Ground

ACADEMY

GEOMAX

TUTORIAL
TERRESTRIAL IMAGE
PROCESSING

X-PHOTO GROUND

DESCRIPTION

• Create Point Cloud from Images

• Create 3D Surface from Point Cloud

• Stereo Drawing Tool

GOAL

• Import and manage data to create Point Clouds and elaboration from images

DATA

• X-PHOTO TERRESTRIAL.gfdoff

• Terrestrial Images Folder

Point: TPS_2
Residual: 0.003m

Point: TPS_1
Residual: 0.002m

Po
Re

Point size: 🌐 Normal | Selection tools: ⚙️ ⊞ ▨ | Clean: 🗑 ↩ ↪ | Edit: ↗ Rotate ▾ 🔲 Scale 💥 Reset | 🔲 Reference points

Ground

X-PHOTO GROUND

Ground: processing of max 75* "ground "images within a max distance of 50 meters, generation of georeferenced point clouds and 3D textured surfaces
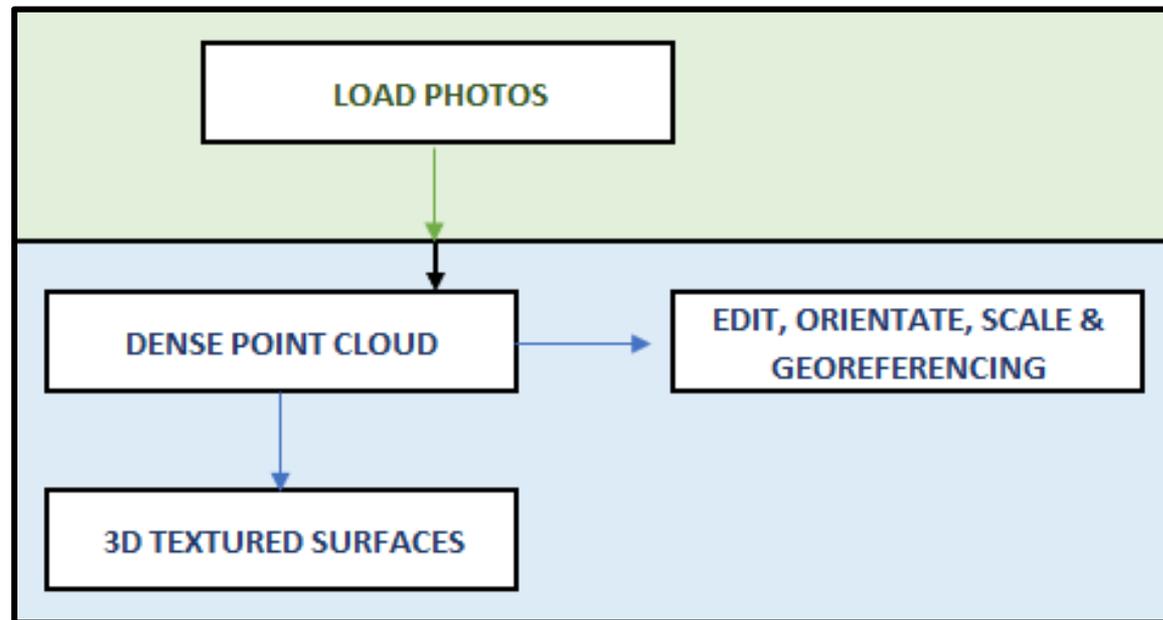
X-PHOTO Ground

REFERNCE POINT

3D Points with known coordinates. During the aerial and terrestrial photographs survey it is possible to use visible markers or targets and determinate the position with a topographic survey. (*)

SPARSE CLOUD

It represents the Point Cloud created by the general alignment of the images used. It shows the Camera Orientation result.

DENSE CLOUD

It represents the complete Point Cloud created by the advanced calculation based on the images alignment and the ground control points used

(*) For Terrestial Photogrammetry project
   Ground Basic license limited to 3 Reference Point from 3D Recontruction menu
   Aerial Pro license unlimited Reference Point from Reference menu

X-PHOTO Ground

GRAPHIC PROCESSING UNIT - GPU
It is part of the graphic card which performs rapid mathematical calculation.
It is possible to use a dedicated GPU to improve Dense Cloud calculation

STEREO DRAWING
It represents an advanced drawing tools based on analytical photogrammetry
process. It is possible to use the Stereo Drawing funciton for the manual
computation of coordinates in 3D space.

Terrestrial Photo Processing
Images Project - Horizontal Overlapping

Use **Terrestrial Images folder** to load photos from which it is possible to visualize camera parameters
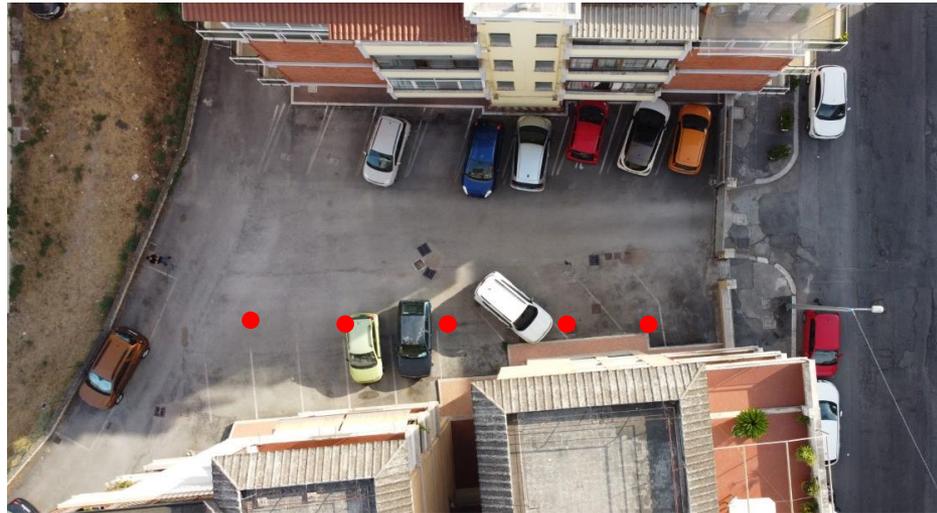
Starting Data

Terrestrial Photo Processing

Images Project - Vertical Overlapping

Starting
Data

Image Processing Project

From Image_Processing folder open Fusion project: **X-PHOTO TERRESTIAL.gfdoff**

The topographic survey was performed using **X-PAD Ultimate Survey** with **GeoMax Zoom 90** Robotic TPS orientated on 3 reference points acquired with **GeoMax Zenith35Pro** GNSS

From Survey menu it is possible to select **Points** option to visualize the topographic points table and check the GCP (from **TPS_1** to **TPS_7**) position from the corresponding images

Photo Processing
Imaging Menu

PHOTO PROCESSING is available from Imaging menu, select **Terrestial photo** and enter **Session Name**
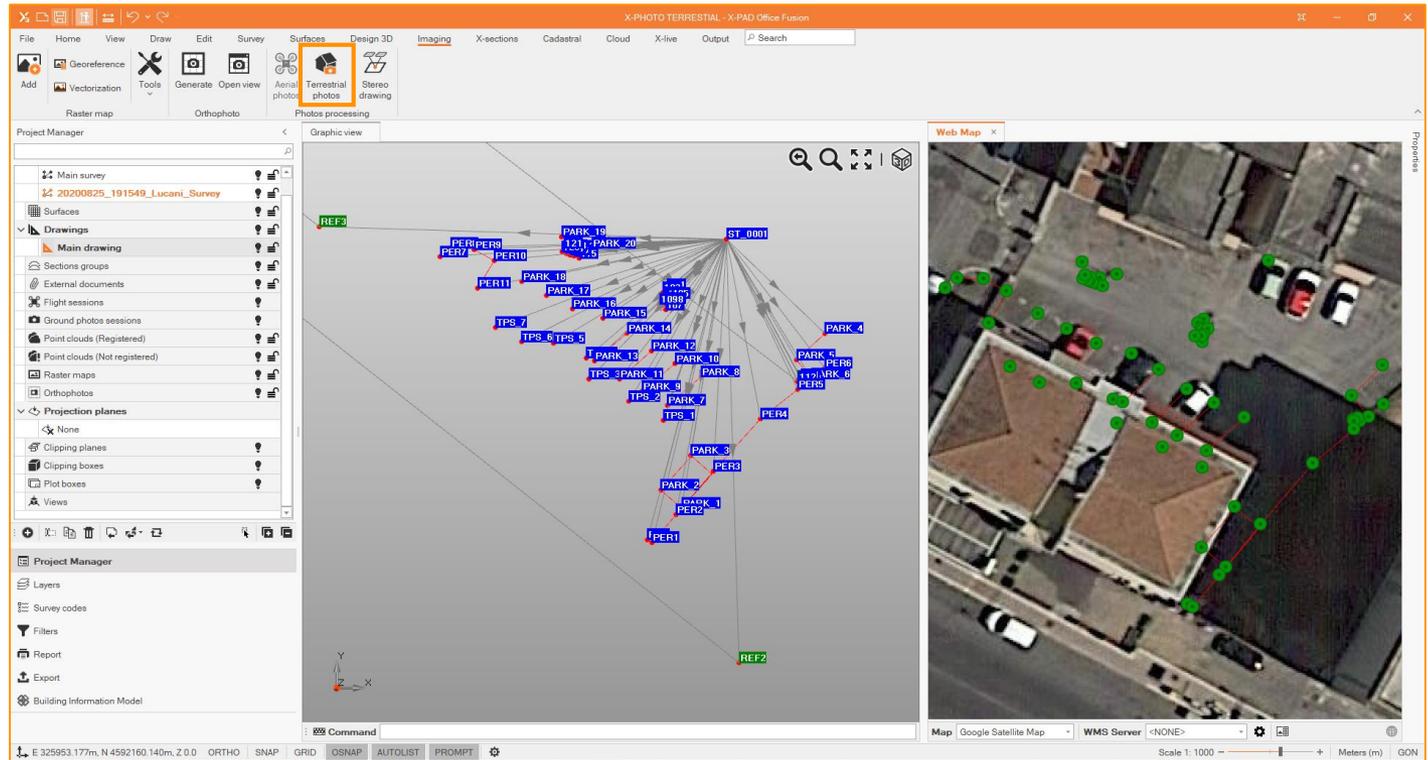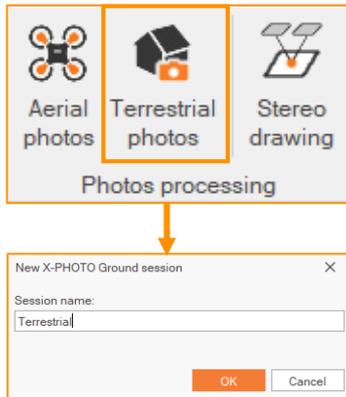
Terrestrial Photo Processing

Images

Use **Terrestrial Images folder** to load photos from which it is possible to visualize camera parameters

Other images formats are: JPG, BMP,PNG

Terrestrial Photo Processing
Images - Camera Parameters
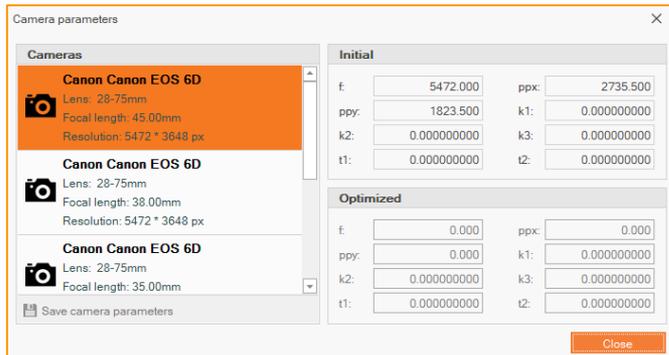
If the camera used is already in our list of camera with calibration parameters, from **Starting Data** menu it is possible to select **Camera parameters** and check the initial parameters for the current camera.

k1, **k2**, **k3**: radial distorsion
t1, **t2**: tangential distorsion
ppx, **ppy**: principal point x and y
(pixels refers to image angles)
f: focal lenght

Starting
Data

Terrestrial Photo Processing
Images - Camera Parameters
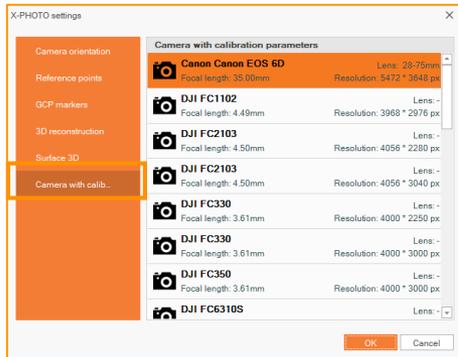
From main menu select **Settings**, then click on **Camera with calibration parameters** to check the camera's list.

If the camera used is not in the list it's possible to continue with elaboration and create a customized profile for the camera

Starting Data

Terrestrial Photo Processing

Settings

From main menu click on **Settings** to set the default parameters for each X-Photo menu and tools

Starting
Data

Aerial Photo Processing
Camera orientation

Camera orientation is the result of a general Alignment of the images used. From this menu select **Global**. It's a necessary step to find out if we have a sufficient overlap between images
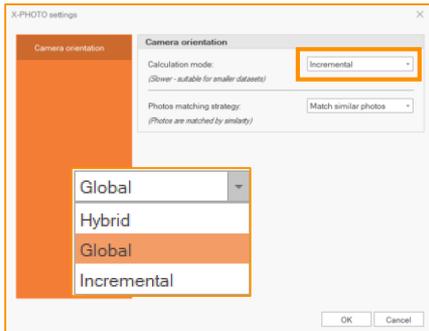
CALCULATION MODE
Different options are available with calculation algorithms based on the dataset

Hybrid Global + Incremental
Global Faster -suitable for larger database
Incremental
Slower - suitable for smaller database

PHOTO MATCHING STRATEGY
It's possible to match photos by similarity or all photos together

MAX RMS error
Root Mean Square error, it is a global indicator of the quality. The lower is the RMS value, the better is the solution. After calculation, it's possible to select "**Orientation Accuracy**" to check the RMS values.

Tie Points are points of interest that can be recognized on images
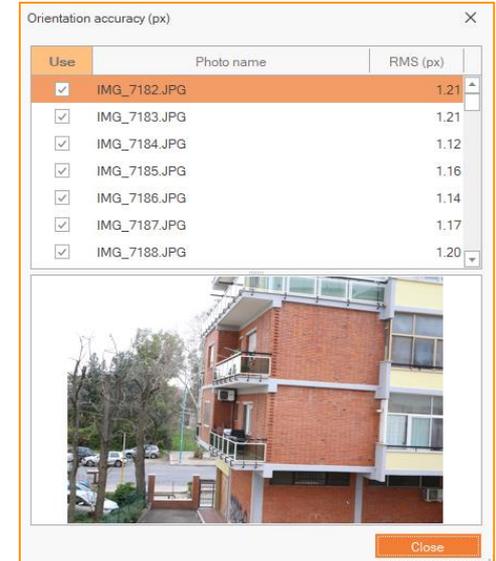
Starting Data

Camera Orientation

Terrestrial Photo Processing

Camera orientation

Camera orientation is the result of a general Alignment of the images used. From this menu select **Hybrid**. It's a necessary step to find out if we have a sufficient overlap between images
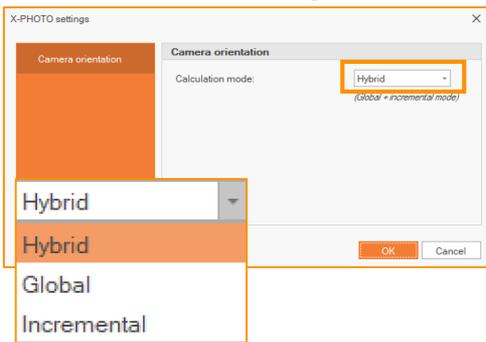
Hybrid
Global+Incremental

Global
Faster - suitable for larger database

Incremental
Slower - suitable for smaller database
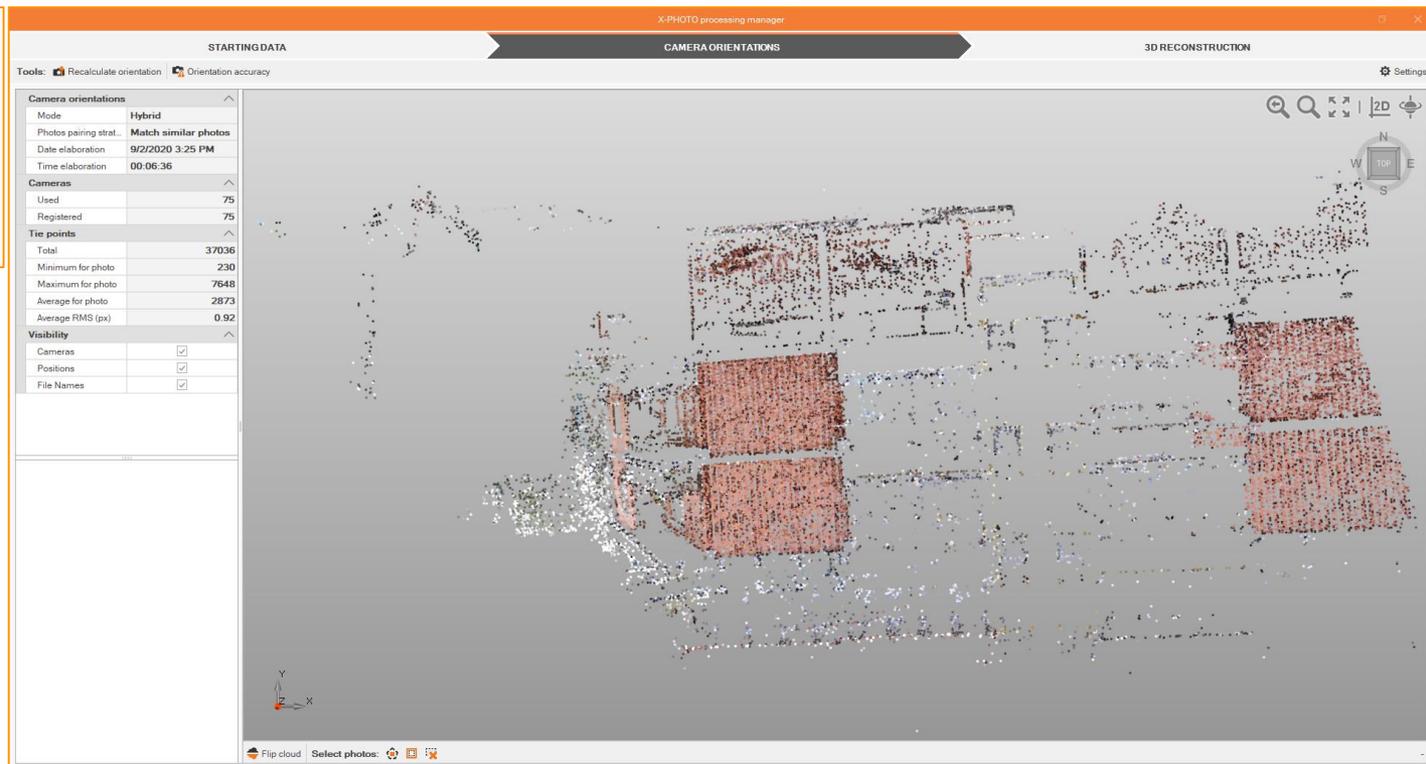
Starting Data

Camera Orientation

Terrestrial Photo Processing

3D Reconstruction

After Calibration we can run Dense Cloud process and create the corresponding Points Cloud in Low, Medium, High or Extreme resolution
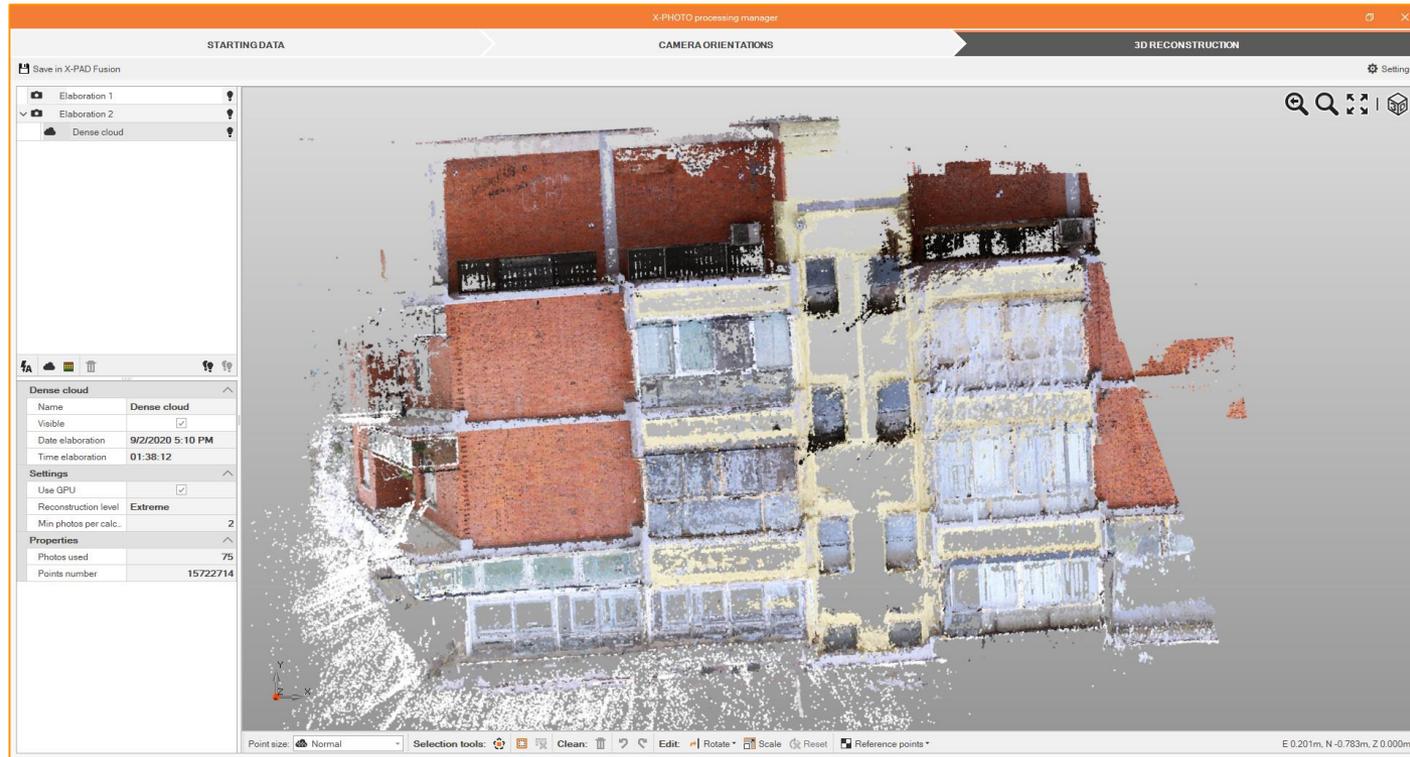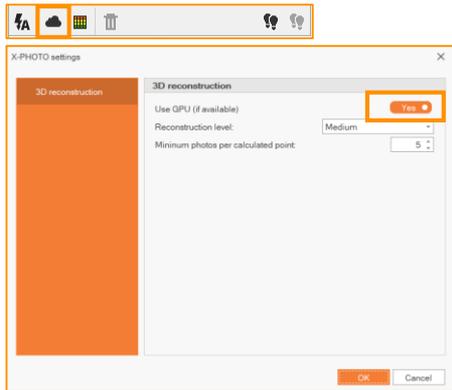
GPU

This command allows to improve calculation using the dedicated GPU (Graphic Processing Unit)
Using GPU we can increase the number of points created with the same reconstruction level

Starting Data → **Camera Orientation** → **Elaborations**

Terrestrial Photo Processing
3D Reconstruction

From Elaboration menu it's possible to use different tools for Visualization, Clean and Editing Point Cloud

Reference Points and Point Cloud visualization

Selection tools available to clean Point Cloud

Editing tools available to **Rotate**, Scale Point Cloud or Add Reference Point to Georeference data

Starting Data

Camera Orientation

Elaborations

Terrestrial Photo Processing

3D Reconstruction

From Elaboration menu it's possible to use different tools for Visualization, Clean and Editing Point Cloud

Reference Points and Point Cloud visualization

Selection tools available to clean Point Cloud

Editing tools available to Rotate, Scale Point Cloud or **Add Reference Point to Georeference data**

Terrestrial Photo Processing

3D Reconstruction

From Elaboration menu it's possible to use different tools for Visualization, Clean and Editing Point Cloud

Reference Points and Point Cloud visualization

Selection tools available to clean Point Cloud

Editing tools available to Rotate, Scale Point Cloud or Add Reference Point to Georeference data

Starting Data → Camera Orientation → Elaborations

Terrestrial Photo Processing

3D Textured Surface

From Elaboration menu it's possible to create Surface 3D from Dense Cloud
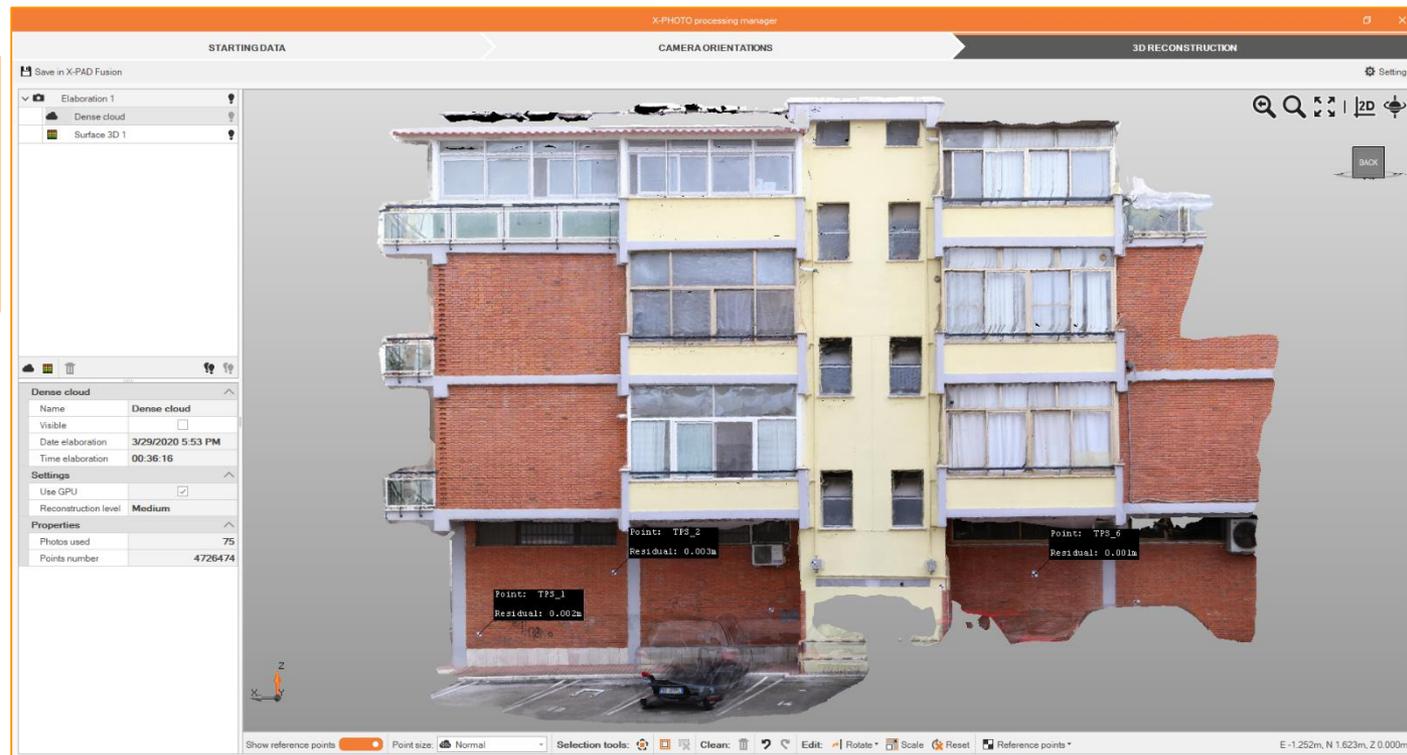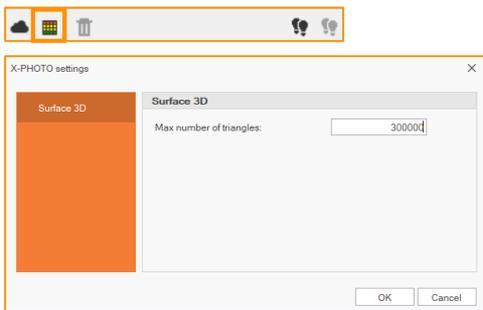
Resolution and size
It's possible to increase the max number of triangles in order to increase the result

Terrestrial Photo Processing
Save Elaboration

From main menu it's possible select **Save data in X-PAD Fusion** with the outputs that have to be saved
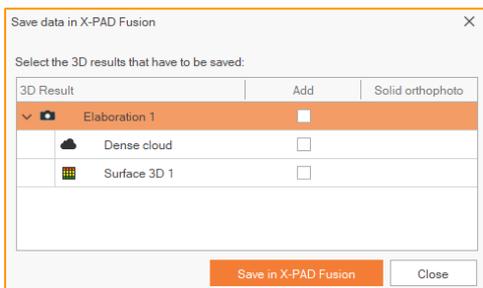
Save Data
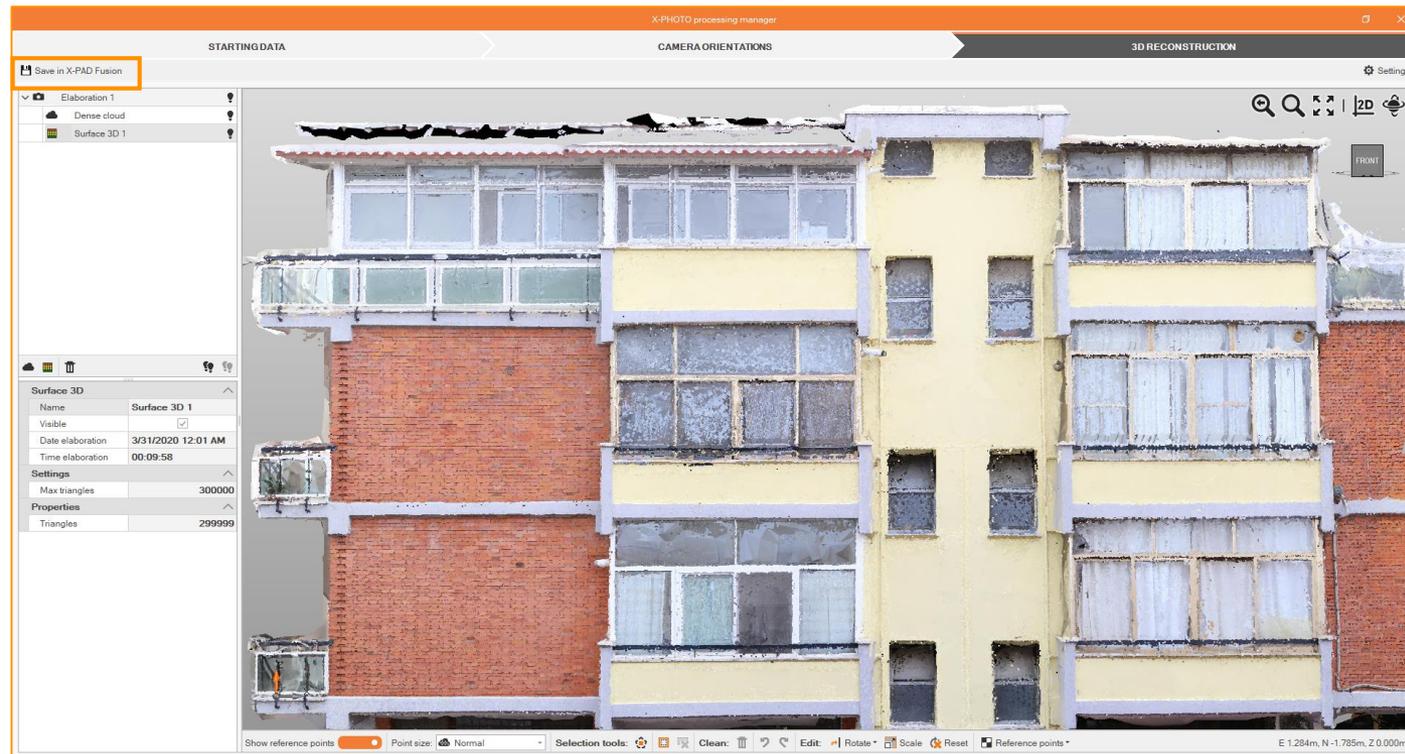
Starting Data · Camera Orientation · Elaborations

Stereo Drawing
X-Photo Drawing tools

Based on analytical photogrammetry process we can use the Stereo Drawing funciton for the manual computation of coordinates in 3D space
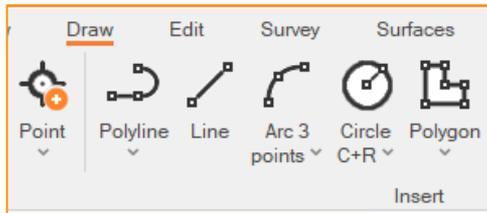
After selecting **Stereo Drawing** function, we can use one of the drawing tools from Draw menu.

We can select points and vertexes from **graphic view** or directly from the photos from **Stereo Drawing** panel.

Once created the point or object we can re-open Stereo Drawing panel and adjust vertexes position