CATALYST
PROFESSIONAL

ADS Ortho Suite Module: Description

The ADS Ortho Suite is an add-on module to CATALYST Professional Essentials.

The ADS Ortho Suite includes rigorous models used to correct the geometry of analogue and digital cameras and to produce orthorectified air photos. These models compensate for the effects of varying terrain and for the distortions inherent to a camera, such as the curvature of the lens, focal length, perspective effects, and the camera's position and orientation. The computed math model calculates the camera's position and orientation when an image is taken.

CATALYST is a PCI Geomatics Enterprises Inc. brand, which has been introduced to put our leading-edge technology into the hands of decision makers. CATALYST provides proven algorithms rooted in photogrammetry and remote sensing to offer engineers, environmental management, and geospatial professionals access to leading edge and scalable software solutions and platforms.

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Module Prerequisites

The ADS Ortho Suite is an add-on package to CATALYST Professional Essentials bundle or comes included with the following bundles: Airphoto bundle, Complete bundle, Developer bundle.

Supported Air Photo Formats

CATALYST Professional supports the following aerial image formats in ADS Ortho Suite (ADS)

Leica Airborne Digital Sensor (ADS)

The Leica airborne digital sensor (ADS) is a line-scanning sensor that collects images in long strips up to 24,000 pixels wide. This camera can simultaneously collect panchromatic, color, infrared and stereo imagery. All multispectral bands are collected simultaneously providing five-band, co-registered imagery at a common, high resolution.

Camera Calibration

Camera calibration information is needed in the orthorectification of air photos. The camera calibration information includes essential camera parameters, distortions, and fiducial mark measurements.

Calibration Information Entry

The calibration panel has two modes:
- Focal length (FL) and principal point offset (PPO)
- Focal length (FL), principal point of autocollimation (PPA) and principal point of symmetry (PPS)

The following calibration information can be entered:
- Focal length
- Principal point offset or Principal point of symmetry / Principal point of autocollimation
- Radial lens distortion
- Decentering distortion
- Fiducial marks from calibration report
    - Entered as Edge, Corner, or Edge and corner positions
- Photo scale

- Select whether to apply atmospheric refraction correction
- Select whether to apply earth curvature correction
  - Earth radius
- Chip size and y-scale factor (digital/video image projects)
- Apply self-calibration (analog projects only)
  - Deviation limits required for focal length and principal point offset

The camera calibration information can also be exported, using the Tools > Export > Camera Calibration Parameters to XML menu item. If the user has an existing XML file they can easily import that in the Calibration panel.

Fiducial Mark Collection
- Interactively selects fiducials from scanned images
- Links camera calibration fiducials with selected fiducials

Ground Control
The OrthoEngine air photo models support imported Global Positioning System and Inertial Navigation System (GPS/INS) data and existing triangulation solutions, as well as ground control point (GCP) and tie point (TP) ground control.

Import GPS/IMU Data
Using the onboard GPS and inertial measurement unit (IMU) you can:
- Skip GCP and TP collection
- Import from any sensor system that uses omega, phi, and kappa
- Use GPS/IMU only, or supplement with GCPs, TPs, or both
- Perform kappa rotations
- Manually edit GPS and IMU data

Import Existing Triangulation Solutions
Using existing triangulation solutions, you can:
- Skip GCP and TP collection
- Manually edit existing triangulation solutions

GCP Collection
GCPs can be collected manually, or automatically by using:
- A geocoded image

- Geocoded vectors
- A chip database
- An imported text file

Other features include:
- Stereo (and multi-way) GCP collection
- Conversion of GCPs to check points to exclude them from model calculation
- Display of individual and overall RMS error for GCPs

Tie Point Collection

- Extends ground control over areas without GCPs
- Identifies how images in a project relate to each other
- Ensures the best fit for all the images in the project
- Imports and exports TP locations
- Allows entry of TP elevations manually or extracts them from a DEM automatically
- Show individual and overall RMS errors

Bundle Adjustment

Using the option for bundle adjustment settings, found in the *Tools* menu, you can adjust the methodology used during the model calculation. The following modes are available:
- Traditional block bundle
- Enforced fitting
- Relative-absolute orientation
- Relative orientation
- Absolute orientation
- Free network adjustment

Residual Report

Using residual reports, you can:
- Show GCP, CP, TP, GPS/IMU, and stereo (and multi-way) GCP error information in one report
- Edit points and update bundle adjustments
- View in ground units, photo pixels, or photo microns
- Print the report to a file

Project Summary Information

Raw Image Summary Table

A summary of information about all of the images in your OrthoEngine project can be viewed in the Raw Image Summary Table window. This window provides information about the following:

- Total number of images in the project

- Total number of GCPs, TPs, and CPs

- Image-specific information, including image ID, GCPs, TPs, CPs, root mean square (RMS) error, number of overlapping pairs connected by TPs, number of potential overlapping pairs that could be connected by TPs, and the percentage of all overlaps connected by TPs

The Raw Image Summary Table provides you with a dynamic view of your project, allowing you to better target your quality assurance efforts to achieve your desired project requirements. Image-specific information is displayed in tabular format. The tabular contents can be sorted, making it easier to analyze the data in your project and identify areas on which to focus your quality assurance activities.

The Raw Image Summary Table window displays both active and inactive images in your project. You can activate and deactivate one or more of the images in your project using the check box column. An active image is included in any processing you want to do on your project. When you deactivate an image, it is still in your project, but is excluded from processing. You can also activate and deactivate images in the Project Overview window.

Project Overview

The Project Overview window provides a graphical display of the raw images in your project, while the Raw Image Summary Table lists all pertinent information in table format. You can use both windows together to gather relevant information about each image in your project, allowing you to better target your quality control efforts and manage your project.

By default, the Project Overview window displays centers of each raw image in project. You can choose to display image centers, geocoded vector footprints, and/or thumbnails of the imagery. You can also toggle the display of ground control points, tie points, and check points, as well as Image and Point IDs, for all images or for selected images only.

Note: When Raw Image Summary Table is open, Project Overview window displays current image with a yellow border and its image ID.

This viewer helps users to better assess their project using a graphical overview. It also includes some simple tools to assist in project management like:

- Ability to display reference imagery or vectors
- Rotating the kappa of the input imagery
- Measurement tools

Orthorectification

- Can run as a batch process

- Utilizes a DEM for terrain correction

- Can increase the size of the working cache for faster processing

- Can increase the sampling interval for faster processing

- Offers the following resampling methods:

    o Nearest Neighbor

    o Bilinear Interpolation

    o Cubic Convolution

    o 8-pt Sin X/X

    o 16-pt Sin X/X

    o Average filter

    o Median filter

    o Gaussian filter

    o User-defined filter

- Clips the image size upon orthorectification

- Can use a scheduled start time

- Provides approximately one-third of a pixel accuracy for VIR satellite images, and approximately one pixel for radar images when quality ground-control coordinates are used

Mosaicking

When you initiate mosaicking OrthoEngine opens the Mosaic Tool application, in which you can perform all of the tasks necessary to create the mosaic.

If the images in your project are orthorectified, the Mosaic Tool New Project Wizard appears, and the images appear in the Source file box on the Source Images page of the wizard; otherwise, a message appears, prompting you to create the orthorectified images.

Mosaic Tool

Mosaic Tool features a wizard to make creating a mosaic project with ease. The Mosaic Tool wizard walks you through the following steps to ensure everything is properly set up to create a mosaic:

- Source files to use
- Key details, such as size and extents
- Applying color balancing, normalization, or both to the input images
- Selecting how to create cutlines and mask layers
- Previewing the mosaic

Import/Export

When working with an airphoto project in OrthoEngine, users also have the ability to import or export their project for use with the following third-party software packages:
- BINGO
- DAT/EM
- PATB
- Supresoft

You can import and export:
- Camera-calibration information, such as a distortion grid
- An exterior orientation (EO) file (x, y, and z coordinates of image centers and orientation angles of the photo: omega, phi, kappa)
- Corrected point coordinates and errors (standard deviations)

You can use either of the following recommended workflows:
- Start a project in BINGO, DAT/EM, or PATB as applicable. After completing point collection and error refinement, import the project into OrthoEngine. You can then perform orthorectification and mosaicking on the project, as necessary.
- Start a project in OrthoEngine. After collecting your TPs and stereo GCPs, export to BINGO, DAT/EM, PATB. or Supresoft, as applicable.

Functions

With a license for the ADS Ortho Suite, the following functions can be executed either independently or sequentially via an EASI™ or Python™ script. They may also be available in the Algorithm Librarian in CATALYST Professional's Focus and Modeler applications.

- ADSADJUST – Adjusts the ADS math model in a standard ADS dataset.

- ADSCOPYCORR - Copies ADS model-correction terms from one segment to another. For example, panchromatic ADS model-correction terms can be copied to a multispectral file such that the panchromatic and multispectral models are synchronized.

- ADSL0TOL1 - Converts ADS products from Level 0 to Level 1.

- ADSMODEL - Performs a bundle-adjustment computation on photos acquired with an ADS that has GCPs and TPs.