# Ortho Production Toolkit

The Ortho Production Toolkit is a collection of powerful automated tools for the orthorectification and mosaicking of aerial and satellite imagery.

The module includes tools for the automatic collection of airphoto fiducial marks, multi-way tie-points and ground control points (GCPs) for image registration and true orthorectification, as well as automated mosaicking, including automatic color balancing and cutline selection.

## Module Prerequisites

The Ortho Production Toolkit requires Geomatica Core or Geomatica Prime, plus one of the associated sensor suites (Air Photo Ortho, ADS Ortho, Satellite Ortho, or Radar Ortho).

## Auto Tie Point and Fiducial Collection

The Ortho Production Toolkit supports automatic fiducial-mark and automatic tie point collection.

### Automatic Fiducial-Mark Collection

Once fiducials are manually collected for one image in your project, the fiducial marks for remaining images can be collected automatically using pattern matching.

Verify the accuracy of automatically collected fiducial marks through a GUI interface or automatically generated text report.

### Auto Tie-Point Collection

Tie points are collected using automated image-correlation techniques, which:

- Let you distribute evenly over an entire image or in overlapping image/photo regions only
- Use moving frames with a search radius (100 pixels default)
- Specify a matching threshold (a minimum correlation score is required for a match)
- Use a DEM to extract elevation values of tie points
- Collect tie points for the working image or all images

## Auto-Image Registration

The Ortho Production Toolkit offers the following registration functionality:

### Automatic Image-to-Image Registration

- Uses advanced image correlation to identify pixel and line locations in raw images that correspond to georeferenced image positions
- Allows for repeat mapping or compositing
- Definition of the number of GCPs you want collected over each image
- Collects points in an evenly spaced pattern over an entire image
- Uses a DEM to automatically supply elevation values of GCPs
- Supports scripted or automated workflows
- Allows you to accept or reject correlated matches displayed in table

## Automatic GCP Collection from Chip Database

The chip database engine stores, updates, and retrieves image chips. Image chips are used to automate the collection of GCPs on raw imagery, which:

- Uses image correlation to identify pixel and line locations in raw image that correspond to georeferenced image chip positions
- Is useful when orthorectifying different images of the same geographic area
- Can define search criteria, such as sensor, range of acquisition dates, and region of interest
- Will let you accept or reject correlated matches displayed in table

## Chip Database Creation

Chip databases are created using the powerful Geomatica Chip Manager interface.

- Insert, search/view, update, and delete image chips in an image chip database
- Automatically create image chips using a GCP segment and source image
- Attach sensor, date, projection and metadata of source image to image chips
- Enables the merging of two imagery chip database files
- Generates chip reports

# Automatic Mosaicking

Ortho Production Toolkit includes automatic removal of image brightness variations, color balancing between images and cut-line determination to minimize visible seams in the mosaic.

- Allows the following normalization methods:
  - Hot Spot removal
  - Across Image 1st Order
  - Across Image 2nd Order
  - Across Image 3rd Order
- Automatically collect cutlines using:
  - Minimum difference method
  - Minimum relative difference method
  - Edge features method
  - Entire image method
- Provides automatic color balancing using:
  - 2-step bundle color-balancing method
    - Global adjustment to minimize the overall differences between all overlapping areas. This adjusts both the mean and sigma (brightness and contrast)
    - Dodging modeling to try and remove the remaining differences
  - Entire image (histogram) method
  - Overlap area method
- Offers a mosaic preview for checking color balancing and cutline seams
- Color balancing techniques:
  - Look-up table: Color balances each input image based on pre-defined look-up tables that have been saved back to the image files
  - Neighborhood: Determines a set of coefficients that modify each image pixel based on the pixel values of the intersecting (neighboring) pixels
- Control reference image selection for increasing control over color balancing and cutline generation

# True Orthorectification

True orthorectification corrects geometric distortions in orthorectified images caused by sensor tilt, ground surface relief and aboveground objects, such as buildings and bridges. It fills occluded areas in each ortho image with valid pixels from overlapping images. Objects are shown in their actual planimetric locations on Earth, which provides a means for accurate measurement.

Ortho Production Toolkit true orthorectification uses either a DEM with buildings already burned-in, or a vector building model file as an input.

## Functions

With a license for the Ortho Production Toolkit, 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 Geomatica Focus and the PCI Modeler.

- AUTOCHIP – automatic GCP collection from image chip database
- AUTOCUT – automatic cut-line generation
- AUTOFID – automatic collection of image coordinates of fiducial marks
- AUTOGCP –automatic GCP collection using image-to-image registration
- AUTOMOS – automatic mosaicking
- AUTOTIE – automatic tie point collection
- CHIPEXT – automatic image chip extraction
- FFTMPOLY – automatic GCP collection by matching image with polygons
- FFTMVEC – automatic GCP collection by matching image with vectors
- GCPCAND - candidate generation for automatic GCP collection
- GCPREFN – automatic GCP refinement
- HOTSPOT – hot spot correction
- MOSDEF – mosaic definition preparation
- MOSPREP – mosaic scene list preparation
- MOSPREVIEW – low-resolution mosaic preview
- MOSRUN – mosaic creation
- OEBLUNDER - automatically detect and removes blunders in an OrthoEngine project.
- OEBUNDLEOPT - updates a Geomatica OrthoEngine project file with new bundle options.
- OEPNTTHIN – thins tie points (TPs) and ground control points (GCPs) in an OrthoEngine project.
- PNT2CHIP – convert points into a chip database
- RAW2CHIP – automatic chip extraction from a raw image and its GCP segment
- RMOVERLAP – remove overlap from input polygons
- TPREFN – tie point refinement
- TRUEORTHO – true orthorectification

**For more information, contact**

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