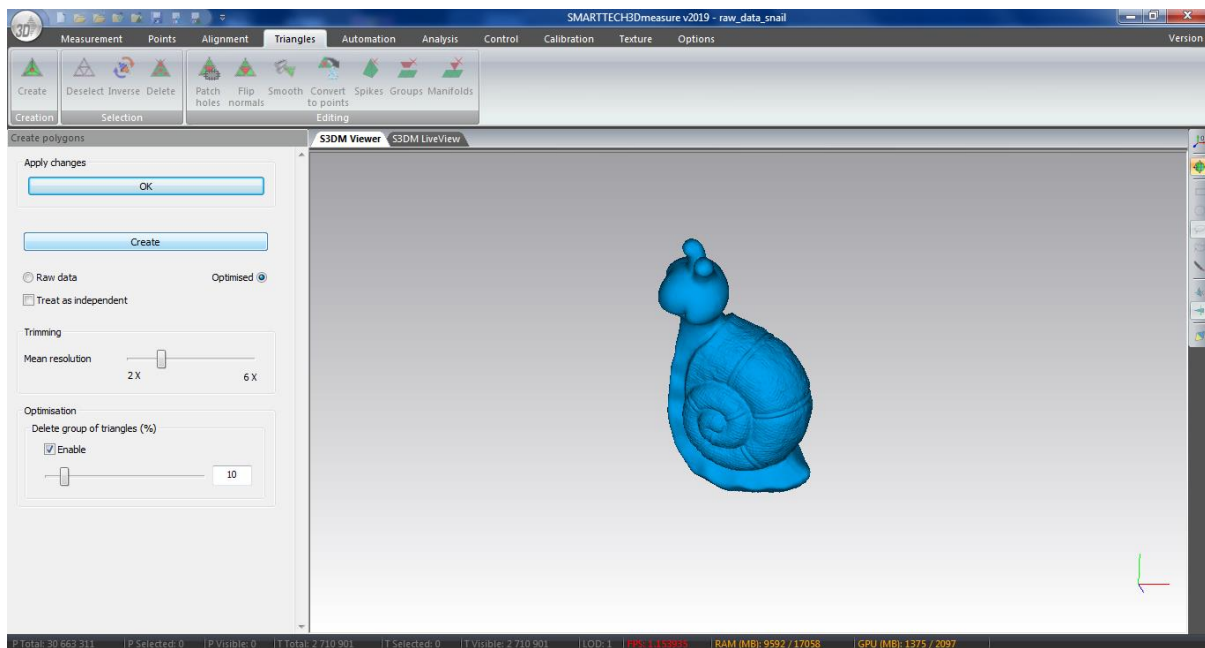


Fig. 2.3.1.3 Generated triangle mesh.

3.2 Patching holes

There are some holes in the created mesh. The SMARTTECH3Dmeasure program allows for automatic interpolation. To patch holes, go to **Triangles-> Patch holes**.

3.2.1 Patching functions

There are different methods of filling holes in the triangle mesh. Firstly, choose the **Filling mode: All** or **Single** (it enables to choose if you want to fill all the holes or leave some of them open). Secondly, choose the **Patching method: Curvature** or **Flat**. The program shows how many holes are in the mesh, and to prepare an object for 3D printing it is required to fill them all.

Slider at the bottom of the window allows to set the number of holes the program will ignore in this operation. Setting slider at the value 4 means that every hole except 4 the largest ones will be patched. Moving slider will highlight contours of holes in green or red. After pressing button „**Patch**” red highlighted holes will be filled and green ones will be ignored. Mode **Single** allows user to choose which holes will be filled by clicking on selected contour.

In this object firstly you have to patch the bottom of the figure. To do it choose Filling mode **Single** and **Patching method** for **Flat**. Then click on the contour of the hole. After that return to Filling mode „**All**” and **Patching mode** for **Curvature** and click „**Patch**”. To exit accept changes by clicking **OK**.

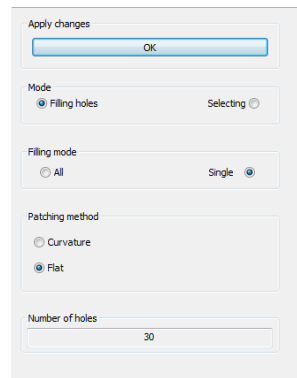


Fig. 3.2.1.1 Parameters for filling the bottom of the object – method „Flat”

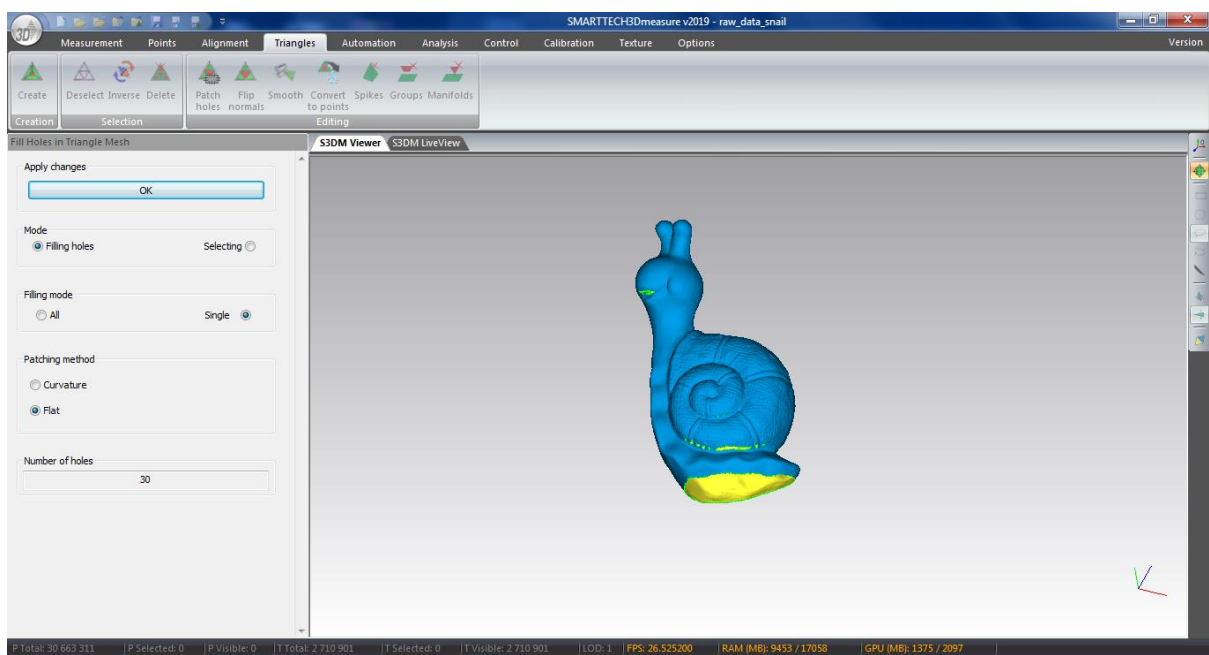


Fig. 3.2.1.2 Before filling the bottom.

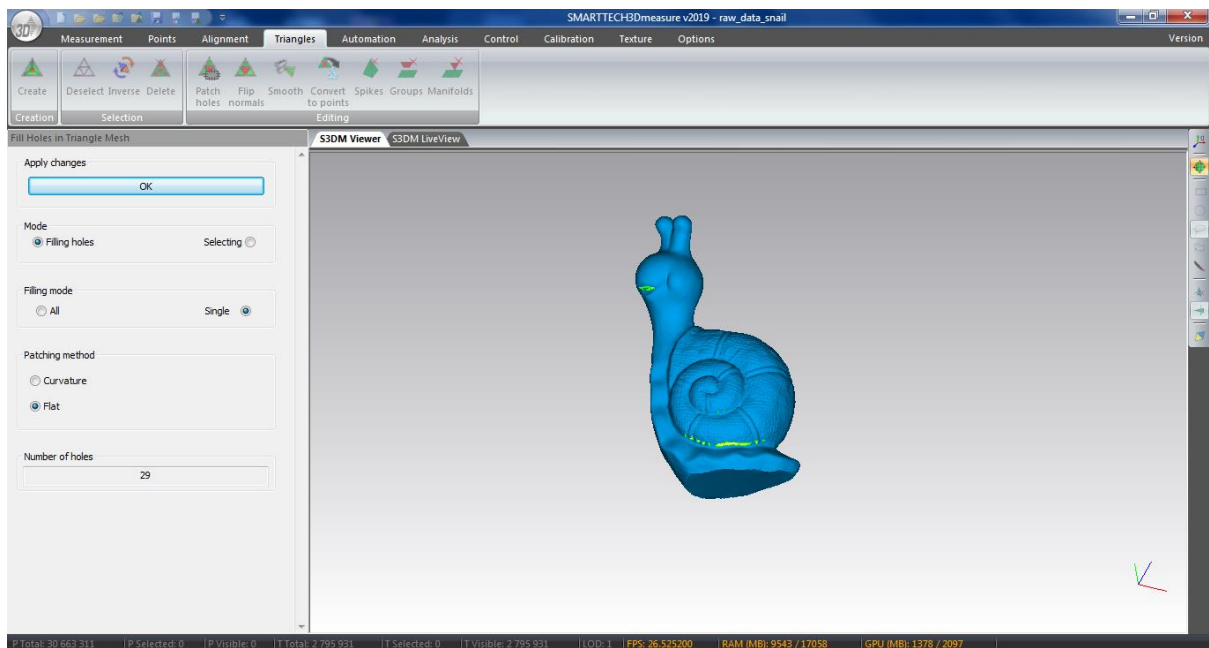


Fig. 3.2.1.3 Triangle mesh with patched bottom.

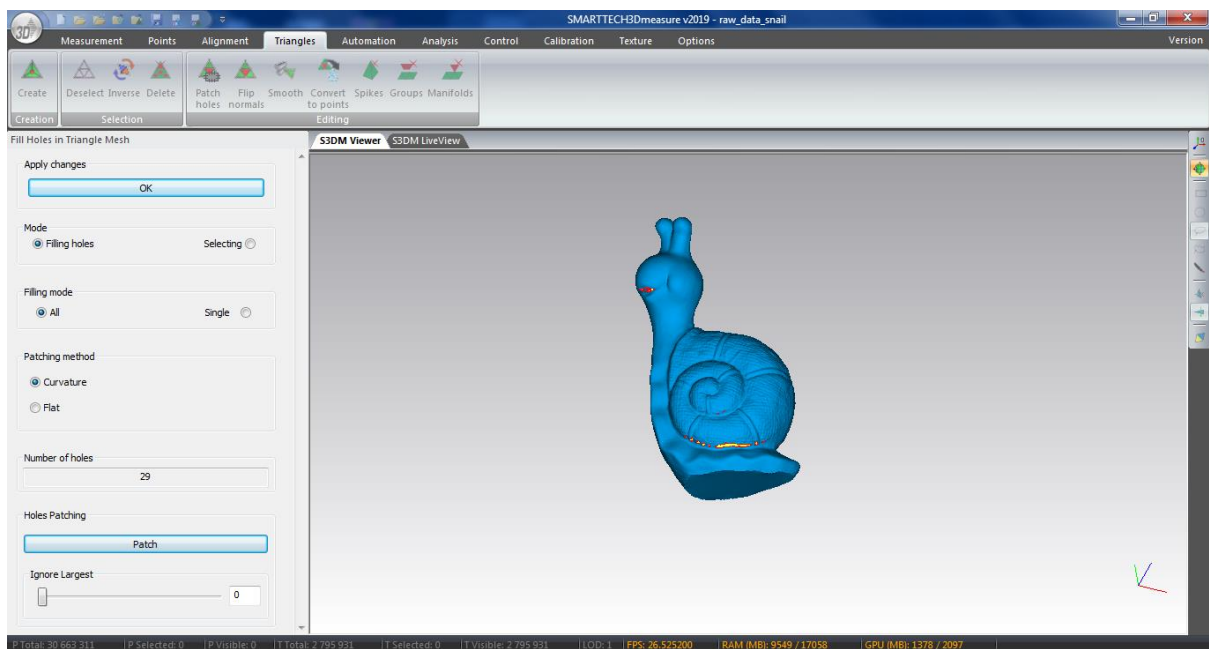


Fig. 3.2.1.4 Patching the holes with the method „Curvature“

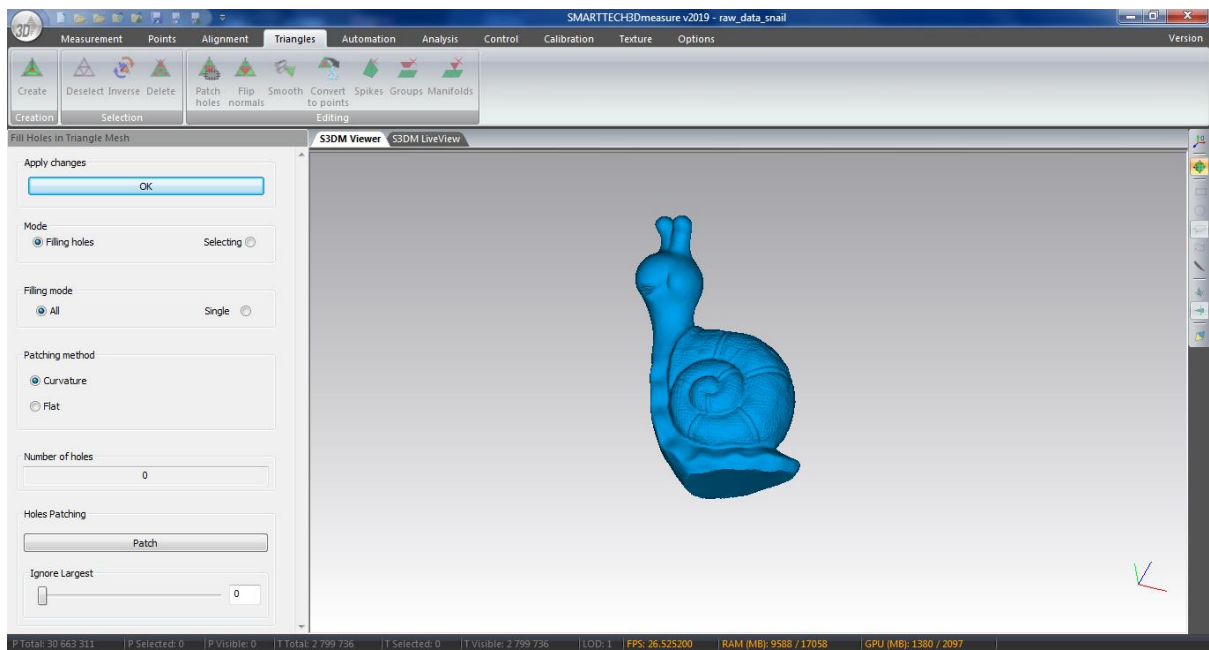


Fig. 3.2.1.5 Ready triangle mesh without holes

4 Texturing the triangle mesh

After generating the triangle mesh we can put texture on it. To do it go to tab **Texture** and choose the function „**Create**”.

Remember to set all the clouds and mesh visible because only with these settings the software will use them in texture alignment. To start the operation press „**Align texture**”.

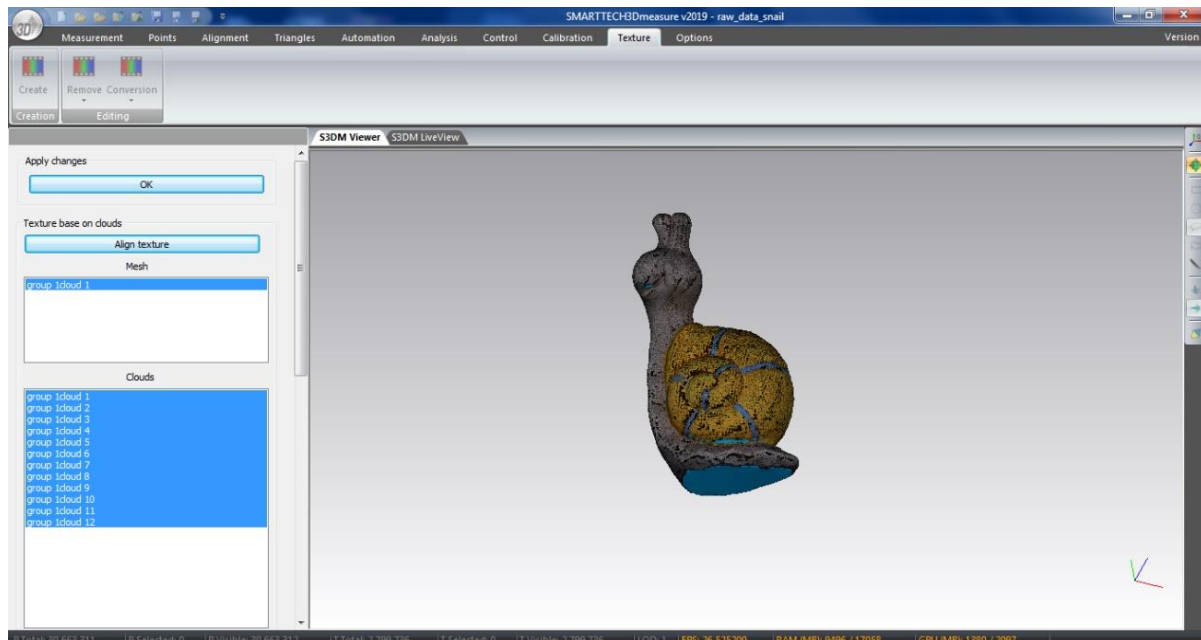


Fig. 4.1 Aligning texture on the mesh

If the texture is not visible after the operation is completed, enable its display in the **Options->Visualization** tab and select the "Texture Color" option for the **triangle grid** and accept with OK button. You should also disable the visibility of the clouds.

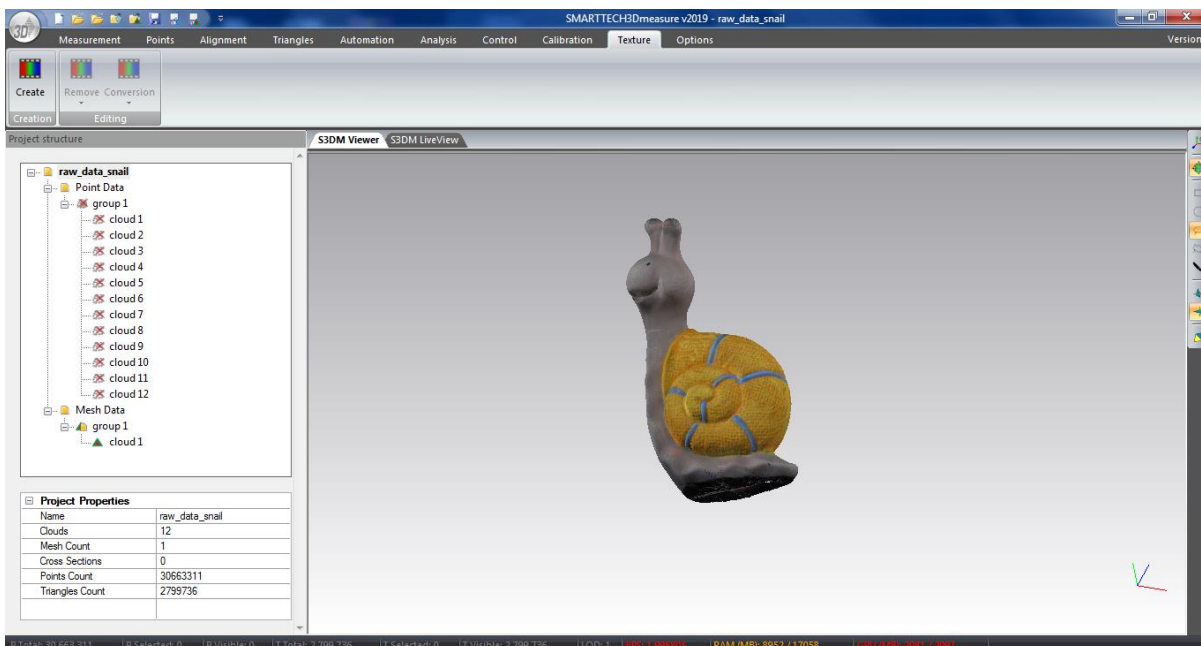


Fig. 3.2.1 Triangle mesh with texture

Attention: Groups and mesh will be exported with the default names from the operations tree. You can change them by clicking on the chosen cloud with the right mouse button and selecting option „Rename” or by clicking on this group or cloud and changing the name in the window „Point Cloud Properties” .

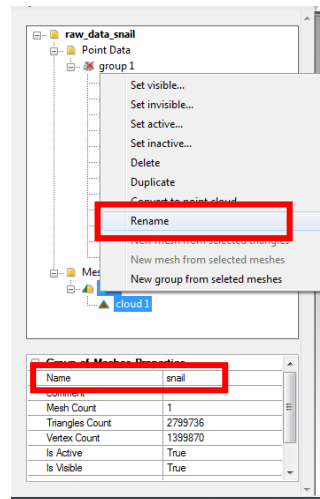


Fig. 3.2.1 Changing the name of the mesh

5 Triangle mesh export

To export the mesh model, press the “Export Triangle Mesh” icon or select an option from the main menu.

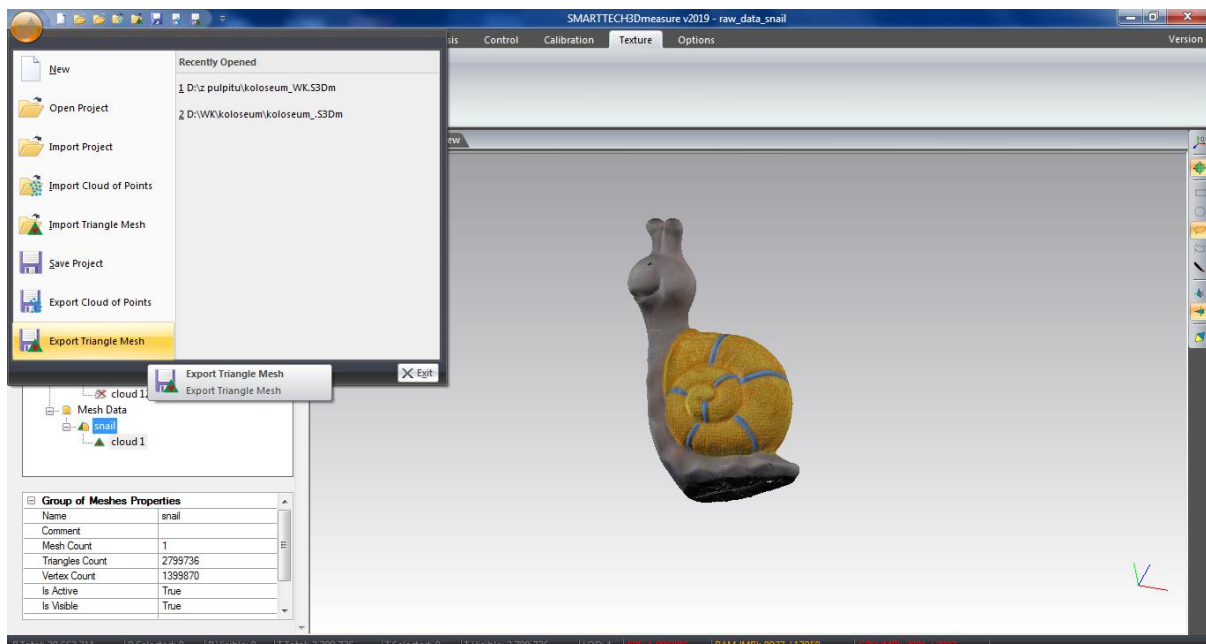


Fig. 5.1 Triangle mesh export

In the shown window choose a wanted format from the list and Export Folder Path where you will find your files and press button „Export”.

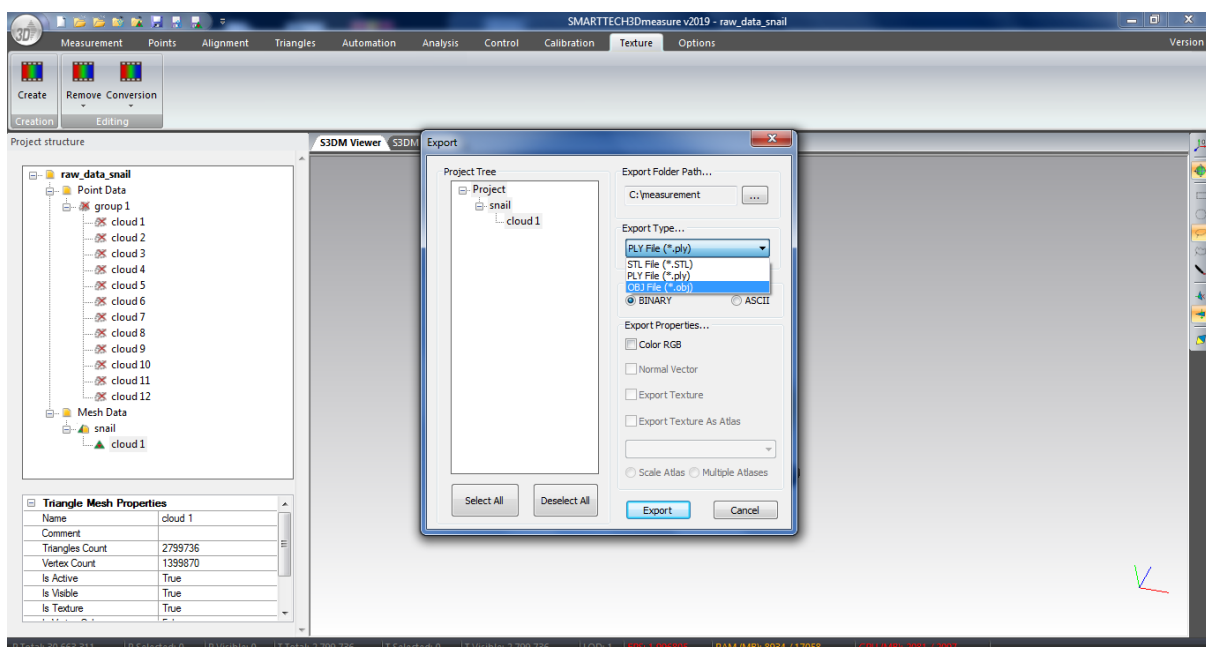


Fig. 5.1 Saving formats of the mesh

After saving the file as "*.obj" it is possible to export the texture as a single bitmap or as all the photos used to texture the object. In both cases, select „Export Texture” and „Export Texture As Atlas” and then click on „Scale Atlas” (one bitmap) or „Multiple Atlases” (all photos).

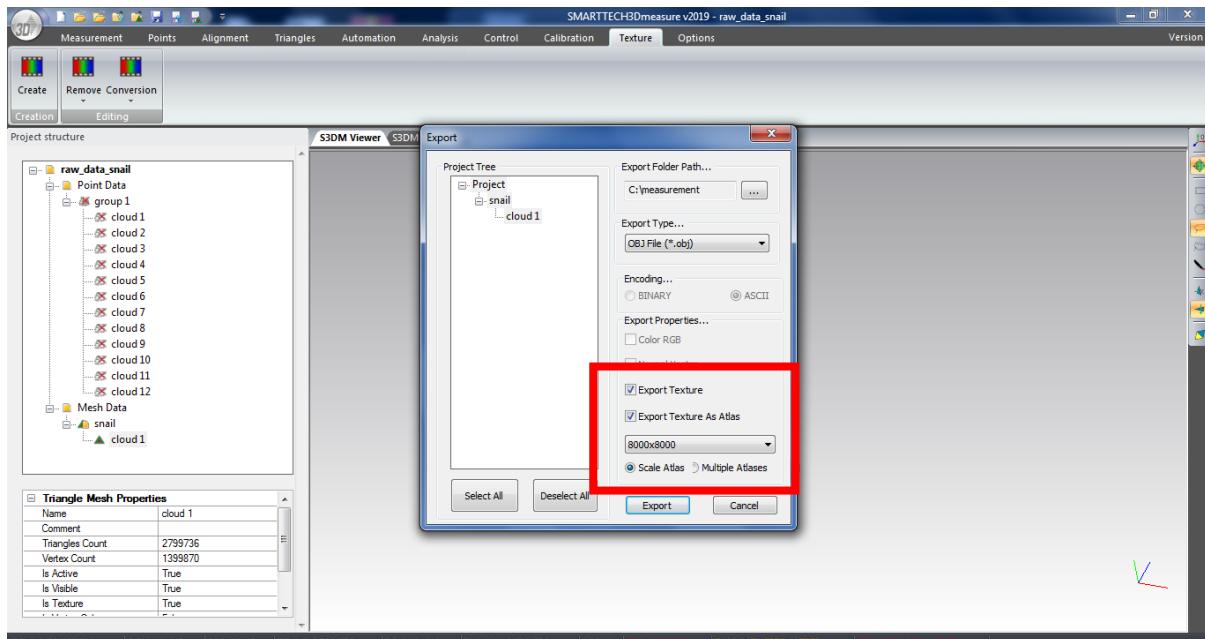


Fig. 5.3 Selecting texture export options

The triangle mesh created in that way is fully prepared for printing. The result can be open in the free software such as MeshLab or Cura Slicer Software to check if everything is correct and ready to print.

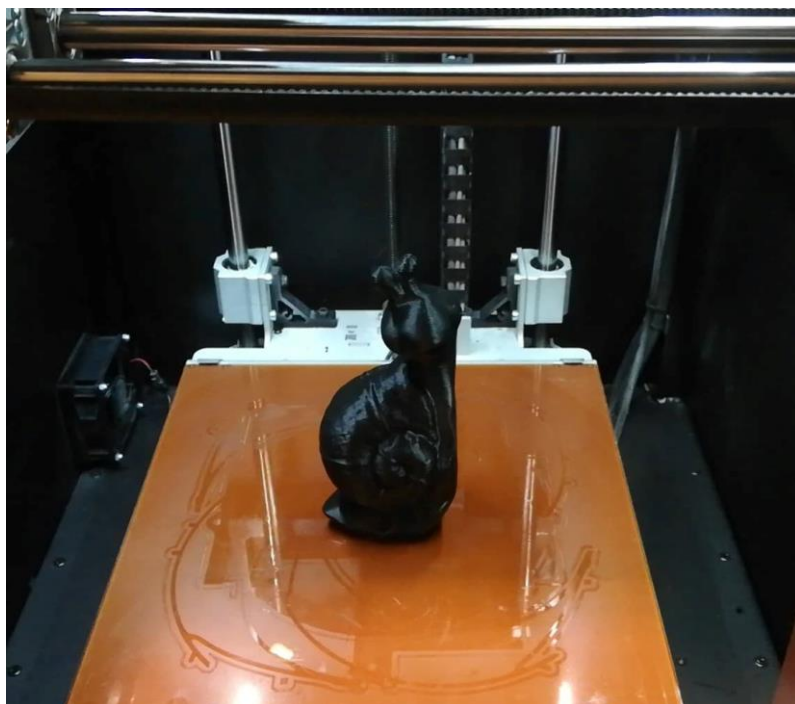


Fig. 5.4 3D printed snail figure