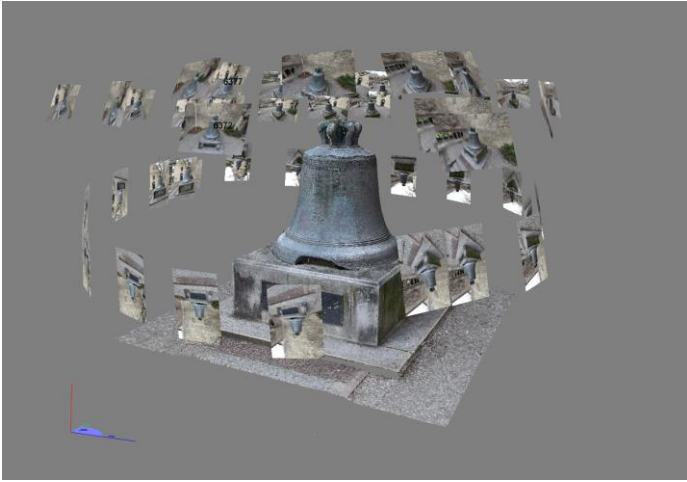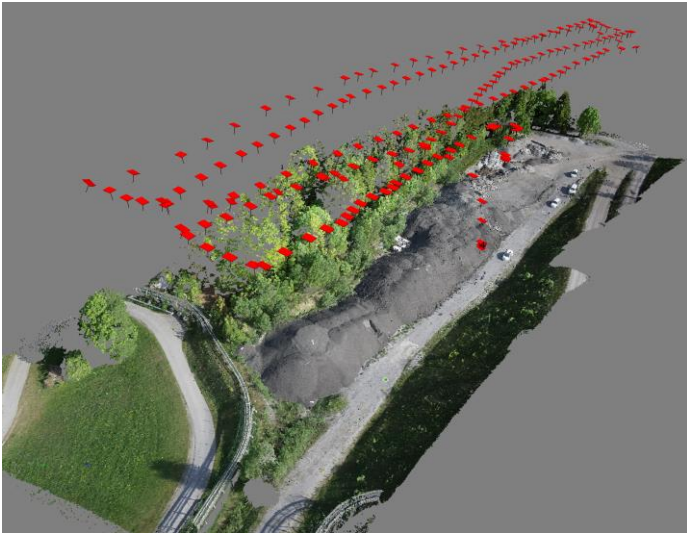# ELCOVISION 10 Version 9: Fully automatic object reconstruction

With **ELCOVISION 10** you can fully automatically and highly accurately reconstruct any objects in 3D: Photograph the object from different points of view, e.g. walk around or along it:

Fly over the area with a drone, helicopter or aeroplane:

Just make sure that any point of the object is visible in at least 3 images from different points of view, e.g. have a good image overlap.

You can use any camera and you can use almost all types of lenses: Normal, macro and fisheye lenses. Special camera systems that are supported are stereo cameras such as the Leica BLK3D or the Leica Imaging Total Stations or spherical camera systems.

The higher the quality of the cameras, the better and more accurate the results, but also images from mobile phones or surveillance cameras can deliver good results.

The cameras/lenses are calibrated simultaneously during the automatic orientation. For applications where very high accuracies are required, the cameras can be calibrated in advance with high precision using a test field. The accuracy achieved then increases by a factor of 2-4.

The accuracy that **ELCOVISION 10** will achieve is approximately the pixel size on the object. Ideally, you should think about the accuracy you want to achieve before taking the pictures and choose a suitable lens for the shooting distance or vary the distance from which you take the pictures. Typically, with standard cameras on facades you can achieve accuracies of 1-5mm, drone images from 30-60m flying height typically give accuracies in the 1-4cm range, depending on the drone camera.

If you need very high accuracies, attach **ELCOVISION 10** targets to the object:

These targets are measured fully automatically with a high subpixel accuracy by **ELCOVISION 10** and thus, when using high-quality cameras, achieve high accuracies in the 0.02mm range even on large objects such as bridges. This allows very accurate deformation measurements to be carried out.

Full automatic workflow

The further work steps are extremely simple: Load the images into the ELCOVISION 10 and start the fully automatic orientation.
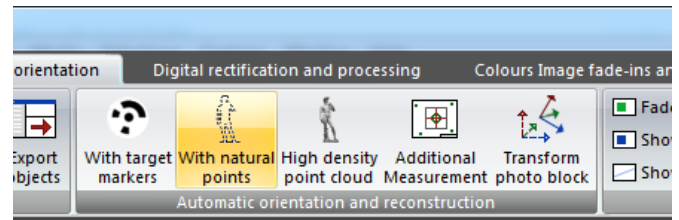
ELCOVISION 10 orients and optionally calibrates all cameras and calculates a high density point cloud of the object.
Even very slight textures on the object surface are sufficient to achieve a good result: Slightly coarse plaster on facades, or a slightly grainy structure of asphalt to model a road, even cars are modelled very well if the paint is not too glossy or possibly even slightly dirty.

## Transformation into the desired system of coordinates

As the last step, you can transform the photo block into your desired system of coordinates: This can be a local coordinate system using distances for scale, or a control point system where you need at least 4 control points. You can use the GPS position information in the images to transform the photo block with a few mouse clicks. For normal drones this is generally sufficient if you don't need a good absolute orientation for example for volume computations. If the drone has an RTK, you automatically have a very good absolute orientation.

Further Evaluation and Data export

Now you have many possibilities to process the automatically generated data: Create for example true orthophotos with ELCOVISION 10:

or do volume calculations, export the point clouds in different formats and process them in other programs, or work in AutoCAD or BricsCAD with the help of the ELCOVISION 10 CAD plugins:
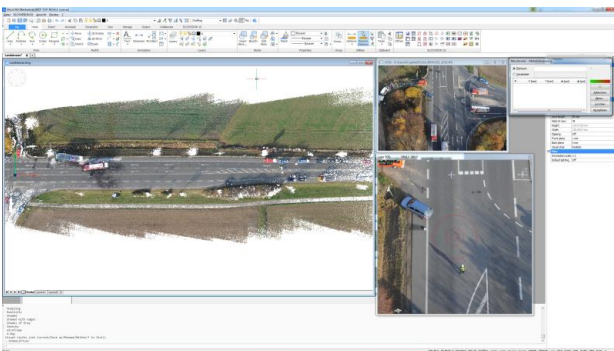
Here you can also import the point clouds or Orthophotos into the CAD drawing with a few mouse clicks and continue working there. With the help of further image measurement functions you can generate further evaluations such as contour maps, profile sections or simply dimension an Orthophoto.

Feature Overview

- Supports all currently available digital cameras
- Supports all types of lenses: "normal" lenses, fisheye lenses and macro lenses.
- Supports stereo cameras such as the Leica BLK3D:
- Supports analog metric cameras with réseau plates from Leica, Hasselblad, Rollei, Pentax, etc.
- Images can be taken freehand, on tripods, airborne and underwater.
- Reads and writes almost all currently known image formats.
- Built-in image processing with contrast enhancement, gamma correction, etc.
- Fully automatic réseau measurement of réseau images from analog metric cameras.
- Fully automatic image orientation if convergence angle <30° and image overlap >65% with currently up to 1000 images/hour and simultaneous calibration of any number of cameras.
- Fully automatic generation of high density point clouds
- Fully automatic detection of points signalled by ELCOVISION 10 targets with high subpixel accuracy for extremely high 3D point accuracies.
- Manual image orientation using single image and double image orientation.
- Definition of 2D rectification planes using rectangles.
- Definition of 2D rectification planes using vertical and parallel lines.
- Definition of 2D rectification planes over arbitrary line squares.
- Linking of 2D rectification planes to each other and also 3D plane positioning via 3D points in space.
- Definition of balanced 3D rectification planes using 4 or more 3D control points.
- Definition of 3D rectification planes using spatial planes and oriented images.

- Arbitrary cutting of rectification planes with automatic determination of the circumference and the area of the resulting rectification plane.
- Digital rectification with lens distortion compensation.
- Automatic assembly (unfolding) of any number of rectification planes to form a digital image.
- Fully automatic generation of 3D rectification planes from AutoCAD and BricsCAD surface models.
- Fully automatic transfer of 3D rectified images into AutoCAD and BricsCAD.
- Measurement methods for point measurement and CAD plug-ins Rectification measurement.
  Single image measurement: intersection of a measuring beam with a 3D plane or with a mesh.
  Two-image measurement: Balanced forward intersection over 2 image measurements.
  Multi-image measurement: Balanced forward intersection over any number of image measurements.
- Measuring aid through epipolar lines.
- Generation of 3D planes for point measurement or as design and measuring aids
- Balanced 3D plane over 3 or more 3D points.
- Creating parallel planes by points or with any distance to other planes.
- Create planes perpendicular to any other planes.
- Evaluation options in the orientation module
- Volumes and area calculations.
- True Orthophoto Generation.
- Simple point and distance measurements.
- Export point clouds in various formats like .e57, .pts, .las, .laz etc.
- Completely integrated into AutoCAD and BricsCAD, all CAD drawing functions can be supplied with measurements.
- Superimposition of a CAD drawing into digital images.
- Numerous additional drawing functions optimised for surveying.
- Integrated 3D surface modeller.
- Generate waterproof surfaces from 3D point clouds and 3D line drawings.
- Create contour lines from surface models.
- Direct measurement and insertion of blocks with automatic block alignment.
- Direct measurement and insertion of cylinders and cuboids.
- Automatic rectification of images into the drawing.
- Automatic insertion of Orthophotos into the drawing.
- Starting with BricsCAD V19: Direct insertion of the generated point clouds into the drawing.

Required Operating Systems and Hardware

Windows 7/8.x/10/11 64 Bit
CPU with at least 4 cores
At least 16GB RAM
SSD recommended
NVIDIA graphics card with at least CUDA 9.1 support.

Available CAD Plugins
AutoCAD 2017 – 2022
BricsCAD V19 – V22

Evaluate ELCOVISION 10 by yourself!

Download the demo version from www.elcovision.com or make an appointment with us for a free online demo.