simactive
HIGH-END PHOTOGRAMMETRY SOFTWARE

microdrones®

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
- 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

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.
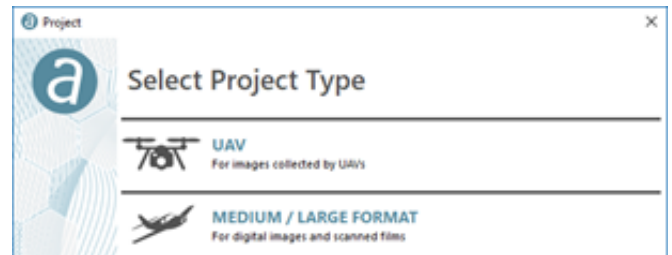
Once a data type is selected, the project creation wizard consists of the following three steps.

STEP 1: CAMERA CONFIGURATION

- In most cases, a project consists of only one camera.

STEP 2: IMAGE SELECTION

- The images to be processed must be selected.
- Exterior Orientations will auto populate via the EXIF data provided with the images, or they can be added via txt file.
- Images are assumed to be WGS 84 Lat\long by default.
- An output projection must be specified.
- If a GEOID offset is known, it can be applied under Altitude Offset.

STEP 3: CAMERA PARAMETERS

- In most cases, the camera parameters are 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 added.
- A reference DEM can be added.
- Reference orthophotos can be added.

AERIAL TRIANGULATION

Aerial Triangulation (AT) is the most critical step of a photogrammetry project. It allows for calibration of the camera and refining of exterior orientation parameters.

The AT toolbar on the right-hand side of the window contains direct access to all AT steps.

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	A graphical tool for removal of unwanted photos as well as ability to edit and merge (or connect) flight lines.
	Allows import of GCPs and/or CPs which ensures absolute accuracy of the results (optional).
	Allows for the creation GCPs and/or CPs which ensures absolute accuracy of the results (optional).
	Automatically extracts tie points between the images.
	Provides manual tie point creation for the user (optional).
	Performs bundle adjustment to calibrate the camera and adjusts the exterior orientation of each image.
	Filters AT results by removing images with a tie point residual higher than a specified threshold (optional).
	Coarse DEM generation.

BUNDLE ADJUSTMENT

Multiple options are available in the Bundle Adjustment dialog. However, the two used with RTK/PPK enabled drones are:

- RTK/PPK Assisted
- Full AT Unconstrained

With the RTK/PPK Assisted bundle adjustment, Correlator3D™ will hold the images XYZ values assuming they are accurate.

With the Full AT Unconstrained bundle adjustment (the default), Correlator3D™ will adjust all image position and orientation parameters.
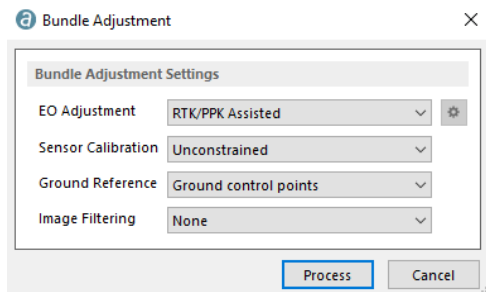
Bundle adjustment results should give an average tie point residual error smaller than 1 pixel. Higher residuals lead to inaccurate subsequent results.

TIE POINT RESIDUAL ERROR AFTER ADJUSTMENT
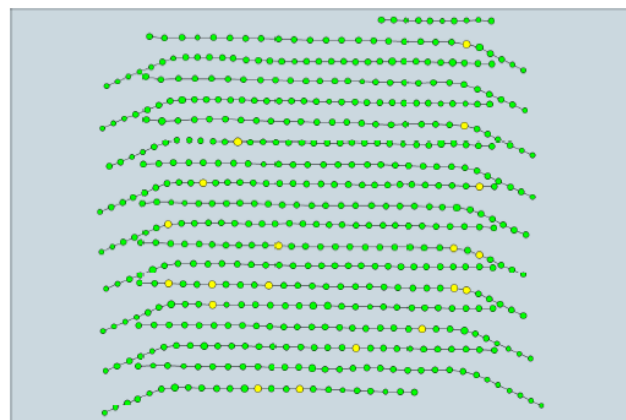
| N/A | 0-0.75 pixels | 0.75-1.5 pixels | >1.5 pixels |

Note that a single bundle adjustment step is sufficient to achieve optimal output for most projects.

An AT Report is generated and presented upon completion of the bundle adjustment. This multiple page report is saved as a PDF in the project folder.

simactive QUALITY REPORT

1. PROJECT SUMMARY

PROJECT

Project type	Aerial
Projection	EPSG:32612 WGS 84 UTM zone 12N
Planar units	METERS
Elevation units	METERS
Camera 1	543 images (Sony Cybershot DSC RX1R II)
Total images	543

GROUND CONTROL POINTS

Average XY error	-
RMS Z error	-
Average projection error	-
Standard deviation	-
Number of GCPs	0

IMAGE TIE POINTS

Quality assessment	EXCELLENT	
Average projection error	0.55	pixels
Standard deviation	0.22	pixels
Average number of tie points per image	127.9	

CHECK POINTS

|		
Average XY error	0.012	m
RMS Z error	0.033	m
Average projection error	0.55	pixels
Standard deviation	0.14	pixels
Number of check points	9	

DSM GENERATION

Once AT is done, a DSM can be generated at the output resolution specified by the user.
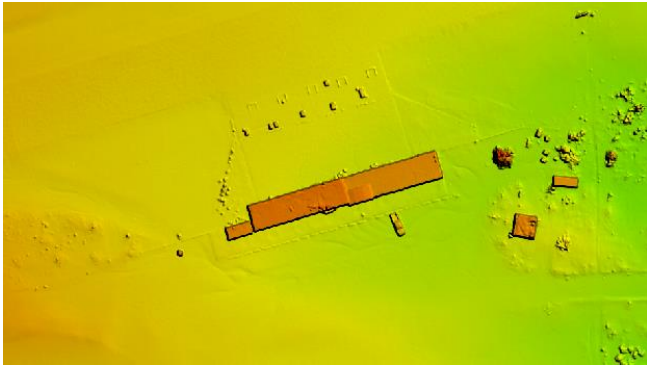
During this process, overlapping regions between successive images are used as stereo data to derive elevation information.

If required, a point cloud can also be produced in parallel during the same process.

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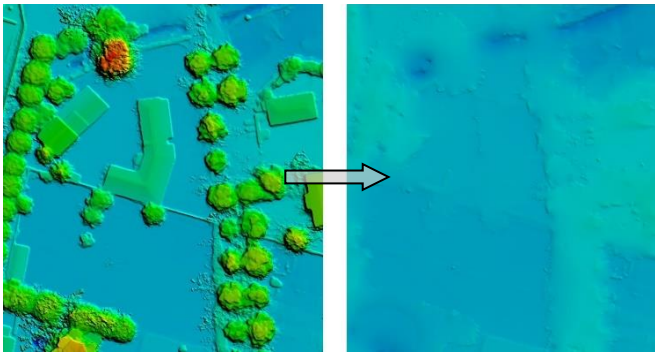
Through automatic filtering of the DSM, a DTM can then be extracted. The software analyzes the DSM and removes structures lying on the ground. DTMs are useful for generating orthophotos as they avoid visual artifacts (e.g. along building edges) caused by using DSMs.

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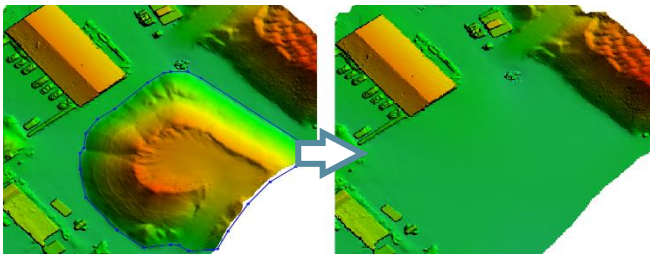
While automatically generated DSMs/DTMs are highly accurate, users may still desire to alter them for specific project requirements. The DEM editing module allows selecting a polygonal selection and performing operations such as crop/delete, set/offset elevation values and filter regions. A "Delete and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

ORTHORECTIFICATION
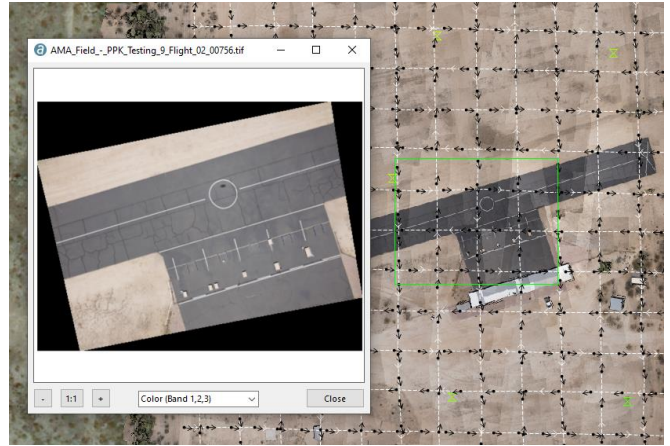
Before an orthomosaic can be generated, individual orthophotos must be created. Orthorectification consists of geometrically correcting the raw images such that they provide an accurate representation of the ground surface. The photos are thus adjusted for topographic relief, lens distortion and camera 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 edited using the mosaic editing module. This allows for manual modification of seamlines with real-time visual feedback on the effect of changes.

The module 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.
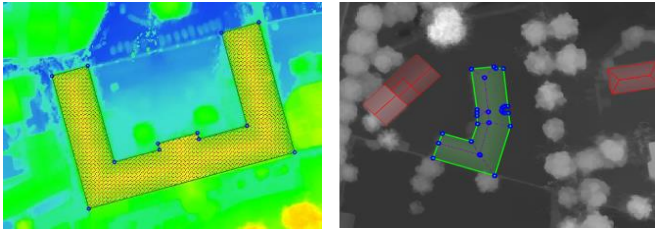
3D MODEL GENERATION

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.
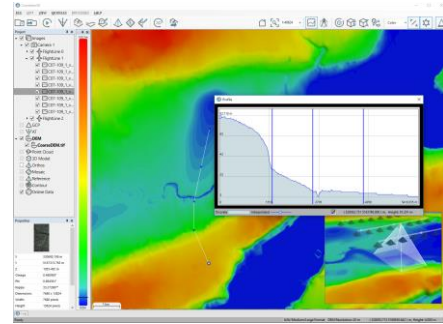
FEATURE EXTRACTION

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
- Index map creation
- Reflectance map creation
- DEM inspection
- Volume calculation
- 3D profile
- Online data sharing
- Contour extraction