StereoCAD User Guide

ver. 2.2.1 - Rev. 1, July 2016

INTRODUCTION

StereoCAD is a stand-alone software for viewing, measuring and draw stereoscopic vector data from images acquired by drone. Its goal is deep and accurate data inspection, survey and 3D drawing.

Inside StereoCAD there are all common CAD entities (point, line, polyline, text, etc.) and editing tools (copy, move, rotate, trim, extend, join, etc.) integrated in a smart CAD environment.

StereoCAD needs a dedicated hardware[1] for advanced active stereoscopic vision, but it supports anaglyphic and monoscopic stereoscopy too.

StereoCAD is fully compatible with APS outputs but it is able to import and use data by third-party software such PhotoScan and Post Flight Terra3D.

1 NVidia 3D Vision 2 Kit, NVidia Quadro family graphic card and a 3D compatible monitor or 3D TV

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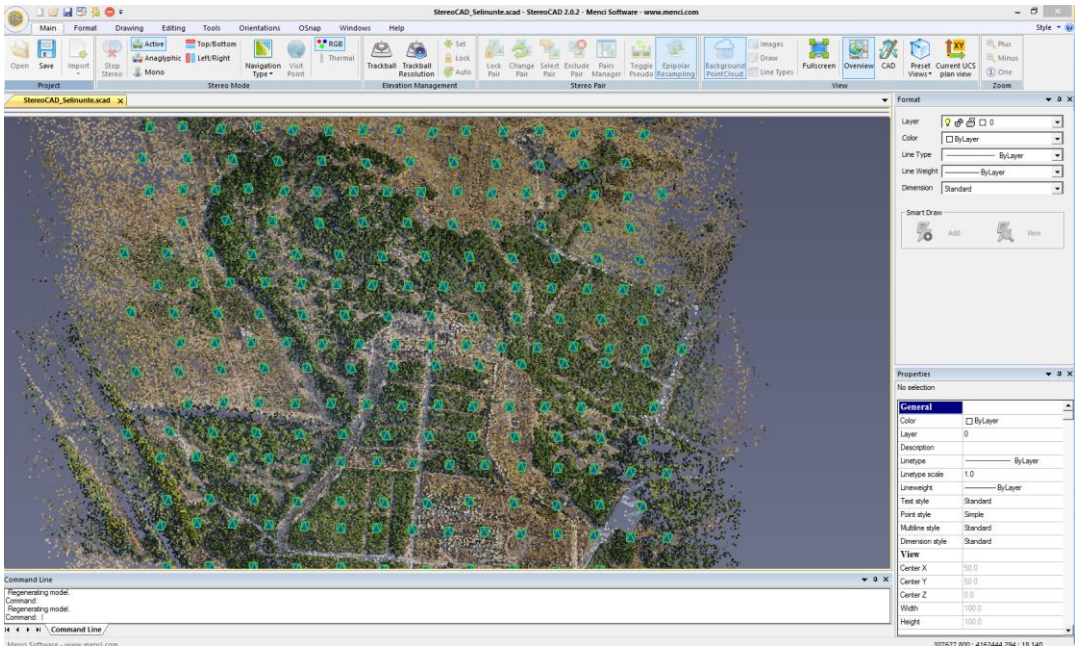
ENVIRONMENT DESCRIPTION

StereoCAD has two user interface modes: the work mode shows a top tabbed bar with commands, a central window with data, a side bar with CAD format, smart draw management, properties and a bottom side with command line and status bar. (side bar is customizable by selecting an option in window menu)



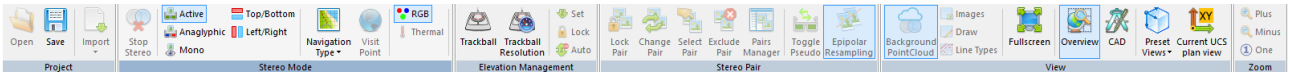
When you are interested to inspection only, a full screen mode is available (press F11 or click the top bar button under "Main" tab to switch on it). You can handle windows visibility by "View" pane in the top bar.

e.g. FULL SCREEN MODE

COMMAND BARS

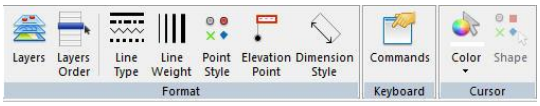
On the tabbed top bar there are several command tabs available

Main



It shows the common commands for stereo windows management and surfing

Format

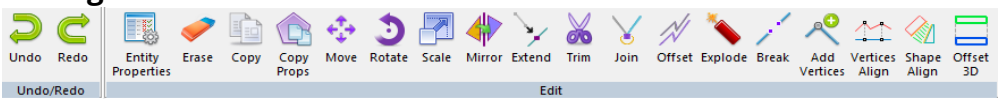


Cad layer management and entity styles

Drawing

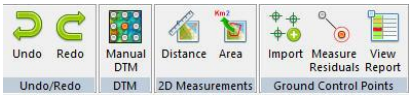
Active when stereo is enabled or CAD window is shown. It includes all drawing commands

Editing



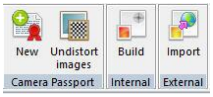
The main CAD editing tools

Tools



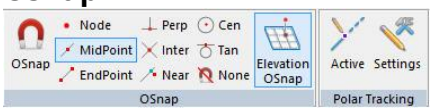
Other tools (manual DTM, measurements and Ground control point management)

Orientations



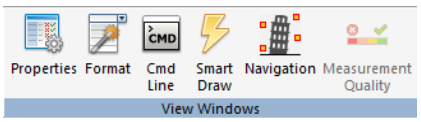
To build internal and extenal orientations with a given camera passport

OSnap



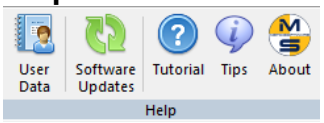
CAD active OSnap selection

Window



Show or Hide window in the side bar

Help

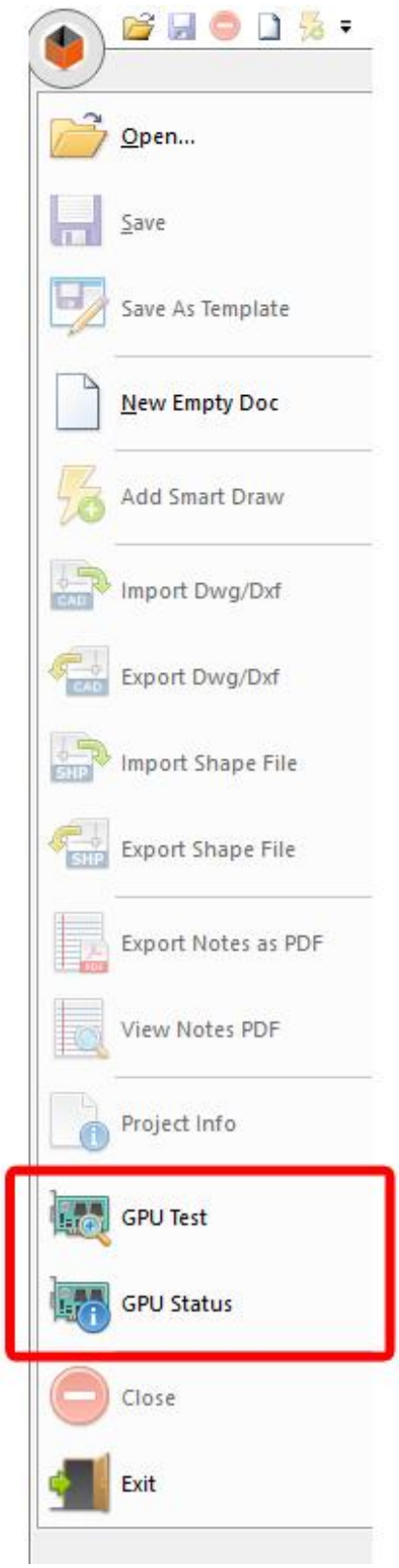


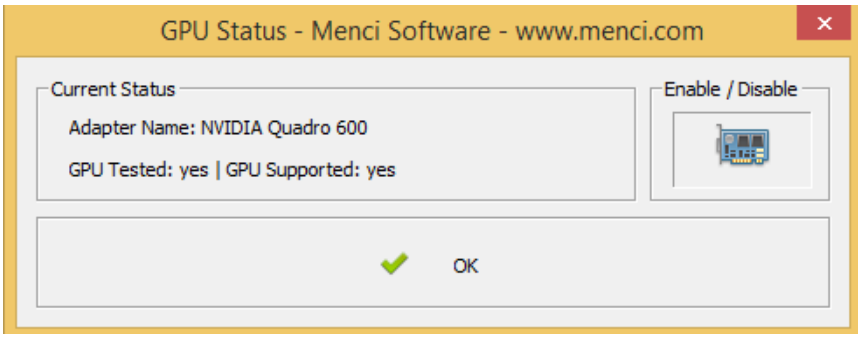
Tutorial, Tips, software updates and crash report

GPU TESTING

StereoCAD could access to GPU resources in order to speed up some tasks.

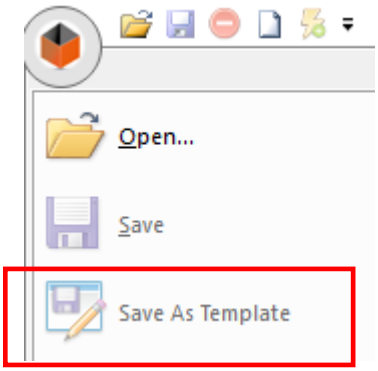
At first start you should see a message that informs you about GPU testing process. In any moment you can restart the test or check the GPU status to know if your graphic card is suitable for StereoCAD GPU processes.



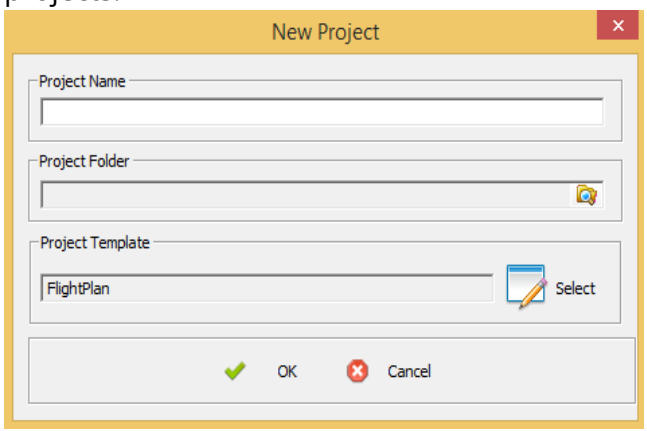


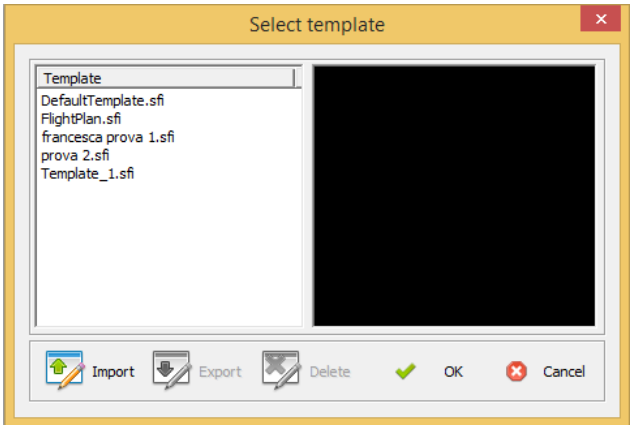
STARTING A PROJECT AND TEMPLATE MANAGEMENT

You can start a StereoCAD project by importing stereo data from other software (see next chapter). Moreover you can start a new empty document, without any raster and orientation data, in order to define a new CAD template. To save a new template select "Save as Template" from Main Button.



A template can include preset layers, smart draw bars, styles and can be assigned to imported projects.

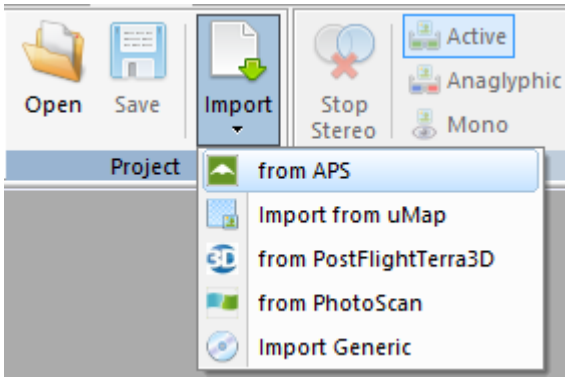




A template can be imported/exported to other PC that must share common drawing features.

IMPORT DATA AND NEW PROJECT

StereoCAD supports project creation from data exported by APS, PhotoScan, PostFlight Terra 3D or a generic orientation software.
from **MAIN/IMPORT**:



There are four import procedures:

> FROM APS

click on "from APS", select the .srf APS project file.
(form APS you can also export a StereoCAD project itself)

> FROM uMap

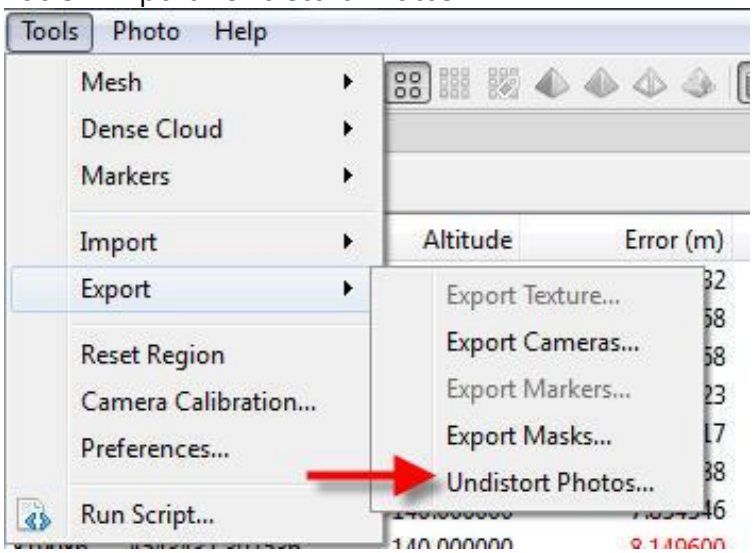
click on "from uMap", select the .ump uMap project file.

> FROM PostFlight Terra 3D

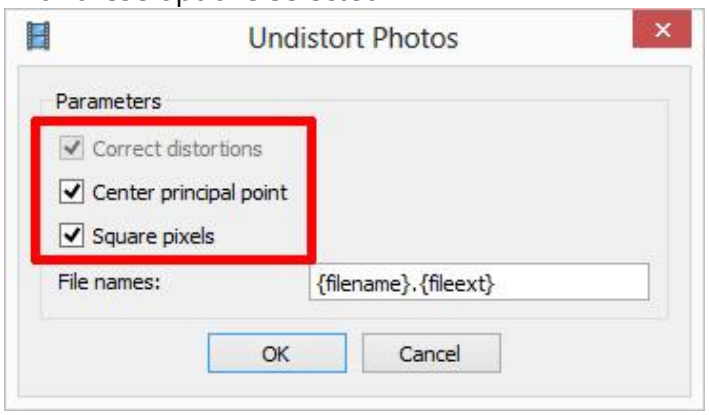
click on "from PostFlight Terra 3D", select the .p4d project file.

> FROM PhotoScan

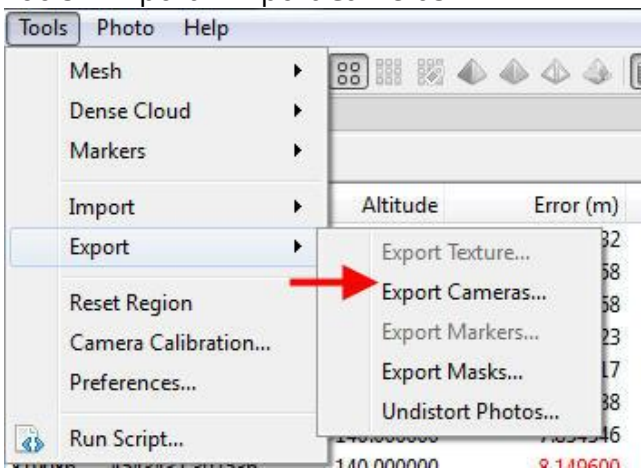
Open PhotoScan. Search your project and export undistorted images to a folder:
Tools > Export >Undistort Photos



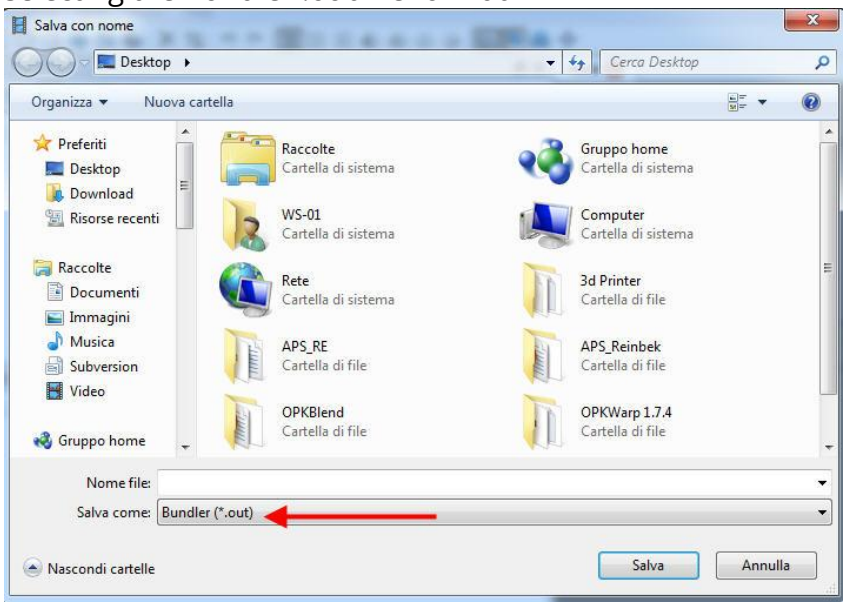
With these options selected



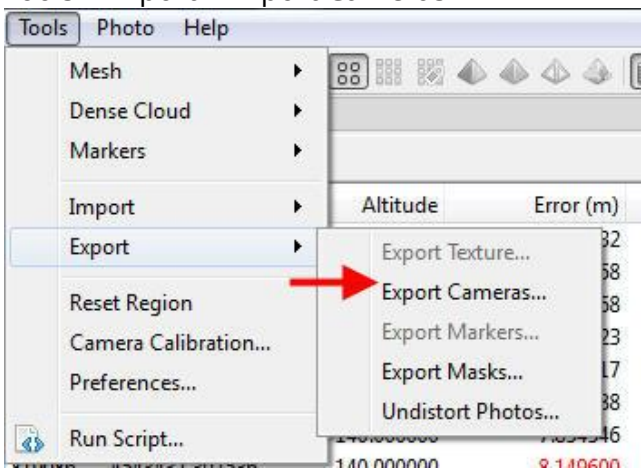
Then export orientation data:
Tools > Export > Export Cameras



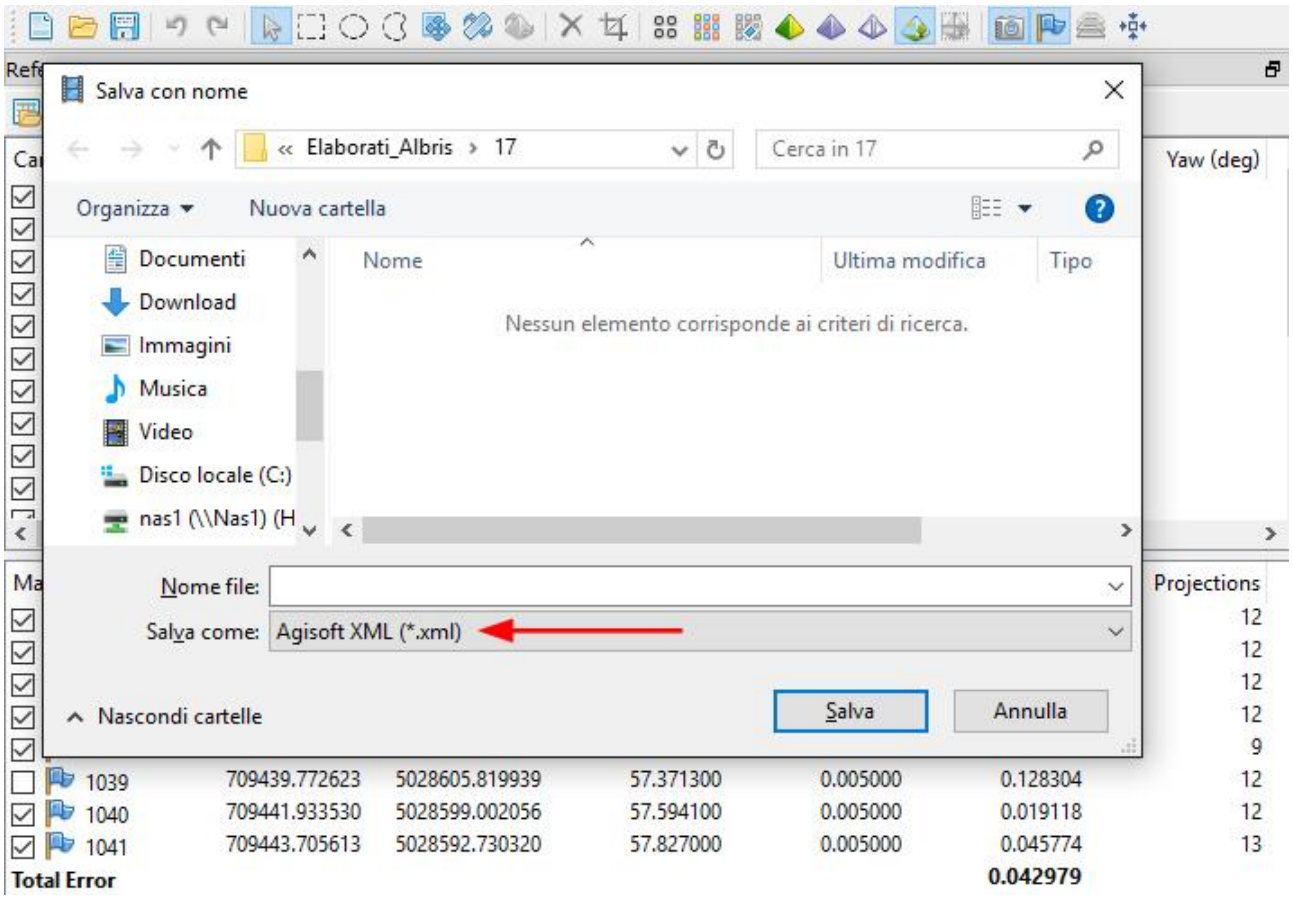
selecting the Bundler .out file format



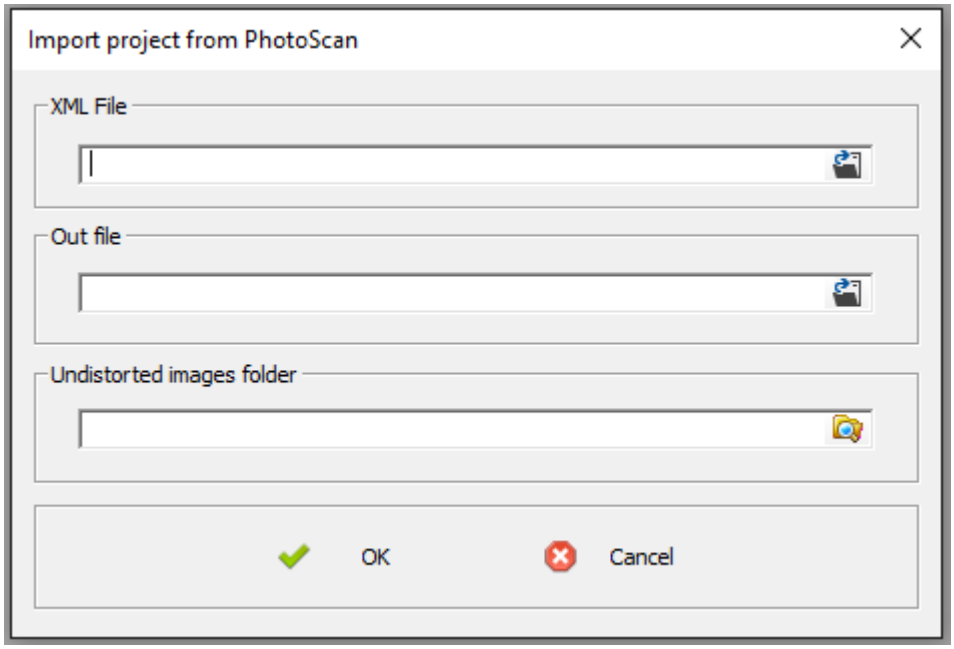
After this, export the same file in XML format:
Tools > Export > Export Cameras



Selecting the Agisoft XML .xml file format

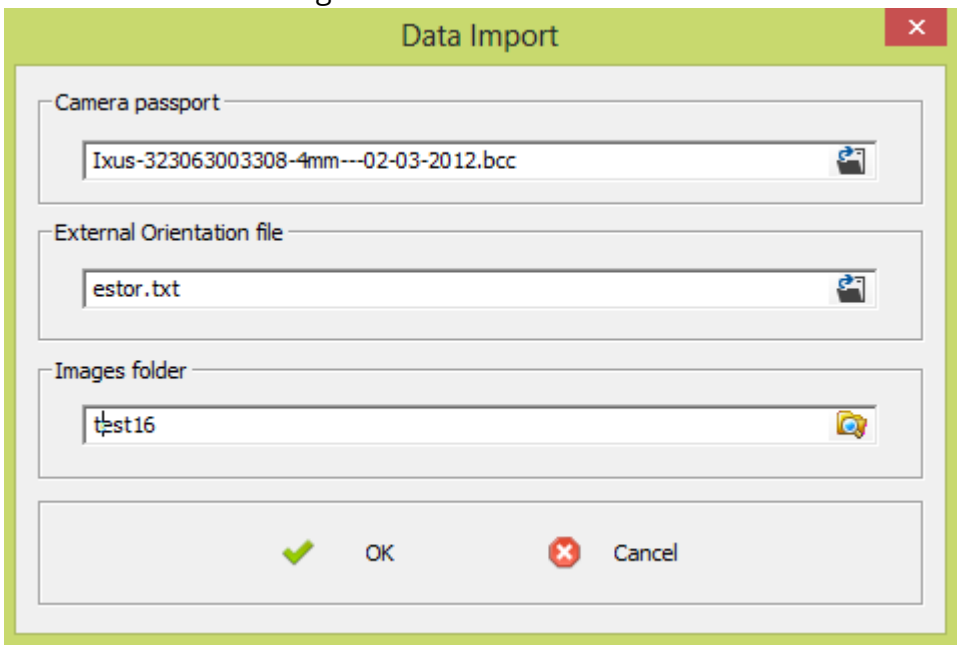


Finally start "Import from PhotoScan" and input requested data:



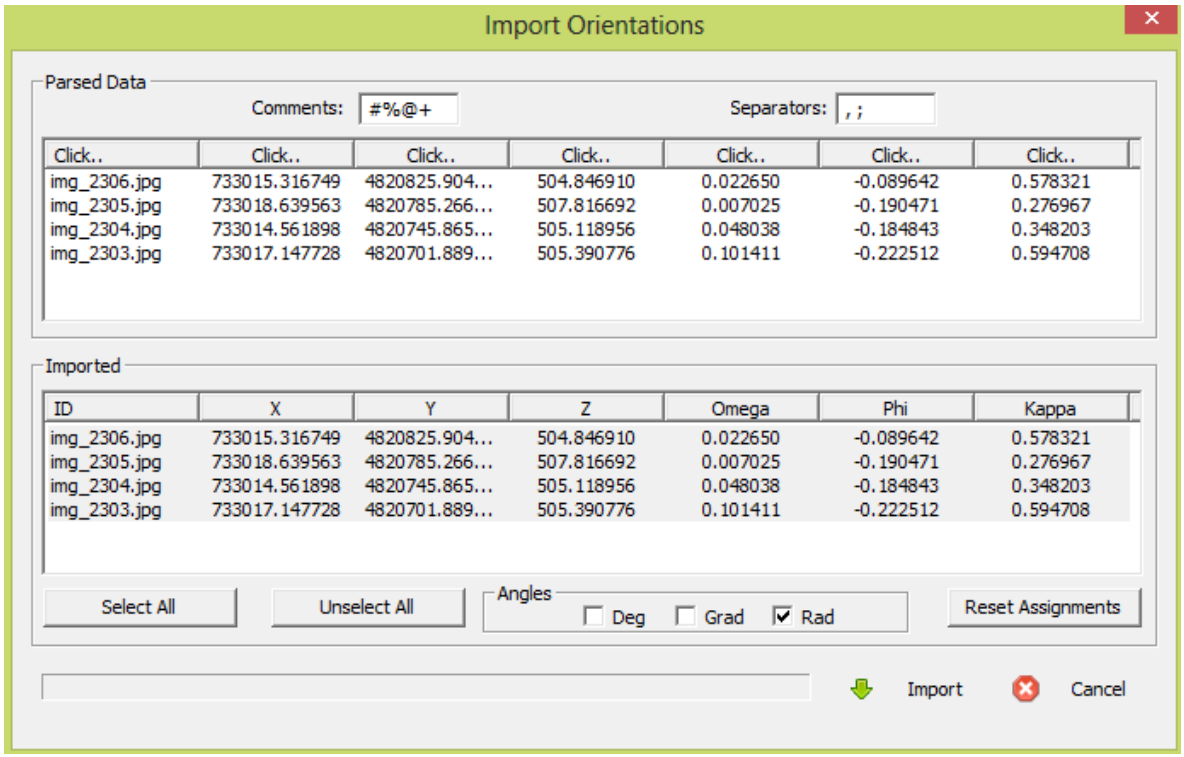
> FROM GENERIC SOFTWARE

You are able to create a new project from generic data.
Select a cvc/bcc camera passport file, an ASCII external orientation file and pick the folder where undistorted images are stored.



In the next step you have to confirm the external orientation text file parsing, by checking the fields' value

Values separators and comments are customizable.
By clicking on column headers of upper “source” list you can exchange the column meaning and sign.
Every image orientation has its X, Y, Z, OMEGA, PHI, KAPPA values stored line by line.
In the bottom list there is the result of data parsing.
You can specify angles measurement unit (degree, radians, grads).



IMPORT STEPS - CONCLUSION

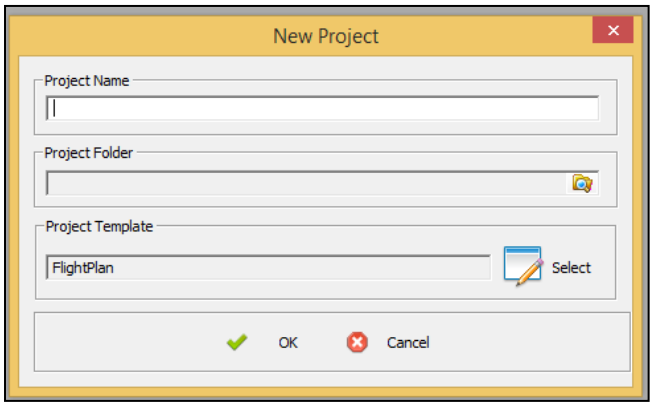
All procedures are completed when you indicates name and template for new project.

FIRST OF ALL, CREATE A NEW PROJECT:

writing the new name on "PROJECT NAME"

"PROJECT FOLDER" - Click on the right icon to select the folder where to save your new project

"PROJECT TEMPLATE"
click on select button if you want to change the Default template



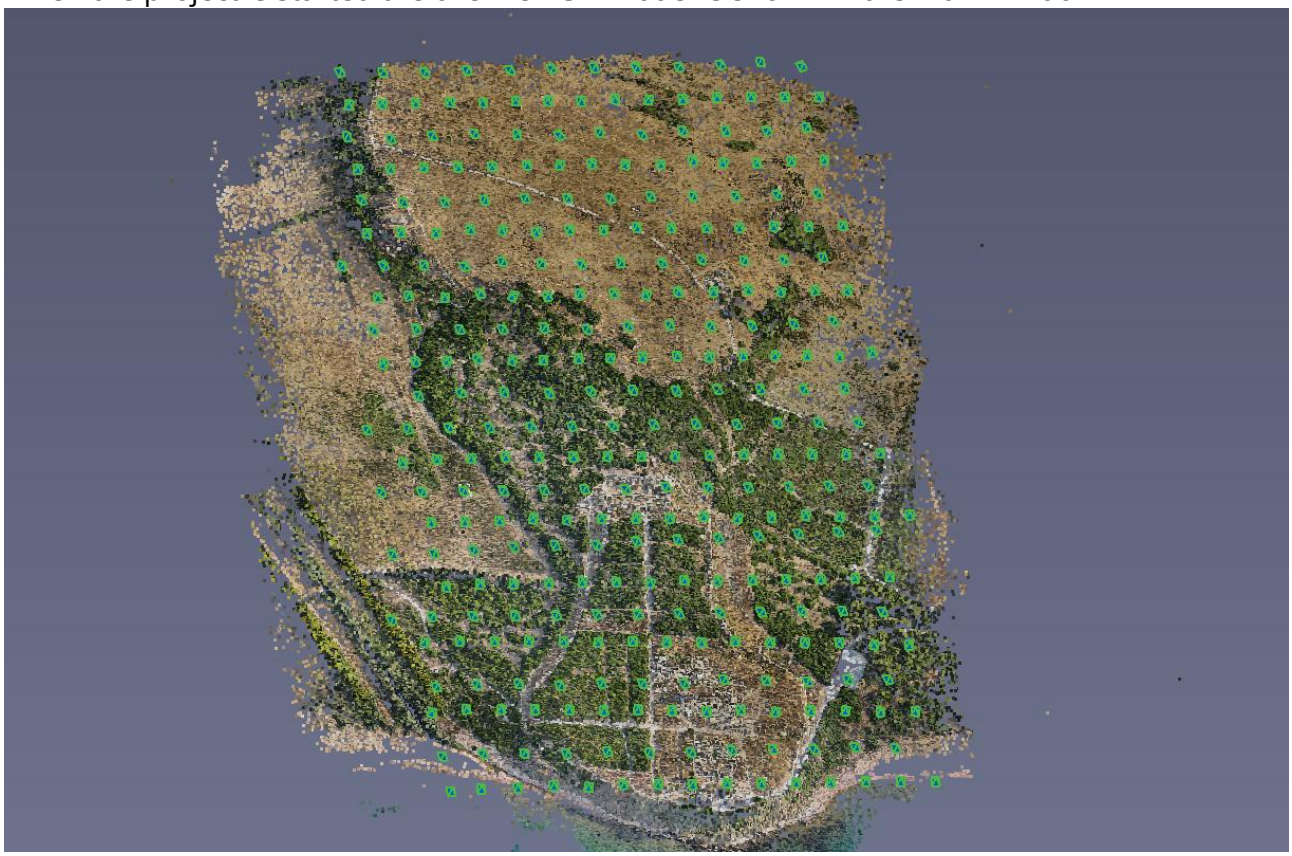
STEREOTOOLS PROJECTS

To import StereoTools projects you have to follow three steps:

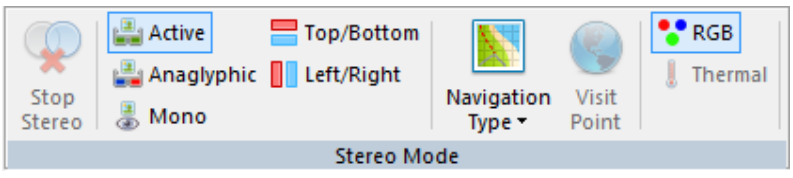
1) open StereoTools and export the dwg/dxf drawing file;
2) start StereoCAD and import APS project data related to StereoTools project;
3) import previously exported dwg inside new StereoCAD project to complete it.

START STEREOSCOPIC VISION

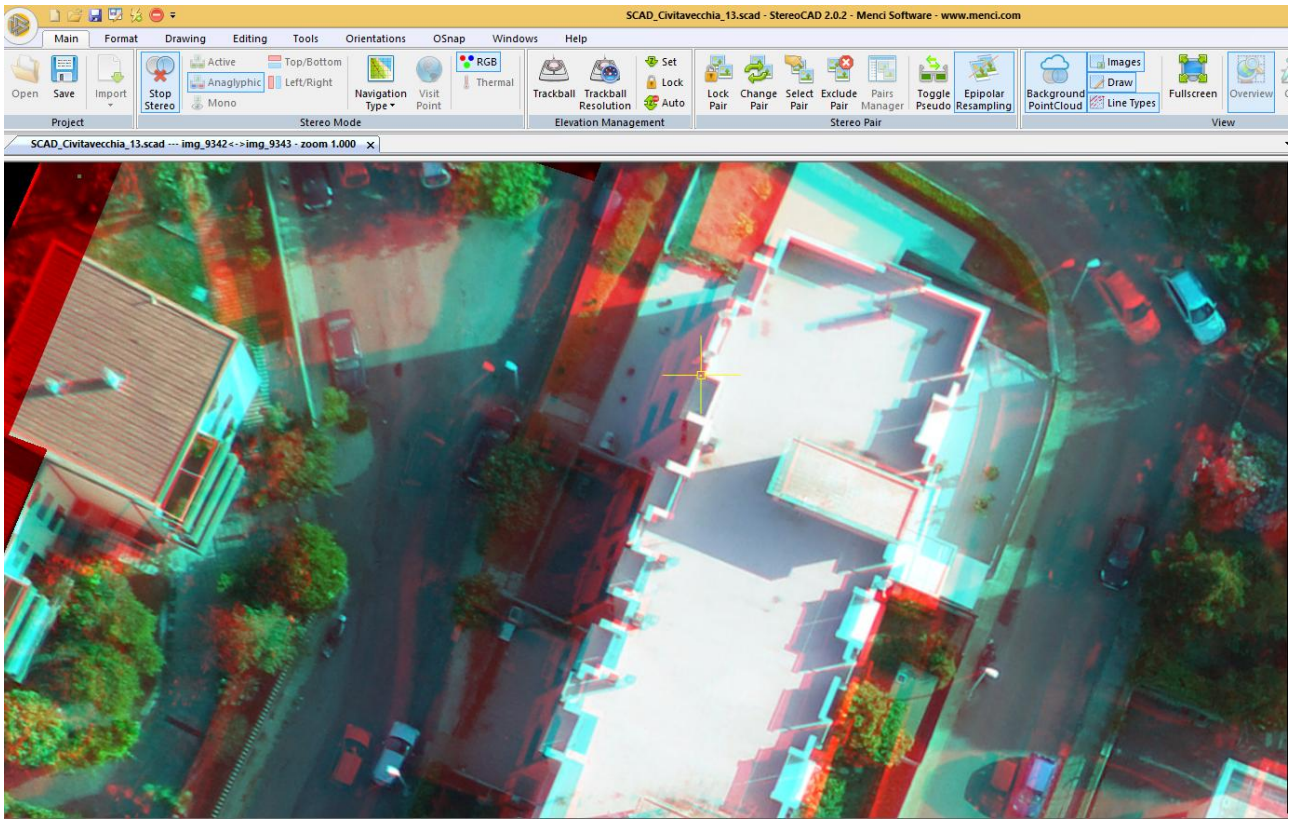
When the project is started the overview 3D model is shown in the main window



You can rotate and zoom it in order to understand where start the stereoscopic vision.
You can switch between available stereo mode selecting the buttons on top bar under "Stereo Mode" panel (MAIN>STEREO MODE)
The stereo mode available are:
- Active,
- 3D tv (top/bottom or left/right)
- Anaglyphic
- Monoscopic



Then the stereo vision is activated by double-click directly on a overview point.
StereoCAD automatically selects and opens the stereo pair that better fits the planar view on the clicked point.

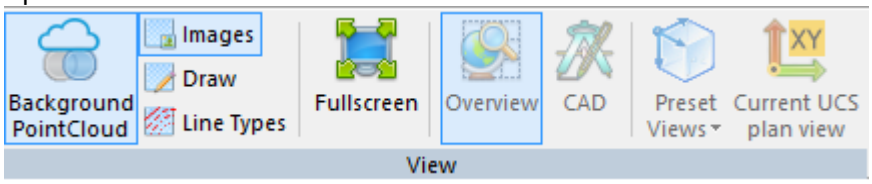


E.G ANAGLYPHIC VIEW

While stereo vision is enabled you can have access to drawing and editing commands but you can't change stereo mode, navigation type and handle overview until you stop it.
You can navigate the stereo model zooming and panning it with mouse wheel.

- pan: press the mouse wheel and drag images
- zoom: press SHIFT key and rotate the mouse wheel in or out. When stereo is not enabled, simply right drag-and-drop and move up or down to zoom + or zoom -

option view are available on **MAIN>VIEW**

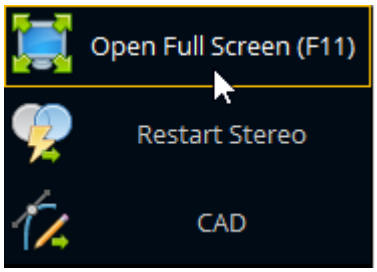


Background PointCloud, images, draw and **line Types** are all active when stereo mode is on. When the "Background PointCloud" is on, it means you have more stereo pair to analyze. On the contrary, you are at the last stereo model.
3D Overview and **CAD** are active when stereo mode is off

FLOATING CONTEXT MENU

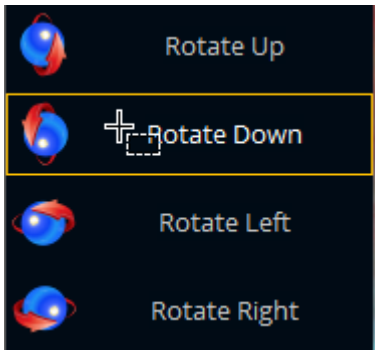
In order to speed up the access to frequently called functions, a floating menu appears when you move the mouse cursor on the top-right and bottom-right corners of the main window.

On the top right corner you can open/close the full screen mode, stop or restart the stereo vision (only if it is activated once before) and switch between overview and CAD window (only if stereo is not enabled).



Zoom commands are displayed on the bottom right corner instead.

When stereoscopy is active you will find a "Rotation" menu on the top left corner, depending of navigation type currently selected.

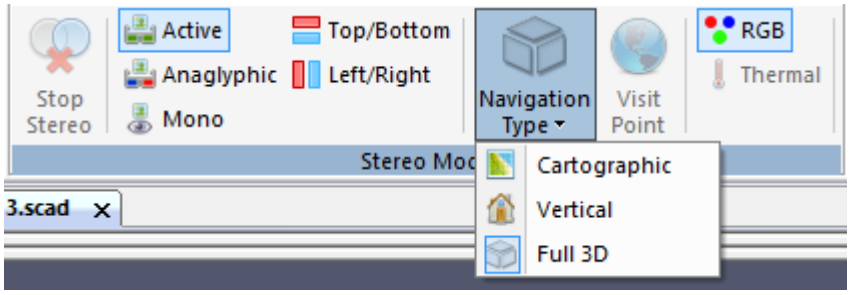


All rotations are available when Full 3D navigation type is selected. With navigation typw Vertical only left-right rotations are available and no rotations are possbile in Cartographic navigation type.

NAVIGATION TYPES

StereoCAD automatically select the best stereo pair to display when you surf the stereo model. Once the stereo pair is shown you can adjust the elevation using mouse wheel or trackball.

Three navigation scenarios are available. XYZ coordinates of current 3D point are differently managed depending on scenario.



- **Cartographic**: in this scenario images are mainly turned to the ground. When you move the trackball or wheel you change the Z elevation, X and Y are related to mouse cursor.

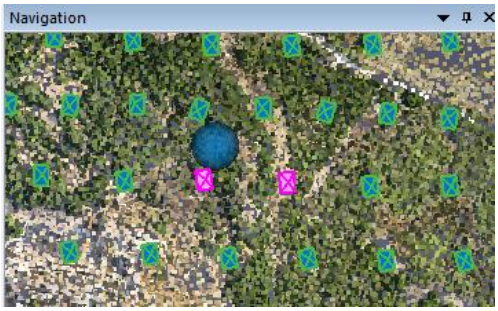
- **Vertical**: in this scenario images are frontal to a surface (e.g. like in architectural surveys) so the trackball doesn't move the Z elevation but the deepness only.

- **Full 3D**: the stereo view is perpendicular to average stereo pair plan, so the trackball doesn't move the Z elevation but the deepness only.

STEREO PAIRS MANAGEMENT

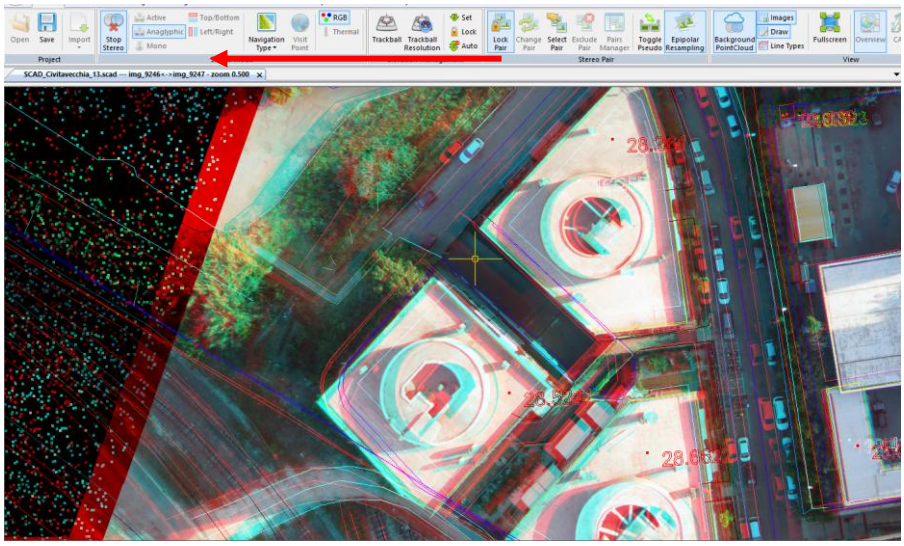
StereoCAD improves the stereo model navigation through a multi-thread image caching that speed ups stereo pairs changing.

StereoCAD provides you an automatic stereo pair selection that you can see in pink on the navigation bar

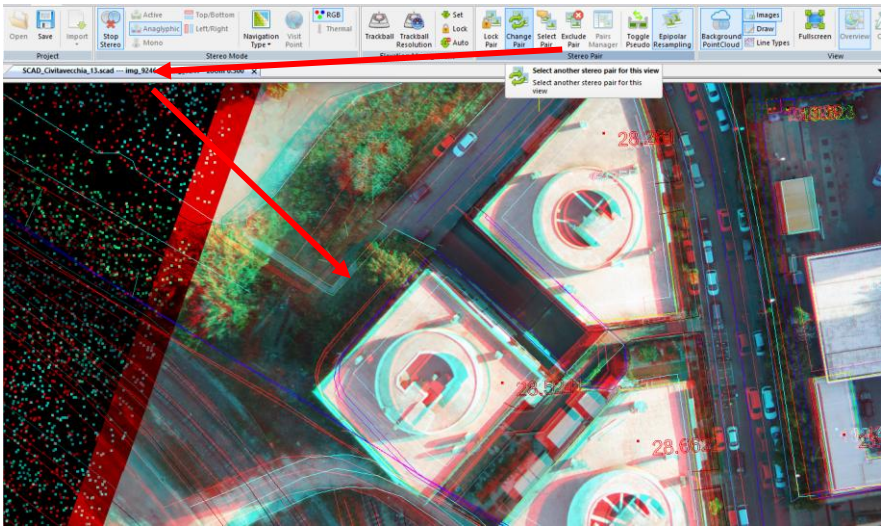


The stereo pair selected can be handled in the **MAIN>STEREO PAIR** panel.

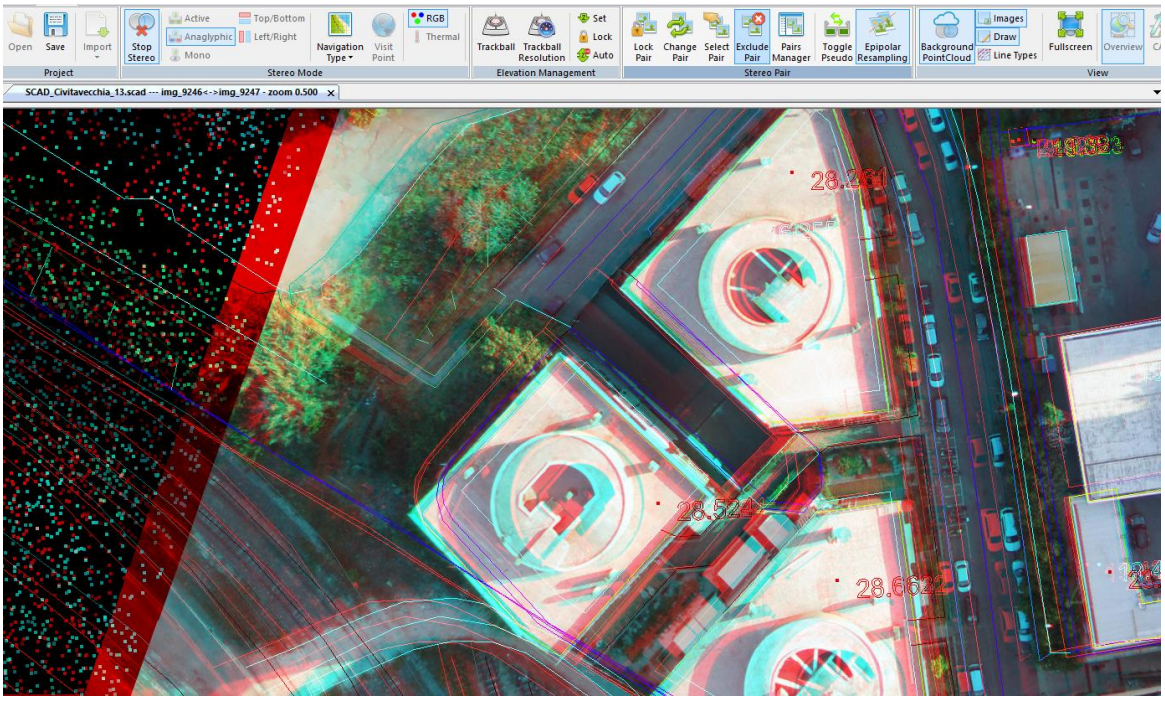
- The "**LOCK**" button toggle on/off the stereo pair locking. If the current stereo pair is locked, then it isn't automatically changed when you pan out of the stereo model.

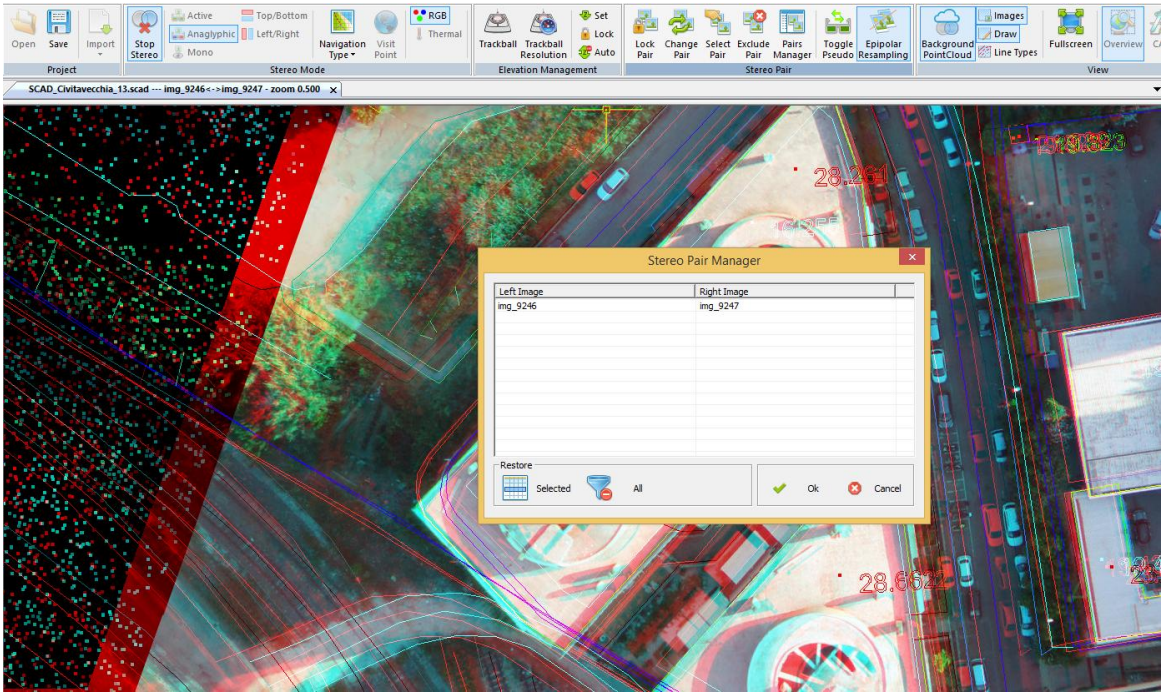


- The "**CHANGE**" button allows you to change current stereo pair without doing any pan movement.



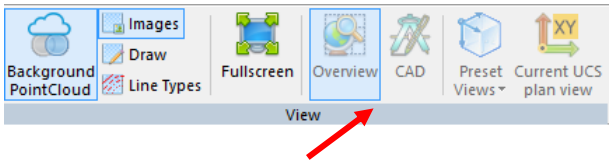
- "**EXCLUDE**" and "**MANAGER**" allows you to remove and restore one or more stereo pair from the automatic pair selection, when the selected pair is not usefull.



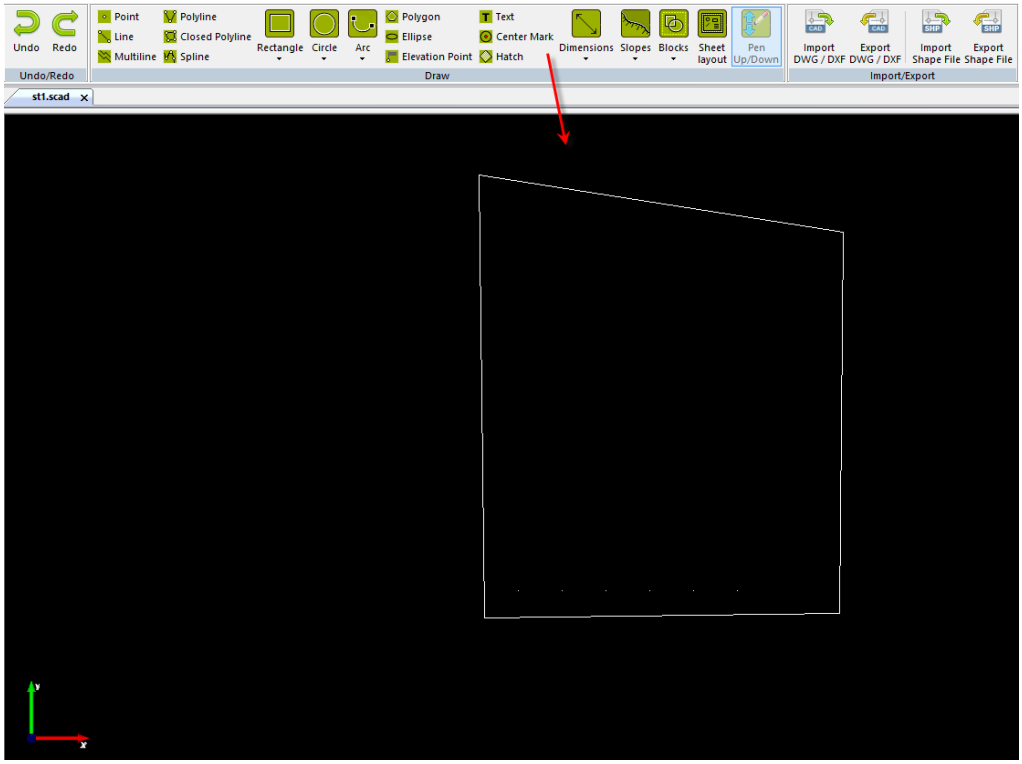


CAD VIEW

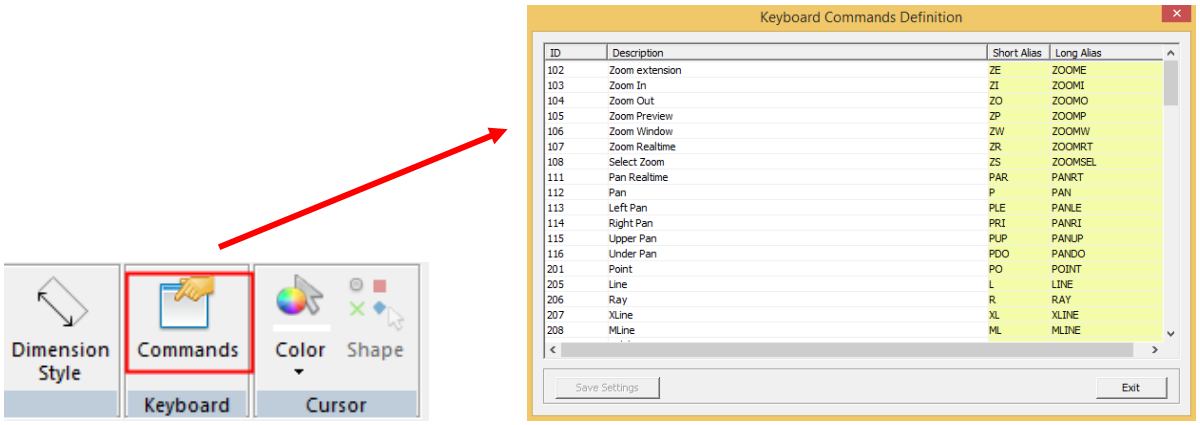
You can switch the CAD view on the main window turning off the Overview or clicking on CAD button



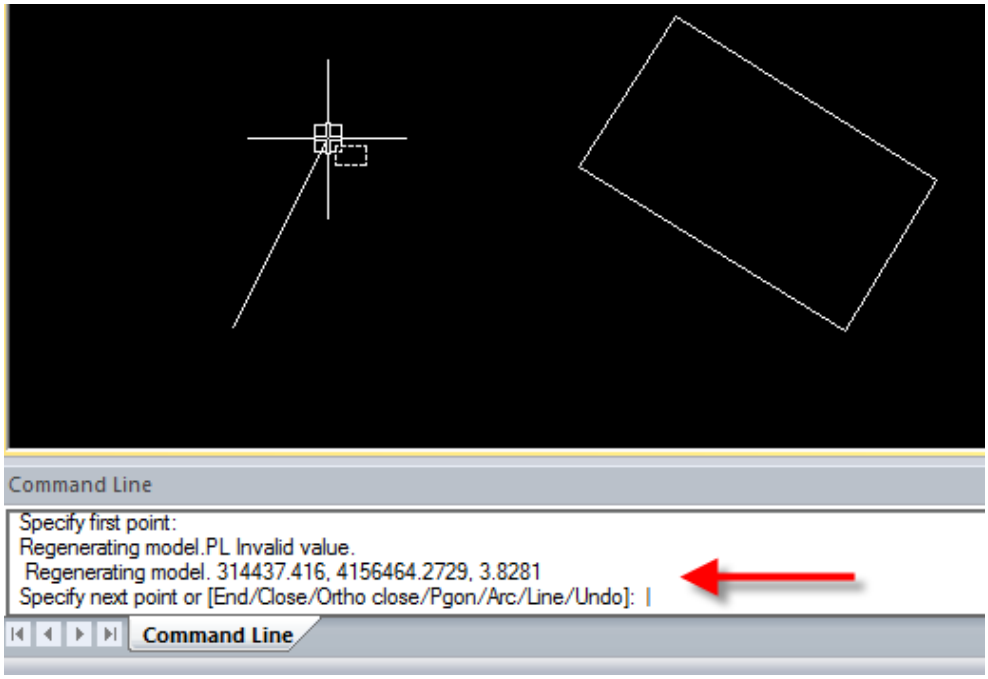
Once the overview is turned off, specific commands related to CAD like drawing and editing are available.



From the menu **FORMAT>KEYBOARD** by clicking on button "command" the list of the keyboard commands will appear.

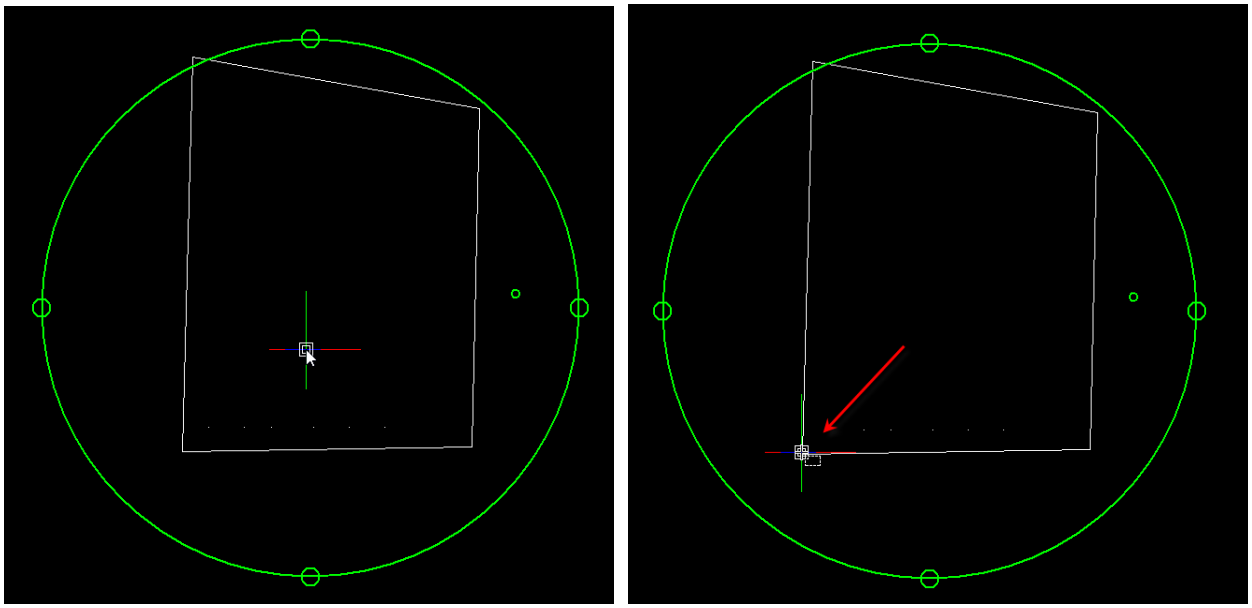


When a command is open on cad the command line shows related instructions.

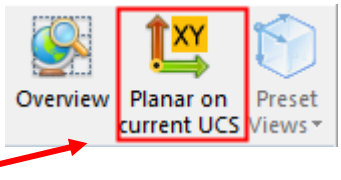


You can **activate the 3D orbiting** on the CAD view by pressing **CTRL key + click mouse button**. The **rotating center** is selected by pressing **CTRL + SHIFT keys and left mouse button** on a given point.

Then you can **rotating the view dragging one of the four** top, bottom, left and right **circle** (it uses a rotation around axis**) or dragging a custom point inside the 3D orbit circle** (it uses a free rotation).



The pan of the view is done by pressing the mouse wheel and the zoom in and out by rotating it. To restore the **planar view on current reference plane** (UCS) press the button on the top bar.

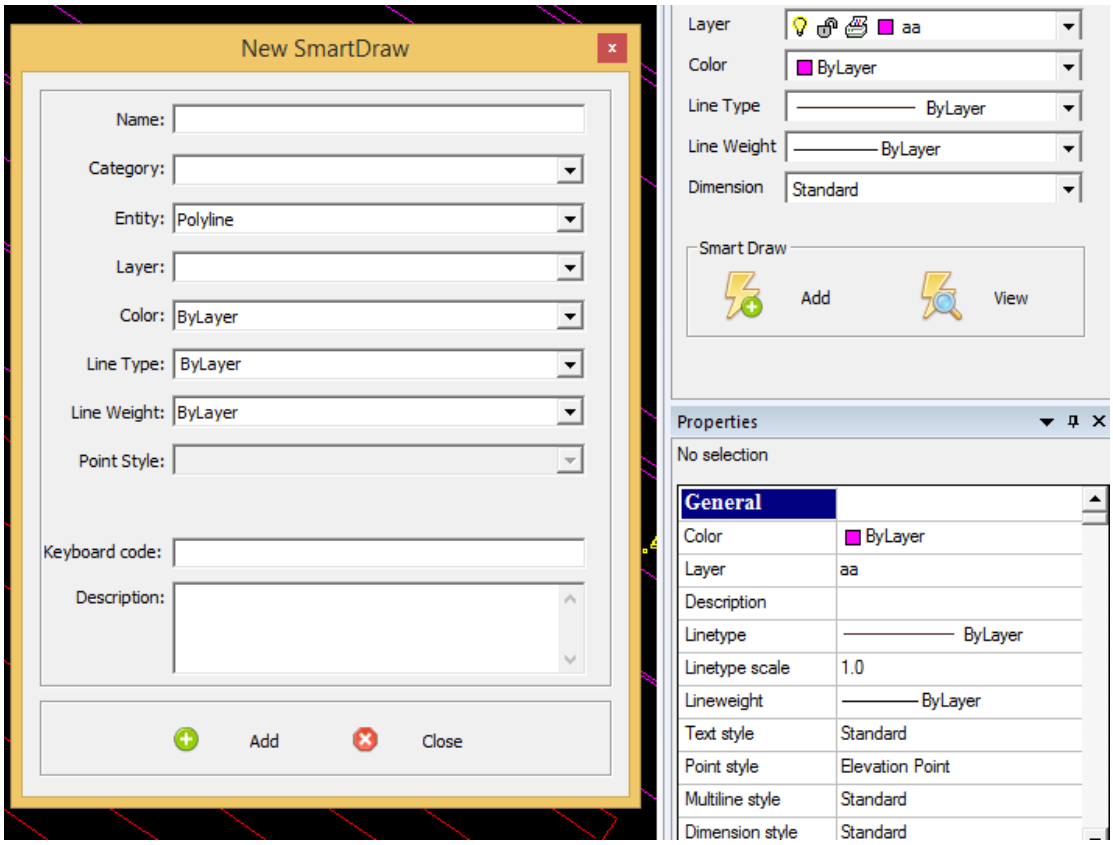


SMART DRAW

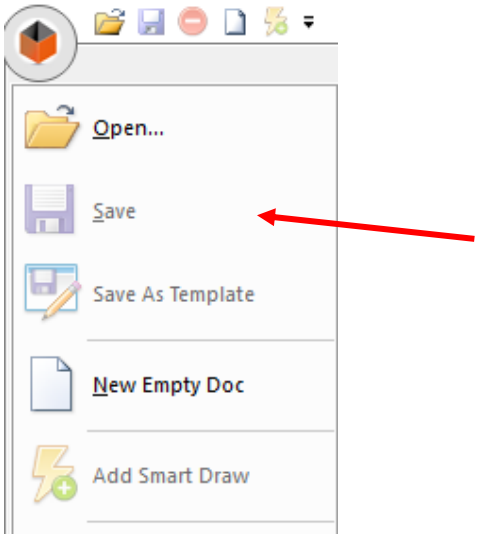
StereoCAD includes some smart solution named Smart Draw tools, in order to speed up 3D drawing. A **smart draw** is a shortcut to a given draw entity, using a preset layer and style.

Smart draw are thought to enhance templates: after you defined a template with standard layers and styles, you can associate to it a list of commands subdivided into categories. Each command will use the right layer and style to draw its entity.

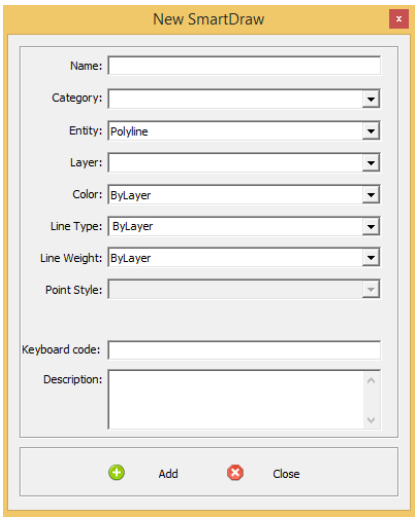
Inside the Format box of side bar (visible if activated) there are two buttons to manage the Smart Draw functions (add and view bottom).



When you save a file as template, its Smart Draw are saved together and they will be available for any further project created with this template.



To create or add a new Smart Draw click on "**Add**" button and fill the form.



You can add more Smart Draw to the same category.

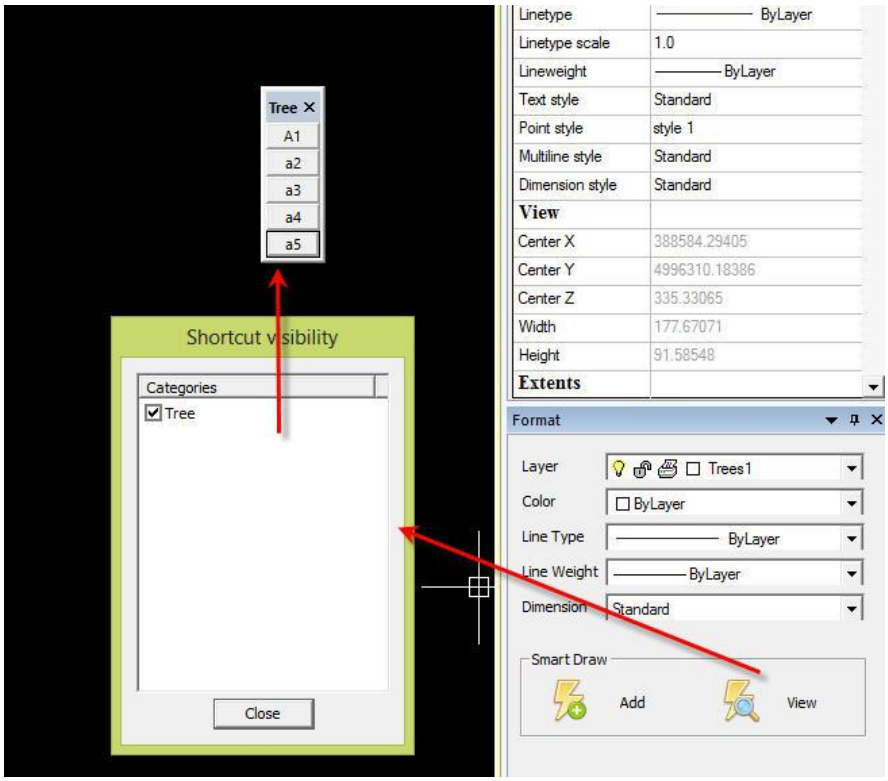
Combo box will suggest you the names available while you are typing. If a category doesn't exist yet, it will be created for current Smart Draw.

you can assign a **keyboard code** to each Smart Draw

If you have created layers and styles you can assign them to the entity. Currently are supported Points, Elevation Points, Lines, Polylines, Closed Polylines, Rectangles.

The Smart Draw description will be shown as tooltip on related command button.

Once you close the dialog form you can view Smart Draw categories as floating command bars.



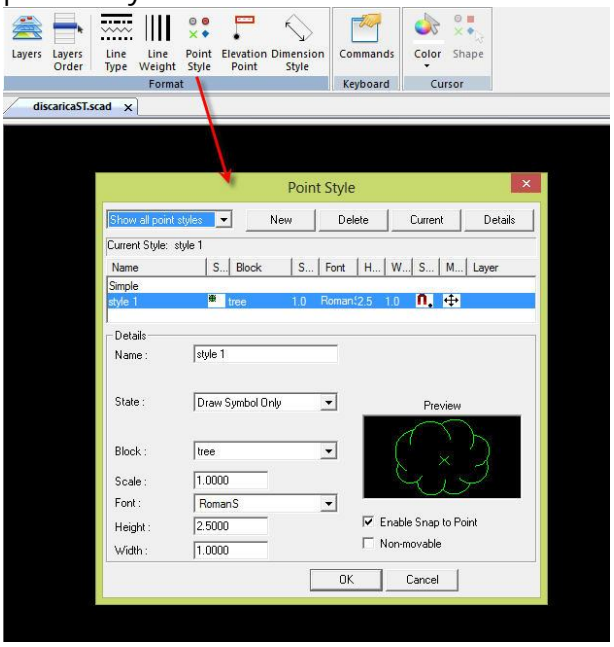
if you click on a Smart Draw (e.g. A5), you will see all its features in the "Format" and the "Properties" menu.

EXAMPLE - HOW TO CREATE A NEW POINT STYLE

For example, could be usefull to create a new point style and use it in a Smart Draw:

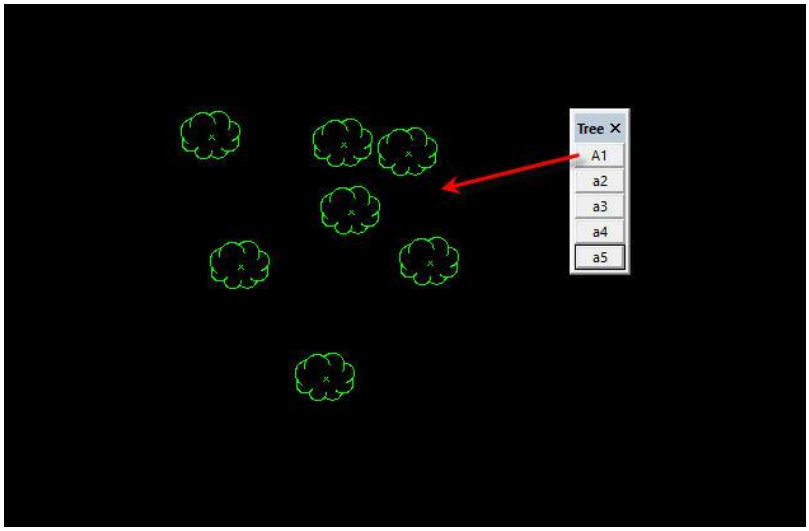
1) create a new block for tree.

   FORMAT> FORMAT, click on point style button and than click on NEW. You will see a new style named "style 1", click on it in order to modify its details. Assign the block previously created to it.



2) add the new point style to a new Smart Draw,

click on "**Add**" button to create a new Smart Draw. Writing "A1" as name, selecting "tree" as category, "Point" as entity and choosing on the combo box the new point style.

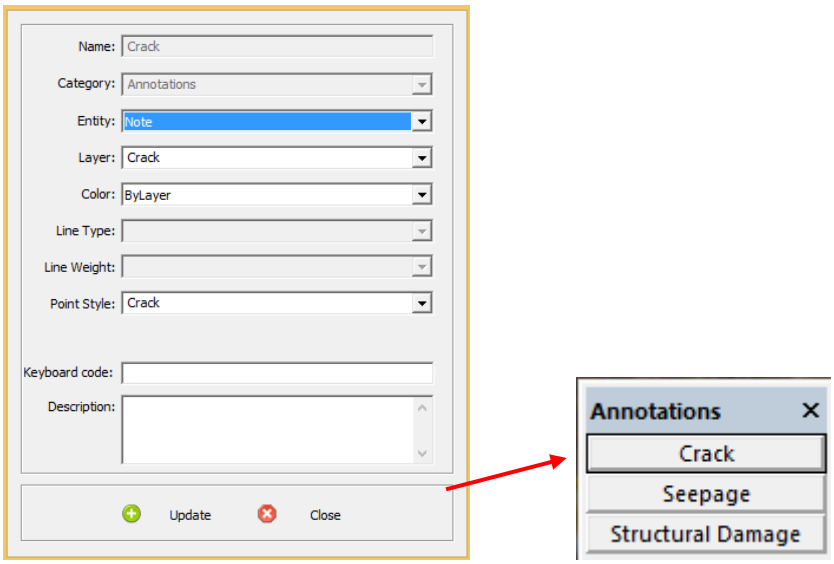


Now you can draw a tree on the right layer every time you call A1 Smart Draw.

EXAMPLE: ADD NOTE AND CREATE A REPORT

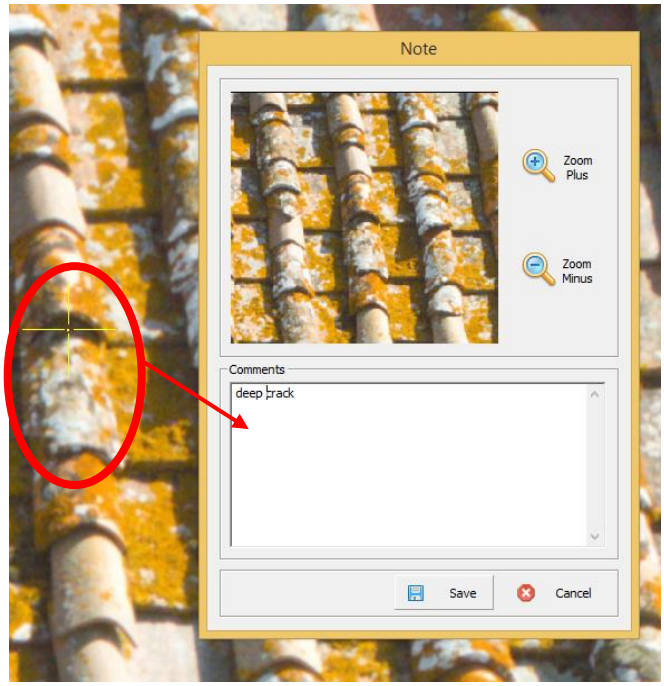
In StereoCAD version you can add note directly on the images. For example: you find a crack on a roof:

1. create a new **Smart Draw,** with **NOTE as ENTITY**.
   on the **FORMAT** lateral bar, click on **ADD**; then, select NOTE AS ENTITY after writing name and category. Add the new note to the category by clicking on update.

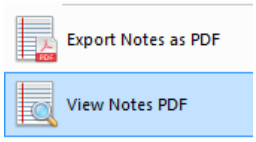


2. Identify the crack and write the note

Click on "**crack"** smart draw button, directly on the category menu (named in this example as "annotations"). When the crack is identified right-click on it. The crack annotation will open, write the note and save it. The "crack" smart draw symbol will appear in the exact point you selected.

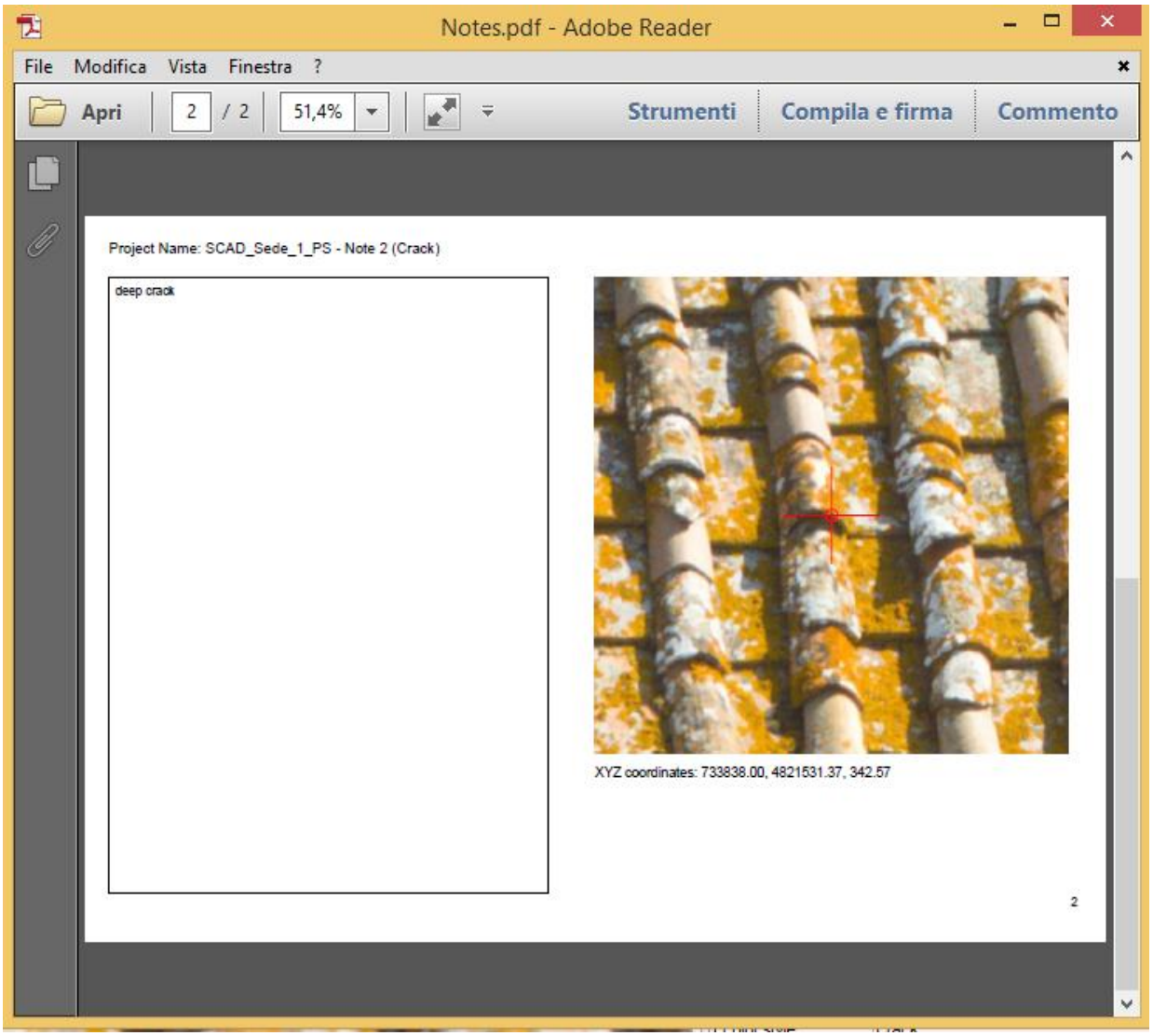


3. <u>View or export the pdf annotation report</u>
   MENU>START click on:



the pdf report includes:

- PROJECT NAME
- NOTES
- IMAGE with CRACK SYMBOL ON THE SELECTED POINT,
- the EXACT COORDINATE of the crack


Notes.pdf - Adobe Reader
File Modifica Vista Finestra ?
Apri
2 / 2
51,4%
Strumenti
Compila e firma
Commento
Project Name: SCAD_Sede_1_PS - Note 2 (Crack)
deep crack
XYZ coordinates: 733838.00, 4821531.37, 342.57
2

STEREO ACTIVE HARDWARE SETUP

HARDWARE - WHAT IS ESSENTIAL FOR STEREO VIEW?

option A - for professional stereoscopic view

- **PC:** Operating system: Windows 7/8/8.1 (64 bit)
  CPU: i3/ i5/ i7 or equivalent
  RAM: 4 GB or more

- **Monitor LED 3D** (e.g. BENQ XL2411Z LED 3D 24" Full HD) or similar that support NVidia 3D vision kit

- **NVidia Quadro family** (e.g. K410, K620..)

- **NVidia 3D Vision 2 Kit**

- **Kensington Expert Mouse Trackball***

opzione B - for professional stereoscopic view

- **PC o laptop** Operating system: Windows 7/8/8.1 (64 bit)
  CPU: i3/ i5/ i7 or equivalent
  RAM: 4 GB or more

- **3D TV with glasses**

- **Kensington Expert Mouse trackball***

** Trackball is necessary to set the elevation for professional project. Otherwise the stereoscopic view works with the mouse as well. If you have another kind of trackball contact Menci Software support in order to evaluate its compatibility.*

The anaglyphic and monoscopic window is always available. In these cases, you do not need additional hardware.

STEREO GLASSES BY NVIDIA 3D

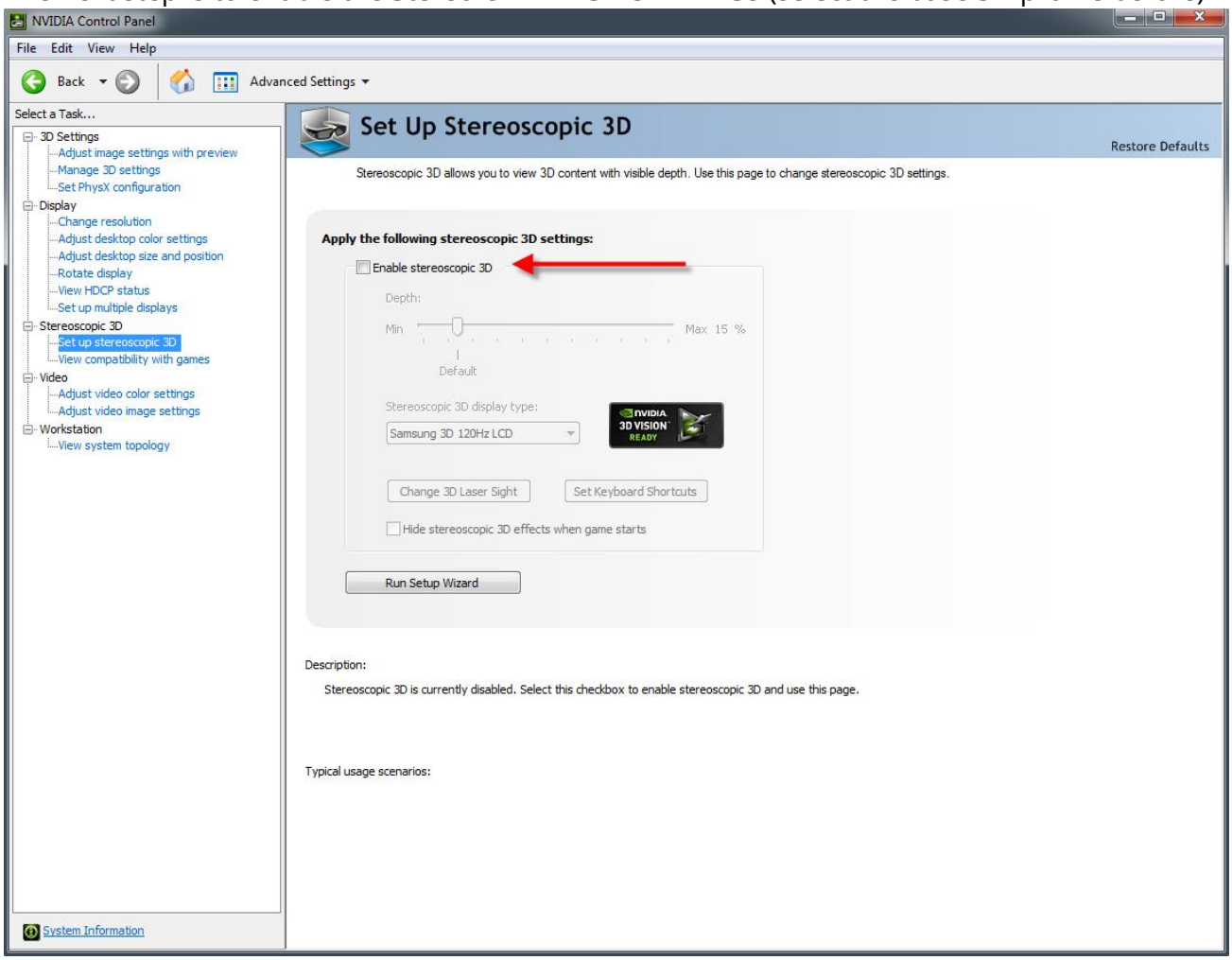
StereoCAD supports active stereo glasses by NVidia 3D Vision kit that is combined with NVidia stereoscopic graphic cards (Quadro family).

In order to enable the active stereo visit point you need to setup your hardware.
Visit Menci Software website to see the suggested hardware setup.

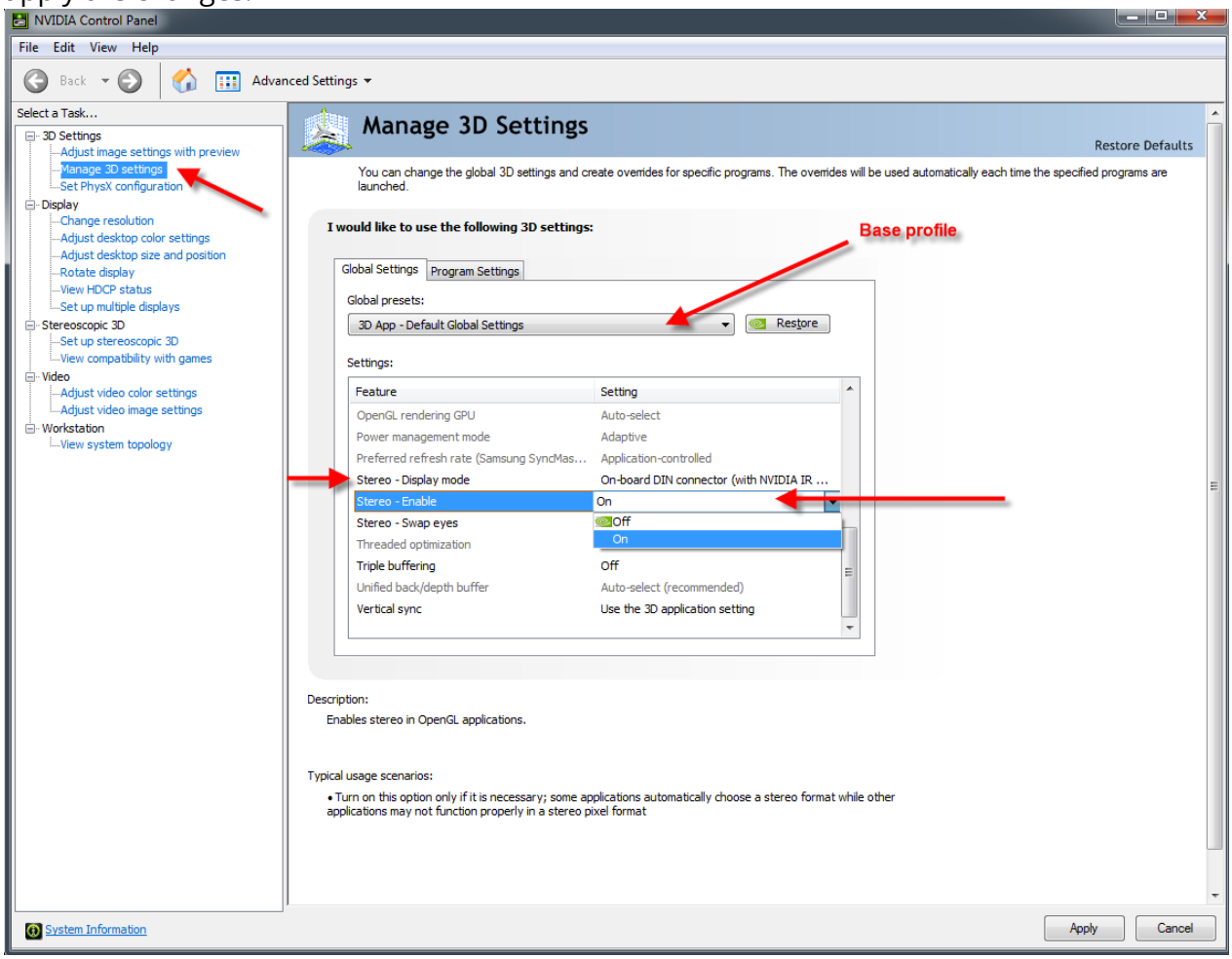
Then download and install latest video card driver version from NVidia website.

Finally open NVidia Control Panel and enable the stereoscopic 3D option. If it is the first time you do this operation the Setup Wizard will be displayed. Proceed with the wizard.

The next step is to enable the Stereo **UNDER 3D SETTINGS** (select the base 3D profile before)



Finally select the Display Mode as "Generic active stereo (with NVidia 3d vision)" profile and apply the changes.



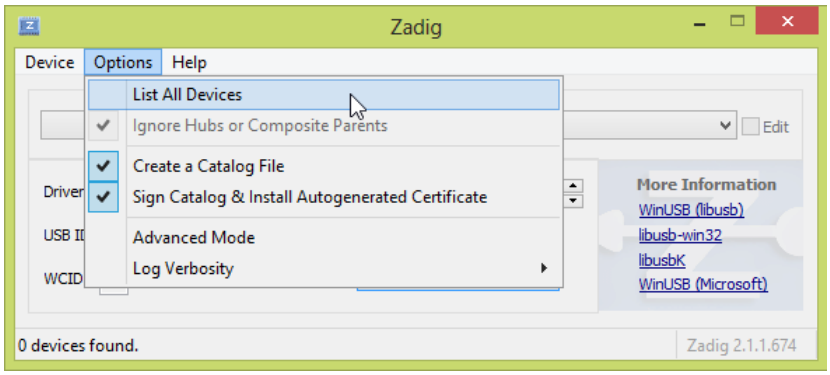
TRACKBALL HANDLING

StereoCAD natively supports **Kensington Expert Mouse Trackball**. But if you have another kind of trackball contact Menci Software support in order to evaluate its compatibility.

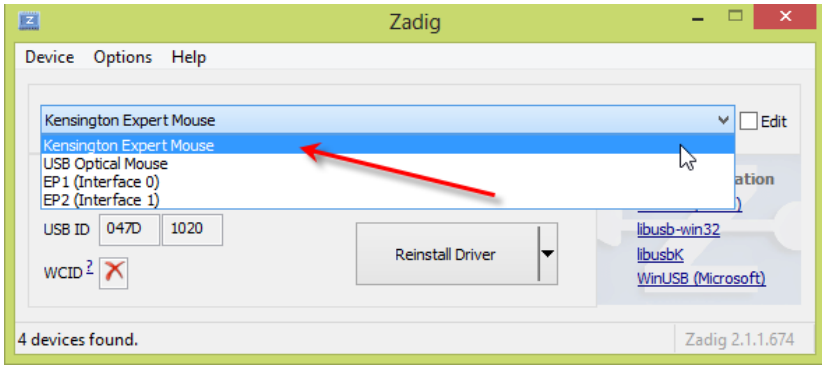
'ZADIG' AUTOMATIC INSTALLATION

A device driver installer tool is included inside StereoCAD installation folder, under Trackball voices. Plug in the trackball and start Zadig:

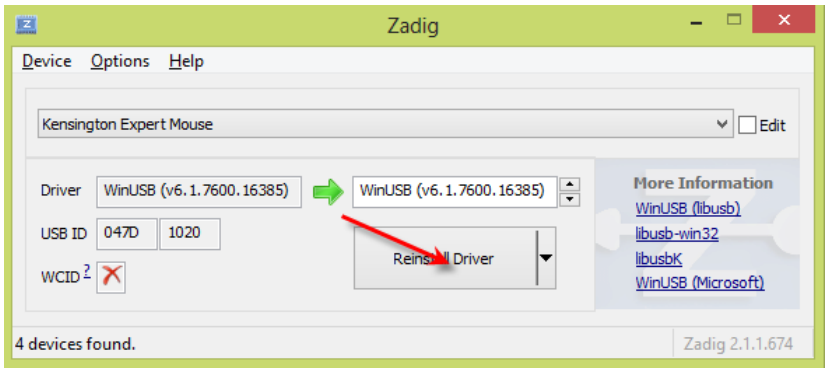
SELECT OPTIONS > LIST ALL DEVICES



Then, select Kensington Expert Mouse from the list

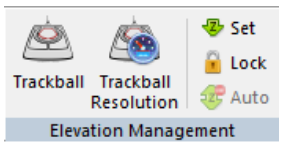


Finally click on driver installation and confirm any warning message



TRACKBALL MANAGEMENT

on **MAIN>ELEVATION MANAGEMENT** there are some buttons related to the trackball:



- toggle the trackball activation on/off;
- setup the trackball Z movement step accuracy;
- set a given Z elevation
- lock the current elevation for all clicked point
- automatic elevation adjustment (on mouse stop)

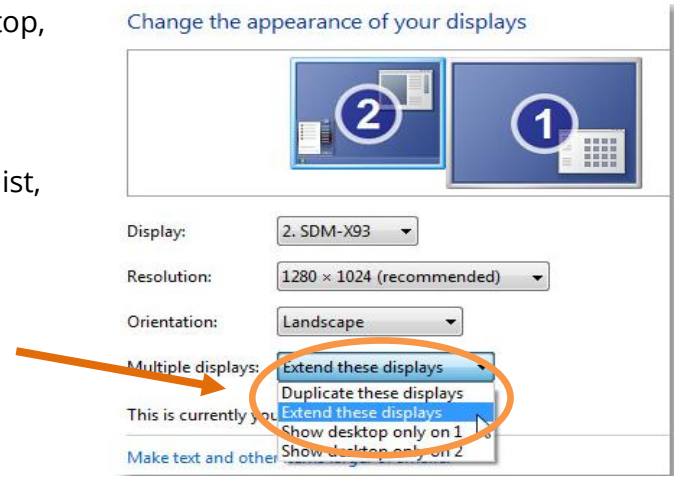
By moving the trackball ring you can control the elevation step accuracy.

3D TV

Right-click any empty area of your desktop, and then click **Screen resolution**.

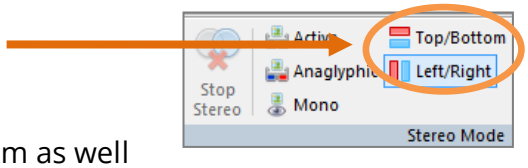
Click the **Multiple displays** drop-down list, and then select **Extend these displays**, or **Duplicate these displays.**

In Windows 7, it is easy to add a second monitor by using the new hotkey **Win+P**



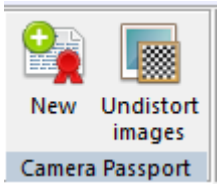
In stereoCAD, click on left/right or top/bottom stereo mode

On the 3D television choose left/right or top/bottom as well



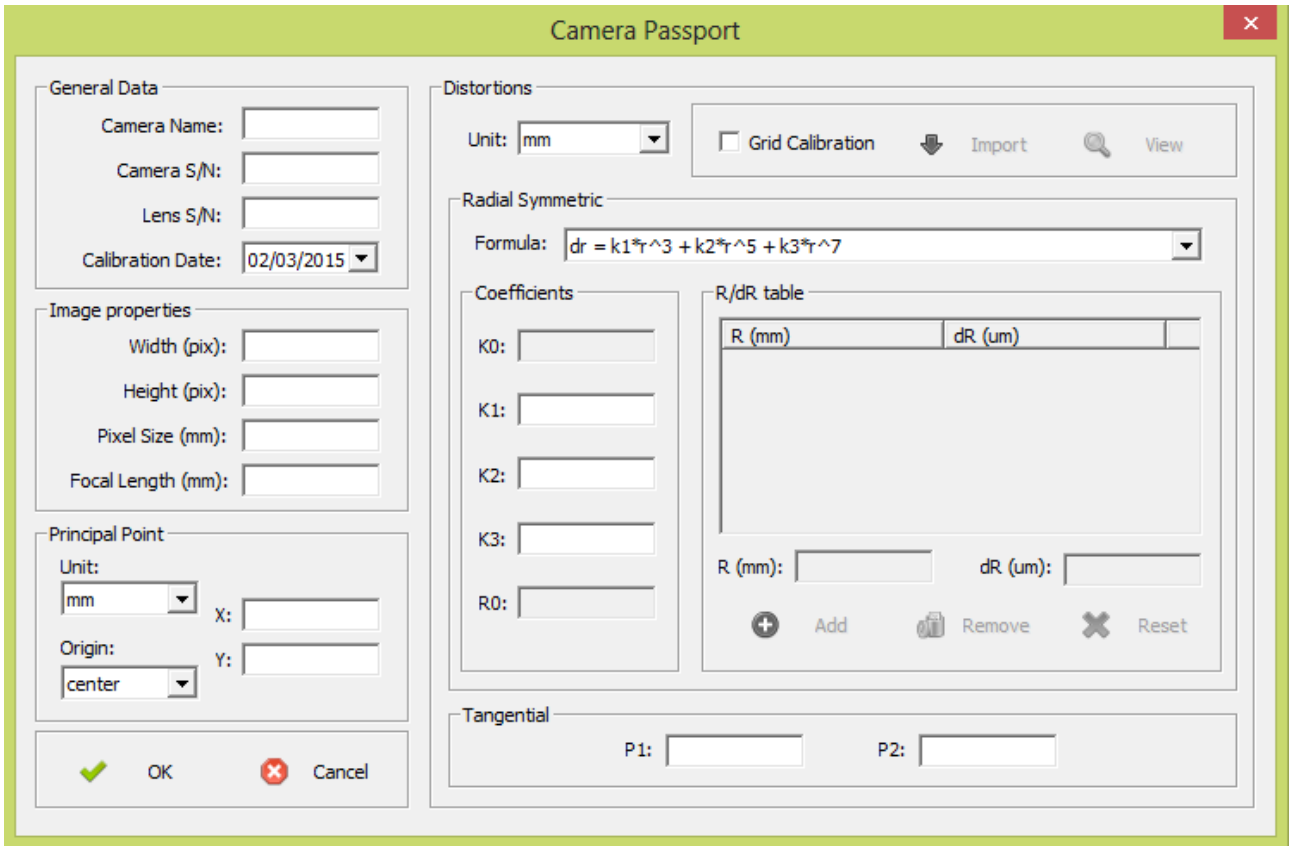
CAMERA PASSPORT AND IMAGE UNDISTORTION

Under **ORIENTATION>CAMERA PASSPORT** bar there are two procedures dedicated to camera passport creation and image undistortion.



NEW CAMERA PASSPORT

If you have not a camera passport for StereoCAD but you have the passport values from a previous calibration, you can manually fill a new passport by typing the data in this form.



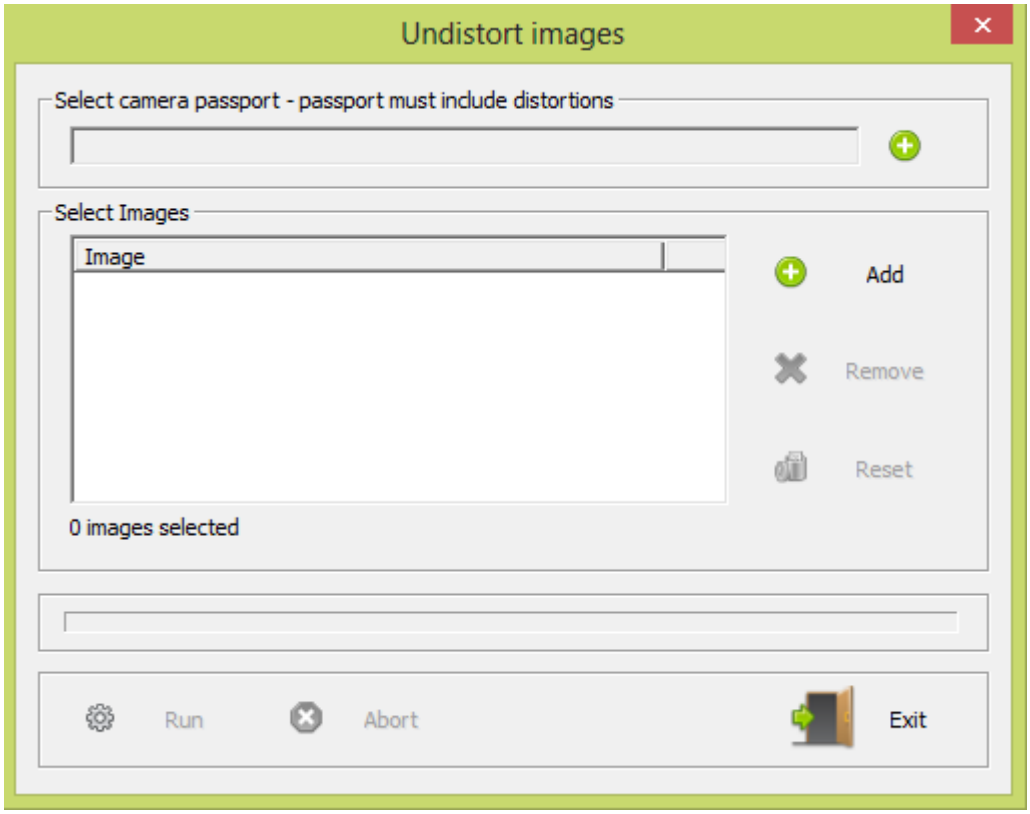
In the general data section you have to input the passport general features. Under image properties there are sensor and image features. The Principal point coordinates can be expressed by using pixel/mm unit and top left / central origin.

The right side of the dialog include distortions values (radial and tangential). You can select both the unit and the formula used for tangential distortions (the coefficient meanings). Every formula requires its own distortion coefficients, by different convention.

IMAGE UNDISTORTION

If you have a camera passport (including distortions data), you can undistort a set of images taken by related camera.

open **ORIENTATION>CAMERA PASSPORT** and click on **UNDISTORT IMAGES**

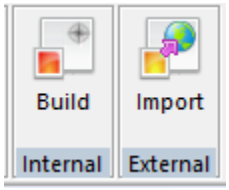


In output folder you will get a new dataset of undistorted images ready for next processes.

INTERNAL AND EXTERNAL ORIENTATIONS

StereoCAD natively works with data produced by APS, so it is compatible with .int and .est image orientation files.

If you are using a dataset produced by another software you could need internal orientation files and import external orientations.



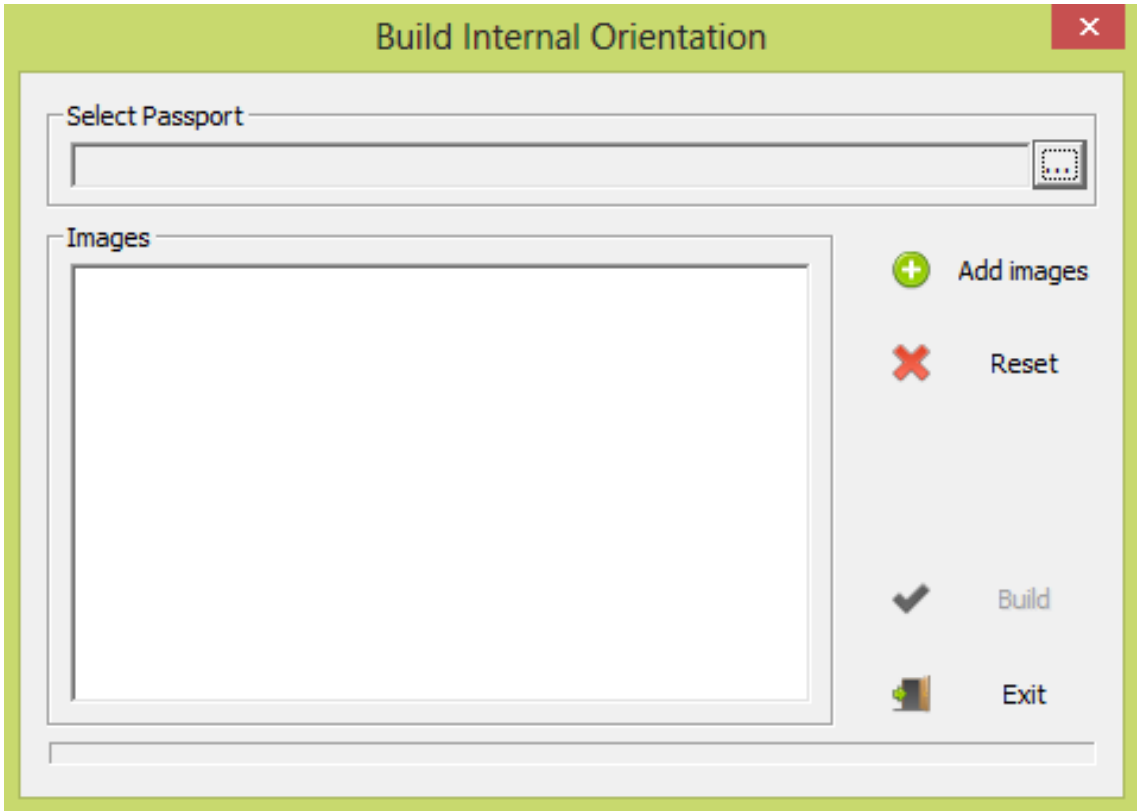
INTERNAL ORIENTATION

The internal orientation file describes the image internal geometry and features. StereoCAD internal orientations can be generated by undistorted images and a camera passport with no distortions.

from **ORIENTATION> INTERNAL** menu click on **BUILT**

Select the passport file and then add related images (those were undistorted with it).

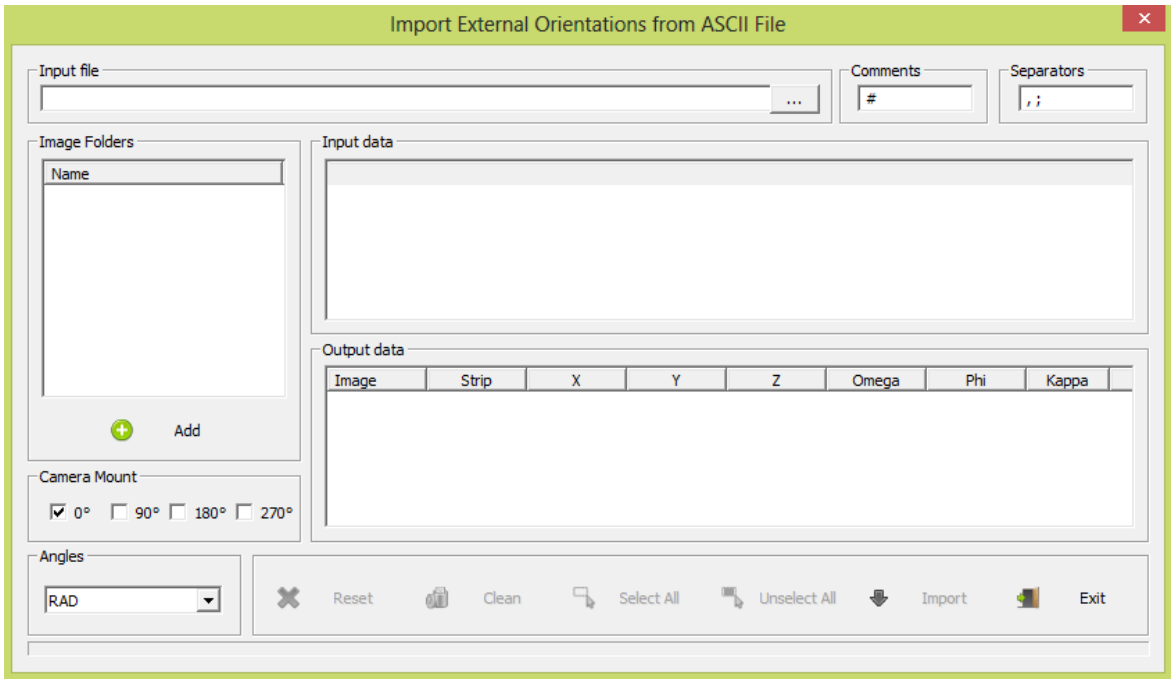
Finally press "Build": one .int file will be generated for each image, in the same folder.



EXTERNAL ORIENTATION

The external orientation describes images global position and angles.

from **ORIENTATION> EXTERNAL** menu click on **IMPORT**



They can be imported and associated to images by ASCII files where X, Y, Z, OMEGA, PHI, KAPPA are stored line by line. Values **separators** and **comments** are customizable.

In the upper "**input data**" list you will see the source data and in the lower "**output data**" list you will check how those data are parsed to orientations.

By clicking on column headers you can to exchange the column meaning and sign. You can specify the camera mount angle and the orientation's angles measurement unit (degree, radians, grads).

Select and add the folders where images listed in the input file are stored and click "**Import**".

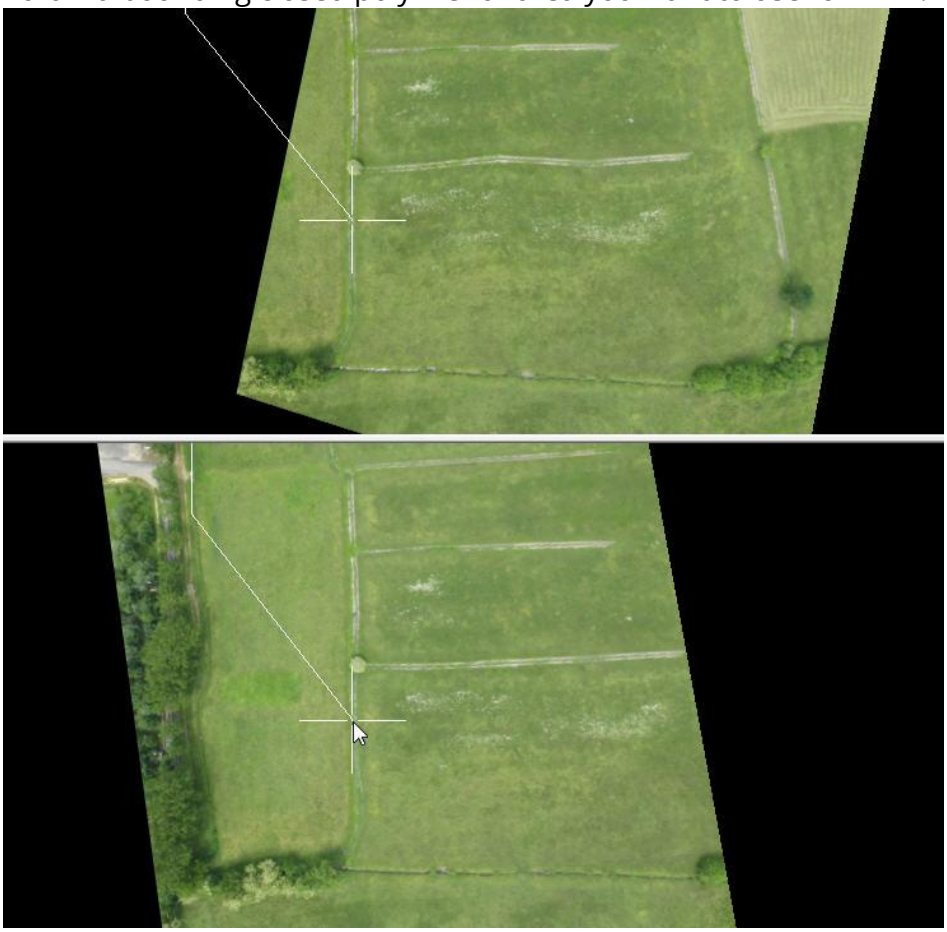
One .est file is generated for each image that matches with an input orientation.

MANUAL DTM TOOL

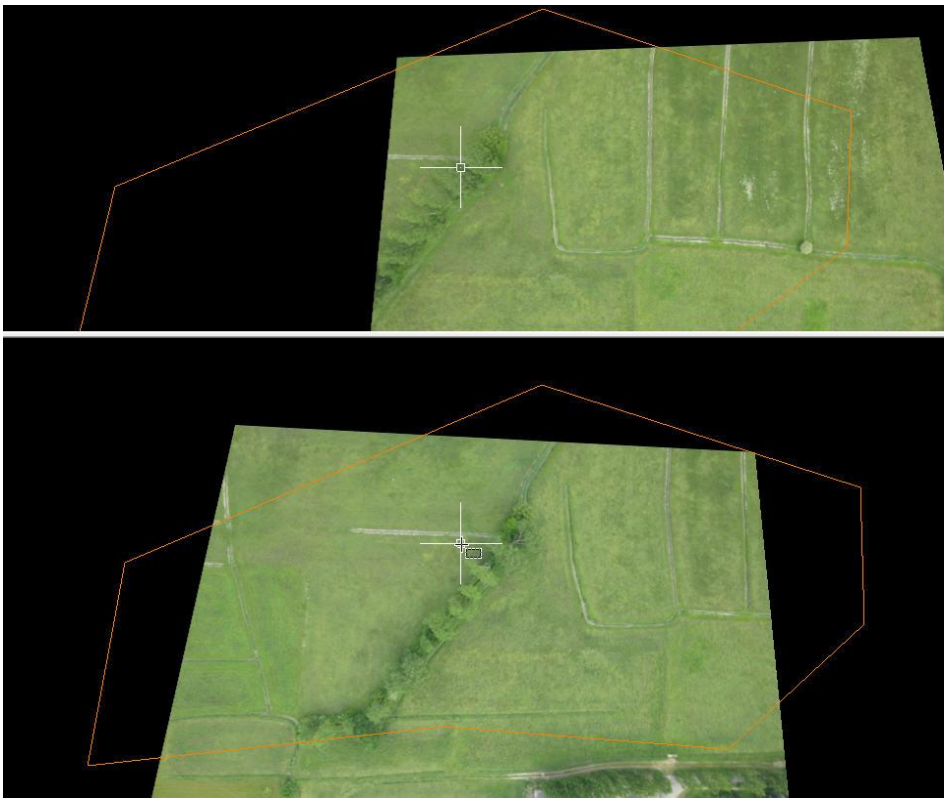
A Digital Terrain Model represents the bare ground surface without any objects like plants and buildings. A DTM can be automatically generated by filtering a Digital Surface Model (DSM) like APS does, or manually, by clicking a grid of points on the ground.

StereoCAD offers a tool to optimize this manual DTM generation, combining the point drawing and stereo features.

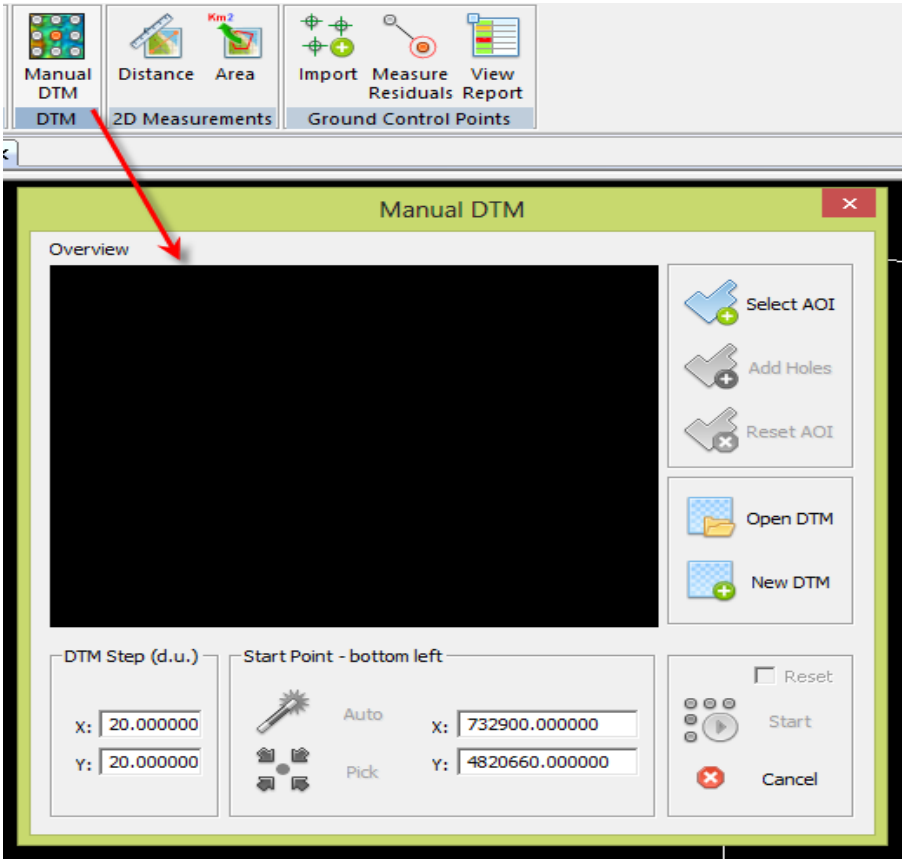
1. draw a bounding closed polyline for area you want to use for DTM.

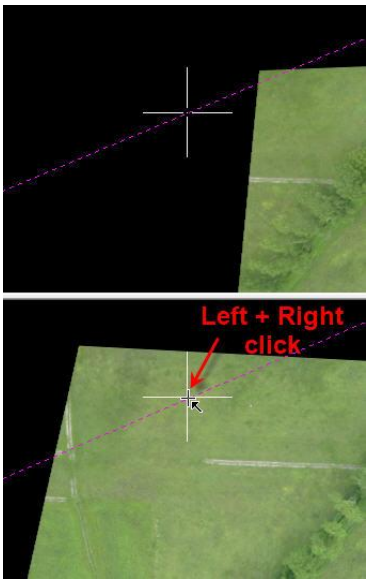


Every part of the area must be viewed by at least 2 images.

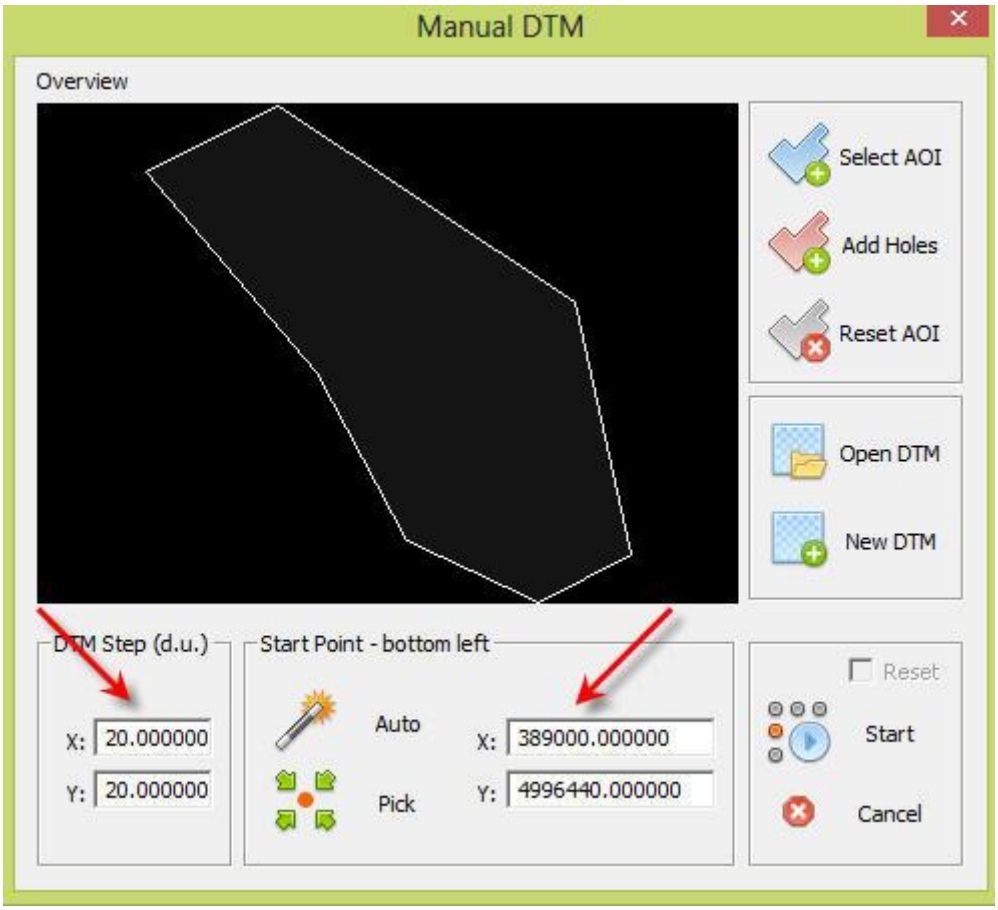


2. on **TOOLS> DTM** , open the **MANUAL DTM** command and **select AOI** area just drawn by clicking left+ right on the mouse buttons

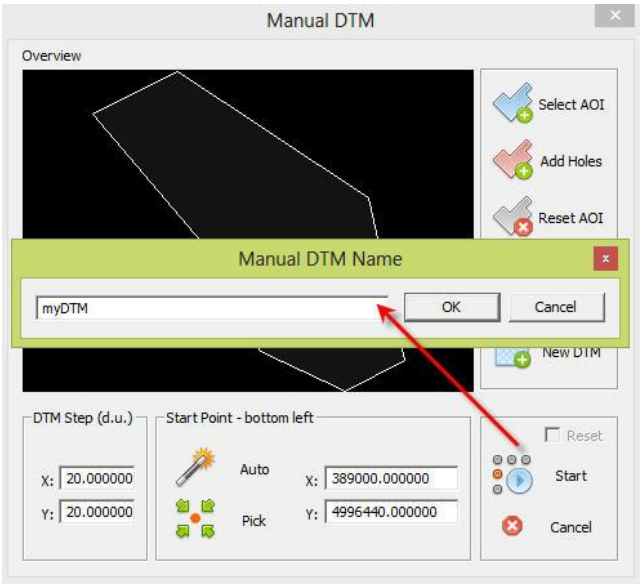




3. Now select the grid step in X and Y to increase the current drawn point position and the start point coordinates.

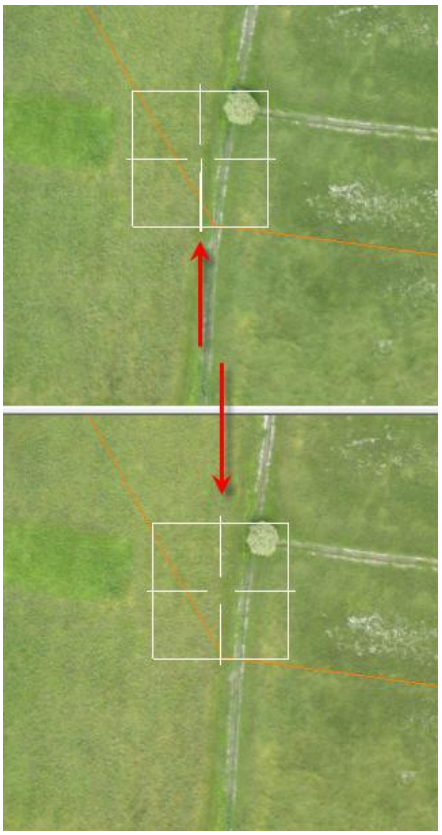


4. Start the drawing command and assign to the DTM a name (it can be opened later in order to continue a suspended job).

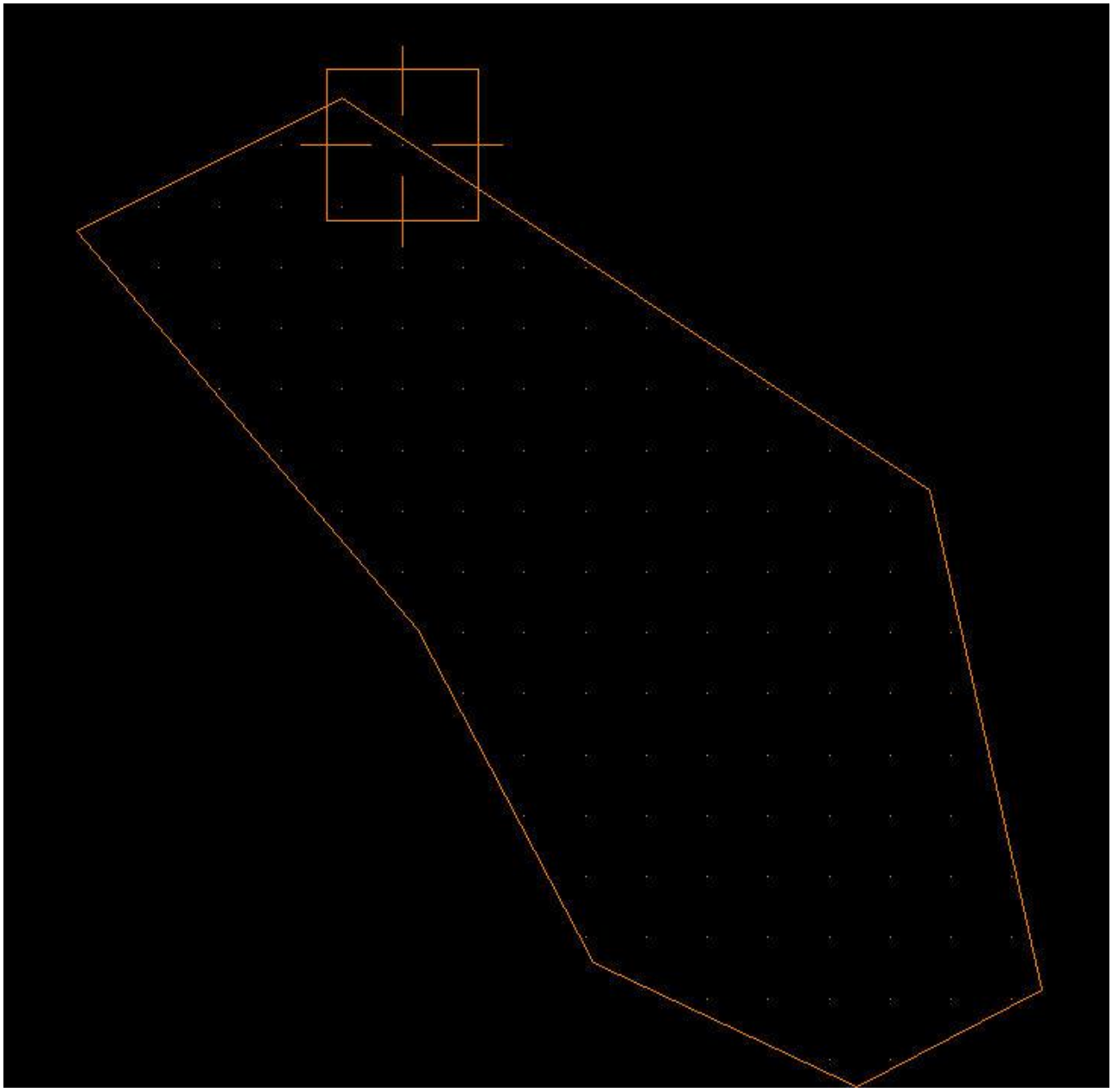


The DTM stereo point picking is started. As you can see in the command line, after the elevation was adjusted to the ground, you can

- press **INS** key and confirm the point
- press **SPACEBAR** and skip the point (if the ground is not visible)
- press **BACKSPACE** and return to previous point to change it
- press **RETURN** to go directly to next DTM row



At the and you will get a DTM result like so, where every point has its own right Z elevation



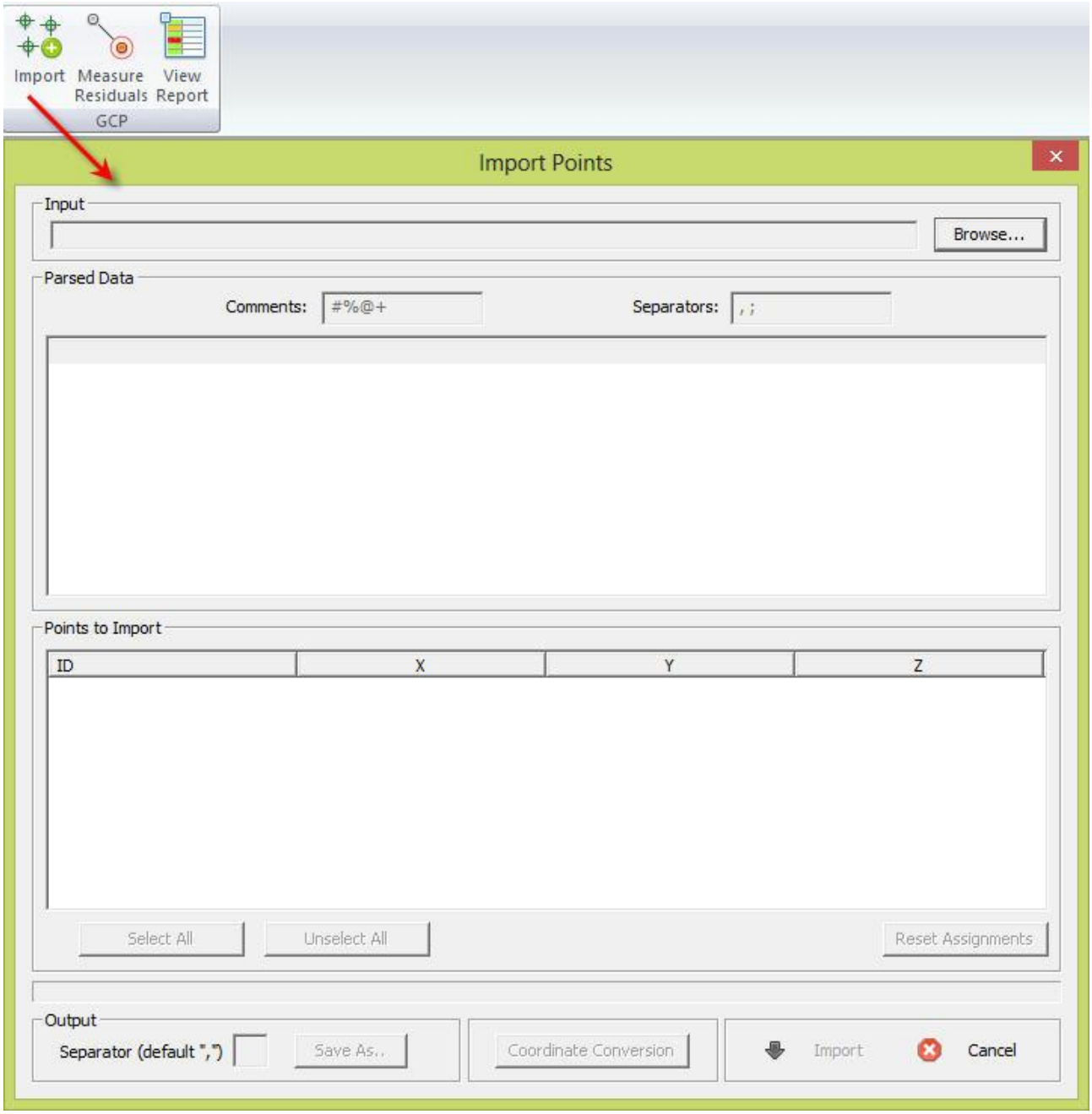
GROUND CONTROL POINTS CHECK

StereoCAD includes a tool to check the residuals of a given ground control points set.

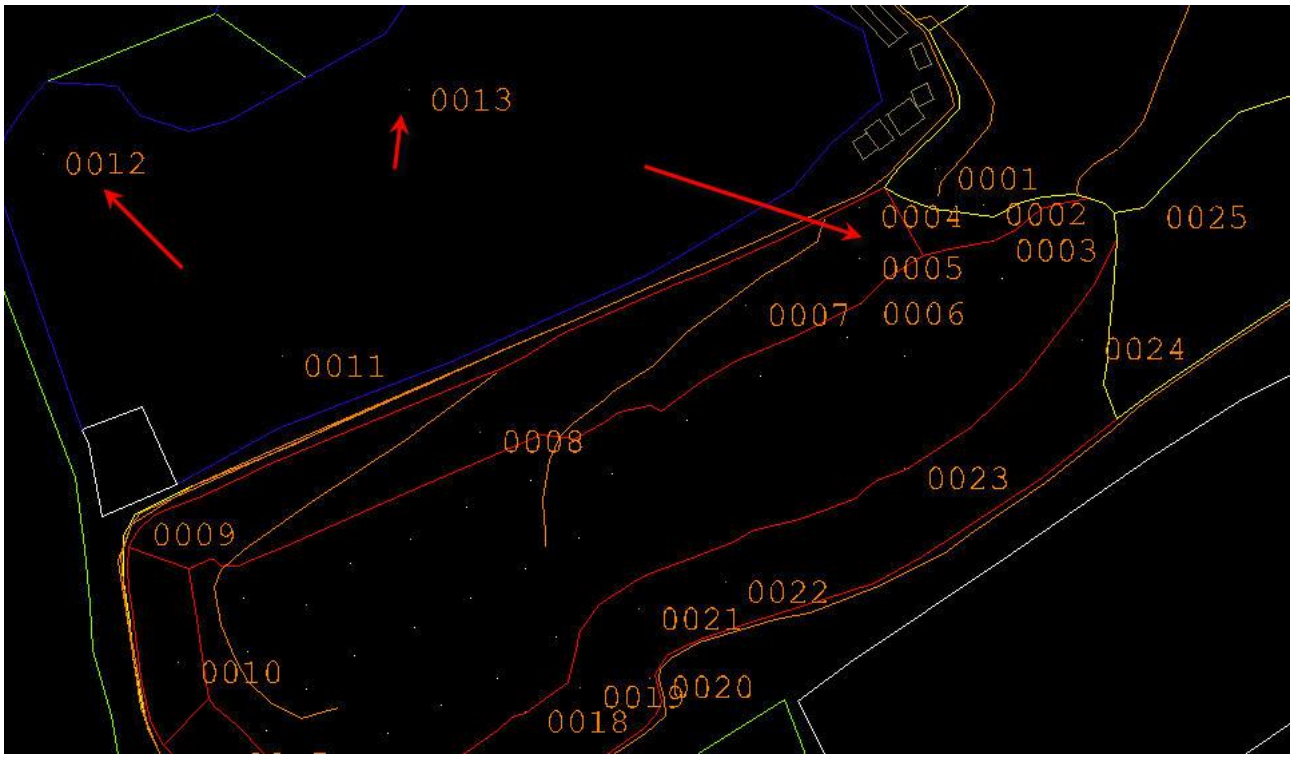
A Ground Control Point or Check Point: is a point located on the ground by precise surveying that, when it is identified on aerial photographs, provides the control necessary for producing a photomap.

You can import the GCPs from a ASCII text file, parsing its content (GCP coordinates and IDs).

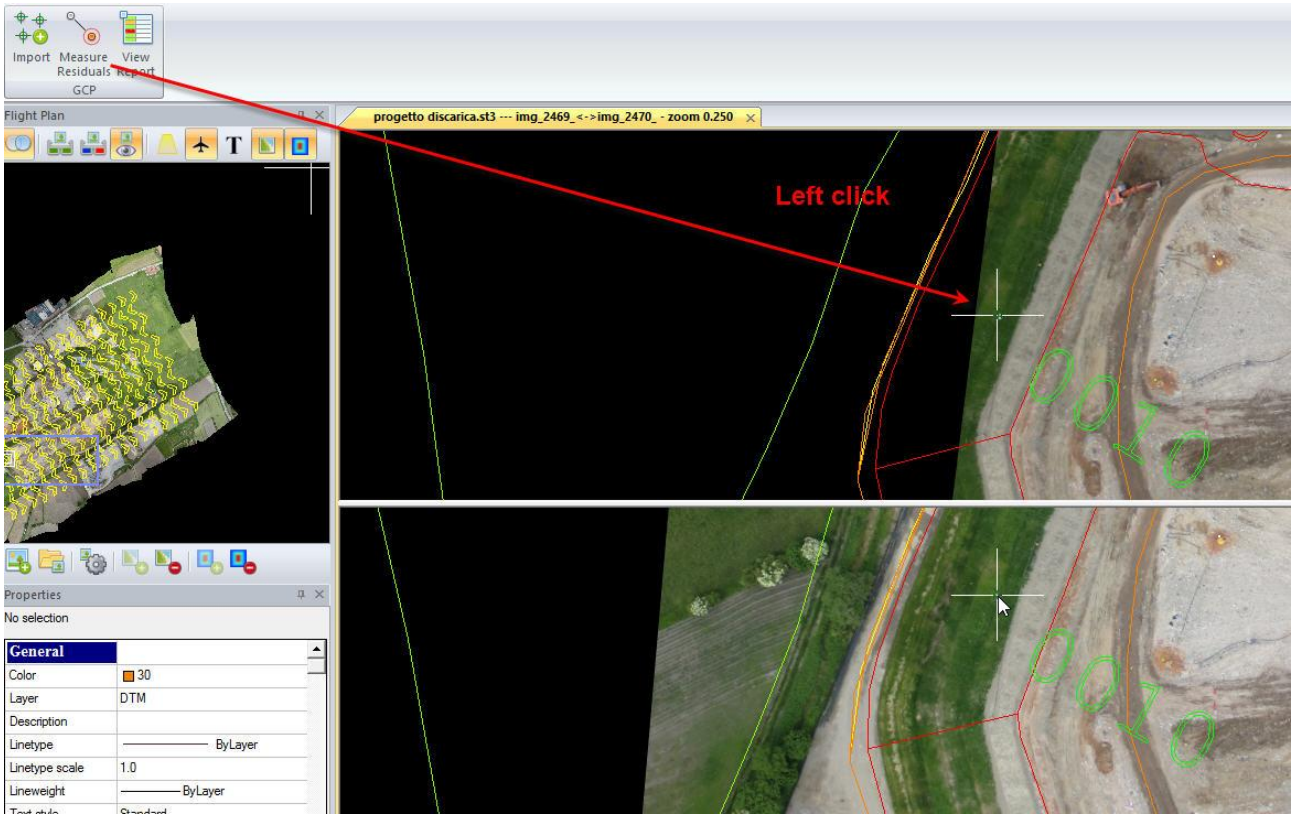
Open **TOOLS> GROUND CONTROL POINT** click on **IMPORT**



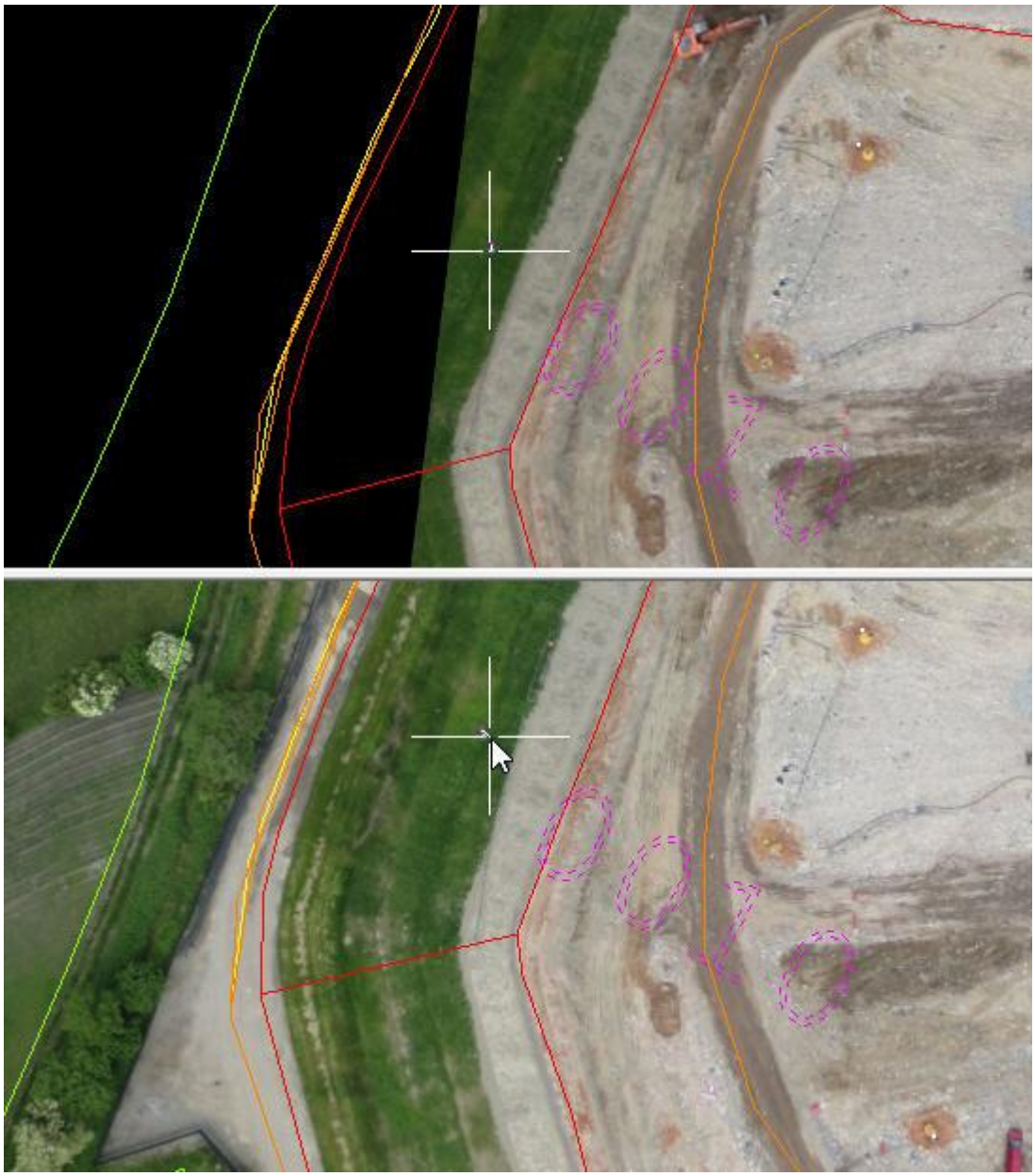
Visit a stereo point and open the stereo view mode where a GCP is shown.



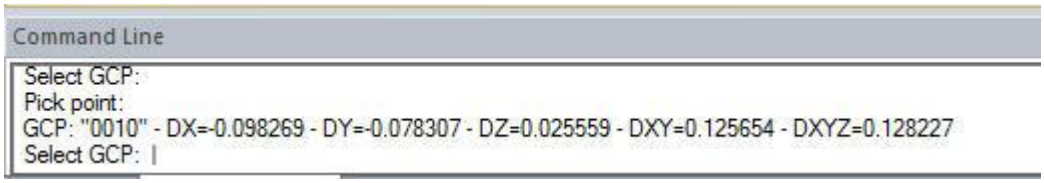
Then start the **MEASURE RESIDUAL** command.



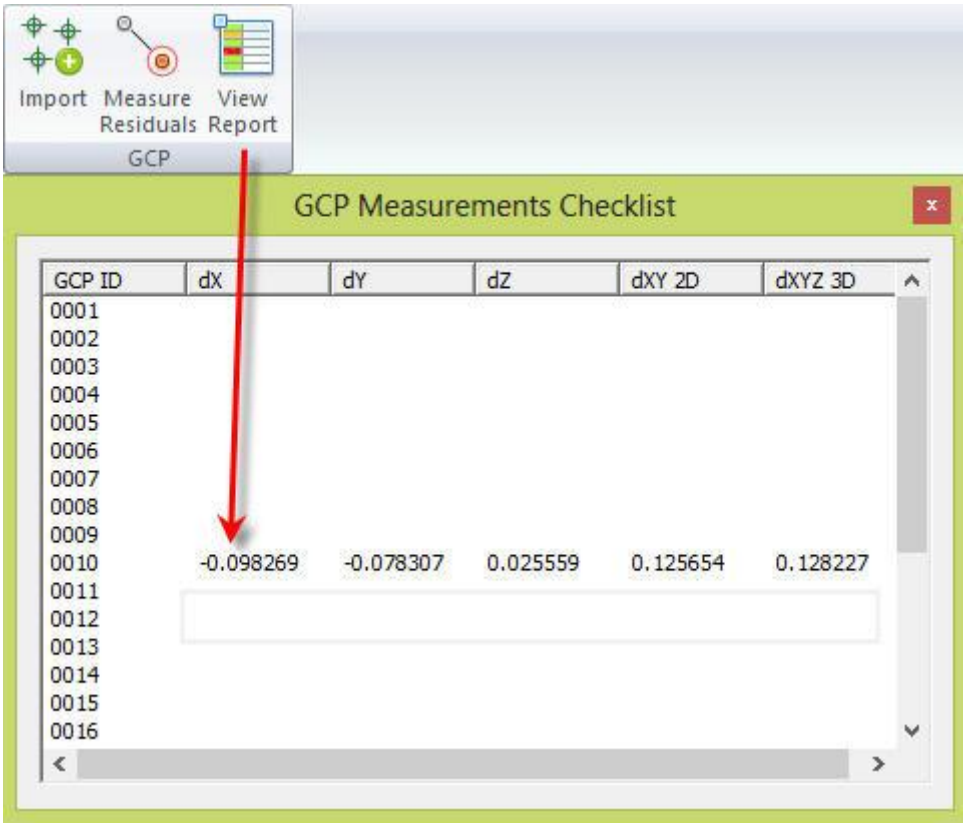
Click on a GCP to select it and start to refine its position/elevation using stereo.



Once you click the final position the GCP coordinates are updated

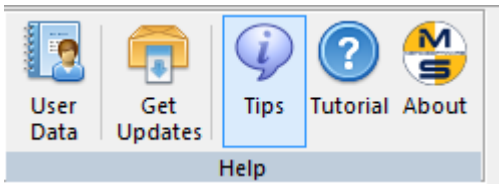


When you close the command and open the check list on VIEW REPORT, you will see the GCP residuals based on your stereo collimation.



HELP, TIPS AND UPDATES

In the last tab of main bar there are some buttons to get help.



The User Data dialog is used to identify reports that could be send by StereoCAD when problems occur. To fix problems related to reports is important you complete the report data with your email.

Get Updates open the remote FTP folder where you can download manually the last StereoCAD installation. Your support license expiration must be valid in order to install latest versions. If you don't know, ask to Menci Software support.

With the Tips you enable/disable tips messages that appear at project opening.

In the About button you get information about your license and the software.

CONTACT

For any technical question please refer to support@menci.com

For any other question refer to francesca.ceccaroni@menci.com

www.menci.com