simactive

CORRELATOR3D™ QUICKSTART GUIDE

OVERVIEW

SimActive's Correlator3D™ software is a photogrammetry solution for the generation of high-quality geospatial data from satellite and aerial imagery, including UAVs. Powered by GPU technology and multi-core CPUs, Correlator3D™ ensures matchless processing power to support rapid production of large datasets.

Correlator3D™ performs aerial triangulation (AT) and generates the following outputs:

- Digital surface models (DSM)
- Digital terrain models (DTM)
- Point clouds
- Orthomosaics
- Textured 3D models
- Gaussian splat models
- Vectorized 3D features

This guide is designed for first-time users and covers a standard workflow from input imagery to final products. A more detailed description of the software can be found in the user's manual.

USER INTERFACE

The main toolbar provides access to the different modules of Correlator3D™. Some modules have their own specific toolbar, displayed vertically on the right side of the main window when active. Once processing is completed within a given module, results can be viewed by selecting an element from the project tree on the left side of the main window.

The main toolbar provides a direct access to Correlator3D™ modules, in the exact order of a standard workflow. From left to right, they represent the following operations:

- Create a project
- Open a project
- Automated workflow
- Aerial triangulation
- DSM creation
- DTM extraction
- DEM editing
- Orthorectification
- Mosaic creation
- Mosaic editing
- 3D model generation
- Feature extraction
- Gaussian splat generation
- Gaussian splat editing

PROJECT CREATION

To assist in the creation of a new project, the software features a wizard to easily specify inputs. The user is first requested to select the type of data to be processed. Once a data type is selected, the project creation wizard consists of the following three steps.

STEP 1: CAMERA CONFIGURATION

- In most cases, a project consists of only one camera.
- Several cameras can belong to the same group or to different groups.

STEP 2: IMAGE SELECTION

- The images to be processed must be selected.
- If the image files do not include exterior orientation data (EXIF), a text file must be imported.
- A projection system must be specified.

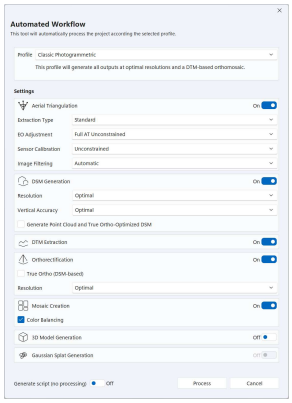
STEP 3: CAMERA PARAMETERS

- In most cases, the camera parameters will be automatically determined by the software.
- Values for the focal length, principal point, pixel size and distortion can also be manually set.

STEP 4: PROJECT PARAMETERS

- The project location on the PC must be specified.
- Optionally, a ground control point (GCP) file can be created or referenced orthophotos can be imported.

AUTOMATED WORKFLOW



Once a project is created, the automated workflow can be used to automatically process the data according the selected profile. Alternatively, users can perform all processing steps through the sequential use of individual modules. The latter approach is recommended for more experienced users and to achieve optimal results.

AERIAL TRIANGULATION

AT is the most critical step of a photogrammetry project. It allows calibrating the camera and refining exterior orientation parameters. The quality of the subsequent DSM, DTM, point clouds and orthomosaics depends on the accuracy of AT results.

The AT toolbar contains direct access to all AT steps, which should be performed in the following sequential order.

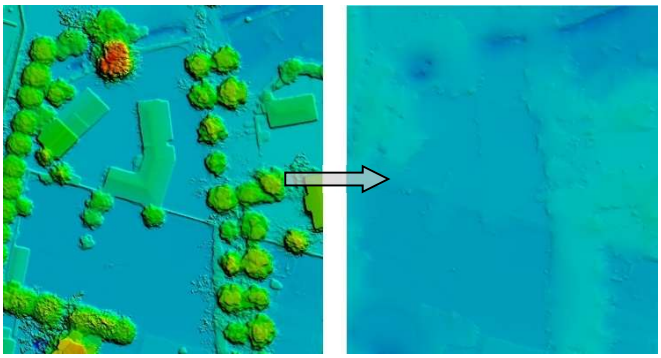
	Allows editing flight lines to remove unwanted images (optional).
	Allows creating GCPs, which ensures absolute accuracy of the final results (optional).
	Automatically extracts tie points between the images.
	Provide manual tie point creation for the user (optional).
	Performs bundle adjustment to calibrate the camera and adjust the exterior orientation of each image.
	Filters AT results by removing images with a tie point residual higher than a specified threshold (optional).

Bundle adjustment results should give an average tie point residual error smaller than 1 pixel. Higher residuals lead to inaccurate subsequent results. Note that a single bundle adjustment step should be sufficient to achieve optimal output. As such, performing additional steps will generally deteriorate accuracy. Unsatisfactory AT results can be due to many factors, but are often explained by an incorrect project setup.

DSM GENERATION

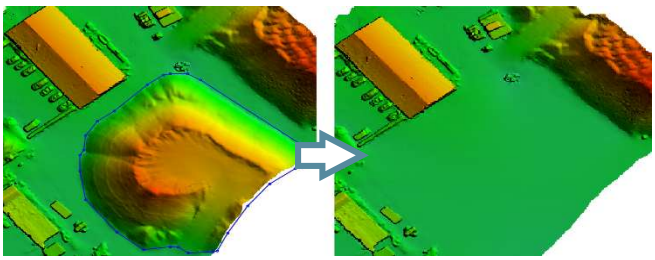
Once AT is done, a DSM can be generated at the output resolution specified by the user. During this process, overlapping regions between successive images are used as stereo data to derive elevation information. If required, a point cloud can also be produced in parallel during the same process.

DTM EXTRACTION



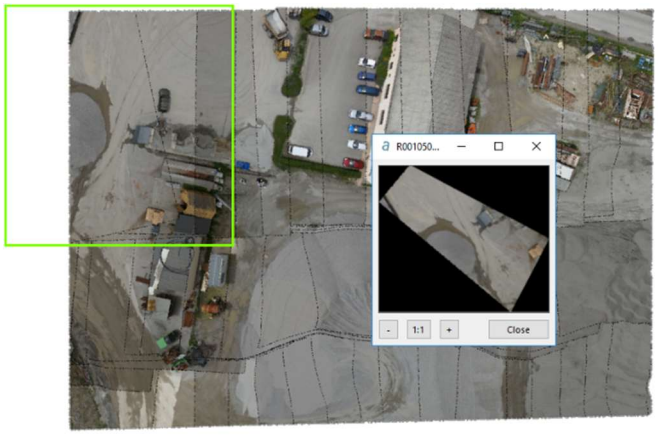
Through automatic filtering of the DSM, a DTM can then be extracted. The software analyzes the DSM and removes structures lying on the ground. DTMs are useful for generating orthophotos as they avoid visual artifacts (e.g. along building edges) caused by using DSMs.

DEM EDITING



While automatically generated DSMs/DTMs are highly accurate, users may still desire to alter them for specific project requirements. The DEM editing module allows selecting a polygonal selection and performing operations such as crop/delete, set/offset elevation values and filter regions. A “Delete and Fill” function is also available for quick removal of structures.

ORTHORECTIFICATION

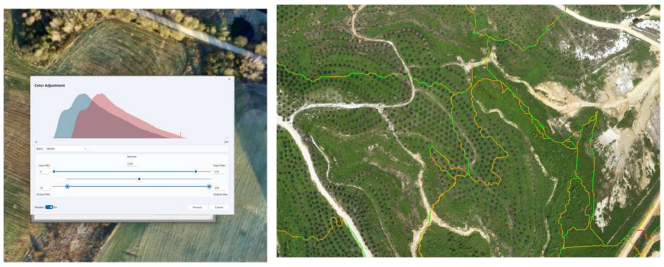


Before an orthomosaic can be generated, individual orthophotos must be created. Orthorectification consists of geometrically correcting the raw images such that they provide an accurate representation of the ground surface. The photos are thus adjusted for topographic relief, lens distortion and camera orientation. Once all orthophotos have been produced, they can be visualized through the software interface.

MOSAIC CREATION

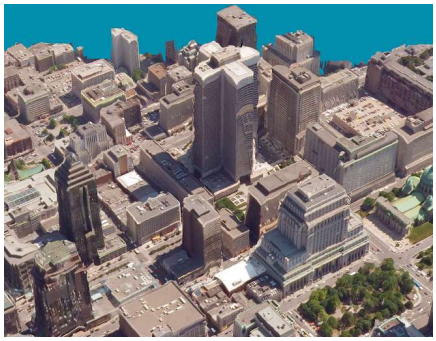
Mosaic creation allows the merging of individual orthophotos to obtain a unique image covering the entire project area. The software automatically selects which portion of which image must be included in the final mosaic. Hence, seamline generation and color balancing are performed to provide smooth and seamless transition between adjacent images composing the mosaic.

MOSAIC EDITING



Automatically generated mosaics can be interactively adjusted. The mosaic editing module allows modifying seamlines with real-time visual feedback on the effect of changes. It can also be used for tuning the global mosaic colors and to enhance its appearance. Once editing is completed, the mosaic can be exported following a tiling scheme defined by the user.

3D MODEL GENERATION



Correlator3D™ can generate photorealistic 3D models. The process creates a mesh from a DSM, then uses input images to texturize it. The size of the output model is determined by the user.

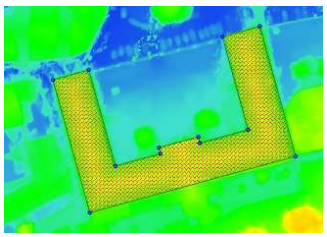
GAUSSIAN SPLAT GENERATION

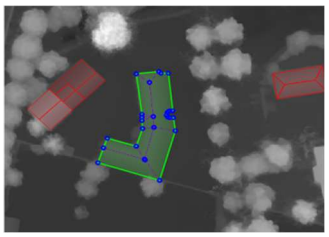
Correlator3D™ can generate photorealistic Gaussian splat models from input imagery and a colorized point cloud. The process uses the point cloud as an initial representation of the scene and refines it using the images to reproduce both its geometry and appearance. Different quality levels are available to balance processing time and visual fidelity.

GAUSSIAN SPLAT EDITING

Generated Gaussian splat models can be interactively refined using the Gaussian splat editing module. Unwanted splats can be selected using rectangular, polygonal or brush selection tools and removed from the model. Undo and redo operations are also available to facilitate iterative editing.

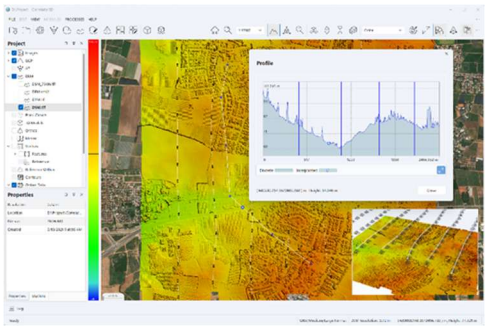
FEATURE EXTRACTION





The feature extraction module enables the user to extract 3D features from a DSM by creating 3D polygons. Automatic contour detection of buildings and other features enable fast footprint collection. This semi-automatic design saves time over traditional vector extraction methods.

ADDITIONAL TOOLS



Correlator3D™ also features additional tools, which allow the following:

- Point cloud colorization
- Point cloud filtering
- Index map creation
- Reflectance map creation
- DEM inspection
- Volume calculation
- 3D profile
- Online data sharing
- Contour extraction
- Pansharpening