INPHO SOFTWARE
MATCH-AT

HIGH THROUGHPUT AERIAL TRIANGULATION WITH AUTOMATED TIE POINT SELECTION, MULTI-RAY POINT MATCHING AND BUNDLE ADJUSTMENT, GNSS AND IMU SUPPORT AND CALIBRATION OF CAMERA AND BORE-SIGHT MISALIGNMENT. PROCESSES FRAME SENSORS, SATELLITE IMAGERY AND PUSHBROOM DATA.

KEY FEATURES

Fully automatic tie point matching and tie point transfer with a fully integrated robust bundle block adjustment allowing for iterative refinement of complex orientation tasks

Multi-camera support with full calibration capability

GNSS/IMU trajectory corrections

Repeatable quality ensured by thorough, reliable and easy to understand graphical as well as statistical analysis

Support for frame imagery, satellite imagery and pushbroom sensors (with MATCH-AT pushbroom)

Precise aerial image triangulation with exceptional performance:

- Geo-reference blocks of aerial imagery based on the advanced and unique image processing algorithms for both frame and with MATCH-AT Pushbroom, line sensor data
- Fully automated processing even for large projects
- Processing is independent of flight geometry and supports completely arbitrary flight patterns
- Automatically extract tie points in frame images at optimal locations using multi-ray image matching
- Measure or verify control and tie points, guided by graphical block analysis
- Orient image blocks using proven bundle block adjustment and quality control tools
- Rigorous GNSS and IMU data support, including calibration of boresight misalignment and shift and drift corrections

Due to its flexible data exchange capability MATCH-AT easily integrates into the workflow of any third-party photogrammetric system.

EVERYTHING YOU NEED IN ONE PACKAGE

- Tie point measurement
- Robust bundle adjustment
- Thorough intuitive QA/QC
- Complete camera calibration
- Exports/Imports
- includes inBLOCK for most flexible parameters, correction strategies and analyzing capabilities

PRODUCT HIGHLIGHTS

- Single, automatic process for point selection, point transfer and measurement, along with an integrated and robust bundle block adjustment requires minimum user interaction
- Support of any film or digital frame sensor, satellite data and pushbroom sensors (MATCH-AT pushbroom)
- No block size, shape or overlap limitations; tested with projects at 90/80 percent overlap and block sizes of up to 40000 images (20000 images in one sub-block)
- Tie points are automatically collected in image areas best contributing to the block strength and quality; Von Gruber positions can be used, or other patterns in case of rectangular image formats or special image overlap situations
- High precision tie point correlation (0.1 pixel) is achieved using an advanced combination of feature-based and least-squares matching, with multi-threading support
- Effective tie point matching also in poorly textured, as well as mountainous areas
- Strong internal tie point quality control achieved by performing robust bundle block adjustment in each level of the image pyramid
- Flexible weighting schemes for all types of observations
- Multi-phase blunder detection
- Internal & external reliability measures

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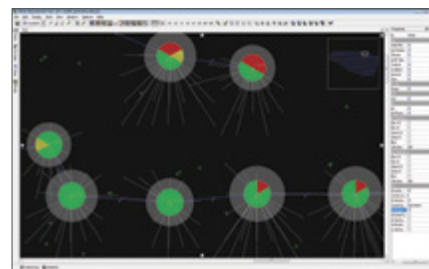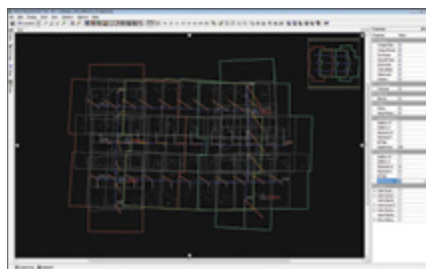
FEATURES OVERVIEW

Multi-camera support in one block and camera specific self-calibration

- Self-calibration results are made available as a dense correction grid for further use in any subsequent applications
- Full camera calibration with inBLOCK camera calibration mode (focal length, principal point, distortion) including calibration report. Physical (5), Brown (16), Ebner (12) or 44 parameter distortion models.
- Powerful adjustment engine:
  – Free block adjustment possible
  – Flexible weighting schemes
  – Sparse matrix technology
  – Bandwidth minimization
  – Reduced normal equations
- Fully automatic interior orientation for film cameras
- Project-wide photo display with correct topology, and auto image-selection for interactive, guided control point measurement.
- Multiple stereoscopic display for easiest stereoscopic manual point measurement

- Advanced sub-block handling
  – Sub-blocks enable easy administration, visualization and analysis of large blocks
  – Free block adjustment allow sub-blocks adjustment without control points
  – Sub-blocks as well as complete sub-projects can be merged

- GNSS data handling with shift and drift determination

- IMU data handling:
  – Preprocessed GNSS/IMU data from POS AV/POSEO by Applanix and AEROControl by IGI or similar
  – Attitude data are used as constraints in the integrated block adjustment
  – Boresight misalignment calibration (correction with up to 3rd polynom order)

- Calculation of ray intersections to check accuracy in specific stereo pairs

- Transform projects between different datums and projections, grid-based transformations, 7-parameters transformations and geoid application available

- Optionally the triangulation can be made in a local space rectangular coordinate system to avoid tensions caused by map projections

- Powerful intuitive graphical block analyzer:
  – Easy visual checking of large data sets
  – Visualizations: image footprints; overlaps; ground control and tie points; point and photo connections; residuals; error ellipses; geometric sector analysis for points and images; binning cell analysis for point density/connectivity; useful display filters, for example multi-strip connections and more; Statistical data tables directly linked to graphics
  – Internal and external reliability values for all observations and unknowns
  – Sensitivity analysis for undetectable gross errors, and their possible influence onto the block

- Specialized UAV/UAS mode for full automatic successful triangulation of challenging UAS projects
- Specialized satellite triangulation mode with automatic tie point matching and positioning refinement

- Smooth transfer of exterior orientation data to stereoplotters (e.g. Summit Evolution) and other photogrammetric applications, such as OrthoMaster or MATCH-T DSM

- High performance with multithreading

MATCH-AT for pushbroom sensors
- MATCH-AT Pushbroom supports ADS line sensors
- Processing supports completely arbitrary flight patterns, including: arbitrary directions (non-cardinal flights), overlaps, crossings and elevations – even turns and changes in elevation during ongoing acquisition
- The sophisticated math model includes simultaneous rigorous photogrammetric sensor modeling and advanced vehicle/platform dynamics modeling of IPAS or Applanix navigation data
- 3rd party compatibility is provided through generation of adjusted Leica GPro compatible SUP- and ODF-files

BENEFITS

- Accurate and reliable results in just few seconds per image High degree of process automation
- Perfectly designed matching strategies lead to maximum ray connections for tie points
- Perfectly integrates into any photogrammetric workflow

VERSIONS

- MATCH-AT:
  – Geo-referencing of frame images
  – Unrestricted number of images
  – Camera Calibration available
  – Including inBLOCK
  – Satellite triangulation
- MATCH-AT Pushbroom:
  – Geo-referencing of pushbroom sensor data
  – Unrestricted number of images
- MATCH-AT Box:
  – Combines MATCH-AT with MATCH-AT Pushbroom
- MATCH-AT Lite:
  – Geo-referencing of frame images
  – Block size restricted to 250 images
  – Handling and merging of sub-blocks is not available
  – Multithreading is not available

OPTIONS

- MATCH-AT pushbroom add-on: adds pushbroom adjustment capability to existing MATCH-AT software
- Monthly rental and upgrades for MATCH-AT versions available
- Maintenance (1st year included in software price) includes support and version updates
- Update of previous versions
- Upgrade from lite version
- Network licensing available

SYSTEM REQUIREMENTS

- Multicore PC workstation (1 license supports up to 16 cores)
- 8 GB RAM
- High-capacity disk system
- Windows 7, 64 bit
- Special hardware for state of the art stereoscopic point measurement:
  – Stereo-capable graphics card(s) supporting OpenGL quad-buffered stereo (e.g. Nvidia quadro series)
  – Stereo viewing system
  – Optional color anaglyphs for systems without stereoscopic hardware

SUPPORTED SENSOR TYPES

- Imaging sensors:
  – Analogue and digital frame sensors
  – Panchromatic or multichannel
  – ADS Pushbroom sensors (MATCH-AT pushbroom)
  – Thermal images
  – Satellite sensors (including SPOT 1-7, Plejades, Quickbird, IKONOS, ALOS, ASTER, CARTOSAT, IRS, GeoEye, Landsat, OrbView, RapidEye, WorldView, Resurs-P...)

PERFORMANCE

- Suited for massive data volumes: tested with projects up to 40000 images
- About 10 seconds computation time per frame
- Theoretical accuracy about 0.1 pixel

SUPPORTED FORMATS

- Supported image formats:
  – Georeferenced orthos: GeoTIFF, TiffWorld (tfw), ADS+tif/tfw
  – TIFF, JPG, BigTiff
  – JPEG2000, TIFFjpeg
  – EXIF
  – 8/12/16 bit

- Height model / morphology data formats
  – Grid-operations:
    ◊ *.dtm *.rdh *.bil *.fit *.tol *.grd *.tif *.tiff *.smti *.tpix.shp, BIL, BWNP, BXYZ, DTM, DXF, DXF_TIN, FLT , GRD, LAS, LASZip, SHP_TIN, TIFF16, TIFF32, VRML, VRML_TIN, WNP, XYZ
  – Point-cloud operations
    ◊ LAS, LASZip, XYZ, BXYZ

For prices and distribution partner information please contact: sales@inpho.de

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