

Expanding Solutions for Photogrammetric and Remote Sensing Professionals

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ABSTRACT

Professionals performing Photogrammetric production and Remote Sensing analytics are continually challenged by the data types and volumes available and the need to rapidly extract high quality deliverables for their clients. This paper describes the latest solutions available for professionals involved in the data capture, processing, modeling and analytics of earth observation data.

1. EARTH OBSERVATION VALUE CHAIN

The cornerstone of extracting valuable information from earth observation data is ensuring data accuracy and quality throughout the delivery process:

- Data Capture;
- Processing;
- Modeling; and
- Analytics.

The ability to extract high quality information as rapidly as possible provides professionals with the ability to distinguish themselves from their competitors. Trimble strives to support these professionals in providing the most advanced solutions available for the extraction of value from earth observation data while also offering a range of solutions that provide businesses with project flexibility.

2. DATA CAPTURE AND ACCESS

2.1. Remote Sensing Imagery

With the explosion of Remote Sensing imagery data types and volumes as well as ready distribution via the cloud, it has never been easier to utilize existing data sets to generate high quality deliverables. Trimble offers rapid access to a multitude of data types via its InSphere Data Marketplace (Figure 1.1) enabling quick discovery and easy access. Data from the InSphere Marketplace can be seamlessly georeferenced, modeled and analyzed within Trimble's specialist software, providing an efficient means to extract high quality information.

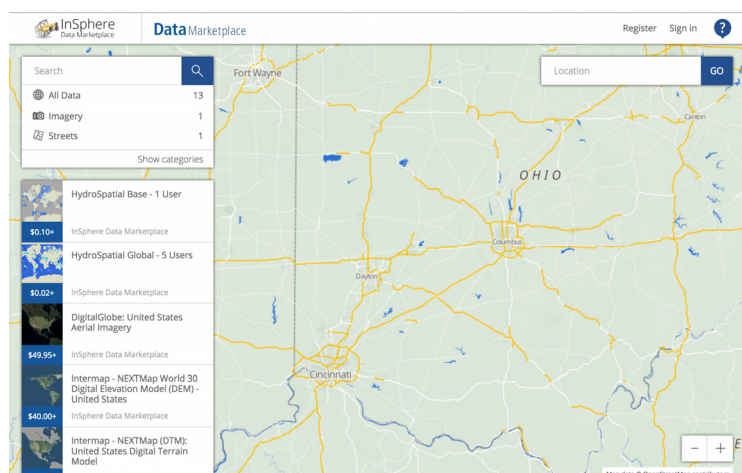


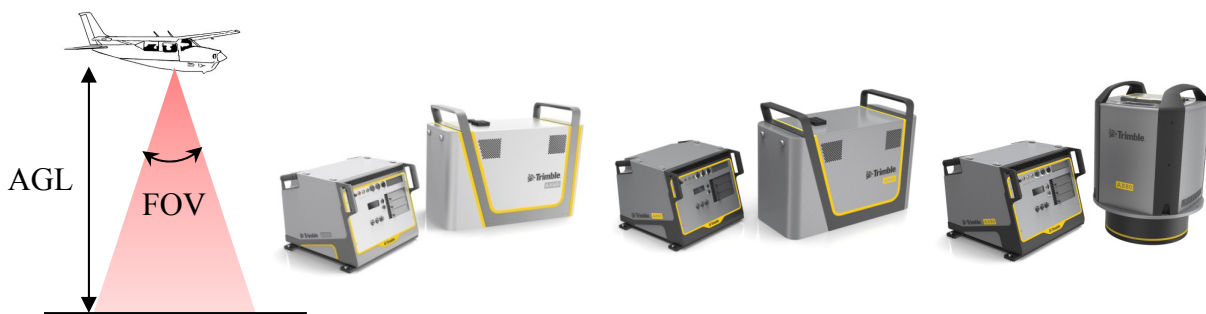
Figure 1.1 – Trimble InSphere Data Marketplace.

2.2. Aerial Imagery / LiDAR

Our latest range of aerial data capture (Table 1.1) and data processing solutions enables professionals to deliver imaging data more quickly than ever before, ultimately saving time and cutting project costs. They help you:

- Capture high-resolution data with confidence in its precision and accuracy.
- Increase the productivity of your aircraft and reduce environmental impact by flying sharp turns over long baselines.
- Reduce the need for control points using direct georeferencing and advanced aerial triangulation software.
- Increase the efficiency of your data processing operation through streamlined workflows and high levels of automation – while also reducing training costs.
- Grow your business into new applications – to capitalize on new market opportunities, diversify revenue streams, extend the flying season and increase equipment utilization.

Whether you need a single subsystem like GNSS+Inertial georeferencing or you are looking to invest in a complete turnkey mapping solution, our broad product line will address your need and help keep you productive and competitive today and in the future.



Features	Trimble AX60i	Trimble AX60	Trimble AX80
LPRR	400kHz	400kHz	800kHz
Max. Scan speed	200 lines/sec	200 lines/sec	400 lines/sec
Accuracy	H=25cm & V=15cm	H=25cm & V=15cm	H=20cm & V=15cm
Operating AGL (max.)	1600m	4700m	4700m
Field of View (FOV)	0° - 60°	0° - 60°	0° - 60°
Returns (Echoes)	Unlimited	Unlimited	Unlimited
Vertical discrimination distance	0.4m - 0.7m	0.4m - 0.7m	0.4m - 0.7m
Weight	75kg	75kg	100kg
Multipulses In Air	Yes, up to 3 simultaneous pulses in the air	Yes, up to 10 simultaneous pulses in the air	Yes, up to 10 simultaneous pulses in the air (per scanner)

Table 1.1 – Trimble Aerial Capture Solutions.

2.3. Unmanned Aerial Systems

Unmanned Aerial Systems (UAS) have taken photogrammetry mainstream with the widespread adoption of the technology for a variety of applications. While we may be a few years away from receiving mail packages from UAS devices, there is no doubt that UAS has impacted traditional photogrammetric processes, providing photogrammetrist with an alternative platform to capture quality data. Lower costs, flying under cloud cover and rapid deployment are all benefits available to users of UAS while delivering the same photogrammetric products with almost the same quality.

Trimble offers a range of innovative UAS (Table 1.2) for fast and safe aerial data collection. The complete solutions are extremely durable, easy to maintain and have a reputation for exceptional performance in extreme conditions.



Features	Trimble UX5	Trimble UX5 HP	Trimble ZX5
Type	Fixed Wing	Fixed Wing + GNSS	Multicopter
Weight	2.5kg	2.9kg	5kg
Camera	24 MP	36 MP	16 MP
Resolution (GSD)	2.0 - 19.5cm	1.0 - 25cm	1.0cm +
Flight Time	50min	40min	20min
GNSS to reduce # GCP's	N	Y	N

Table 1.2 – Trimble UAS Solutions.

3. DATA PROCESSING AND MODELING

To ensure high quality deliverables for all your Earth Observation data, Trimble provides leading solutions with the Inpho® software suite. The Inpho software is designed to precisely transform aerial images into consistent and accurate point clouds and surface models, orthophoto mosaics and digitized 3D features using state-of-the-art photogrammetry techniques. Inpho has an open market concept and therefore is able to process data from almost every hardware vendor. Its modules (Figure 1.2) can be used as a complete system or as individual components, which integrate easily into any photogrammetric production workflow.

3.1. MATCH-AT

Match-AT provides precise aerial image and satellite triangulation with exceptional performance. Projects can be automatically processed with advanced automatic tie point extraction using multi-ray image matching.

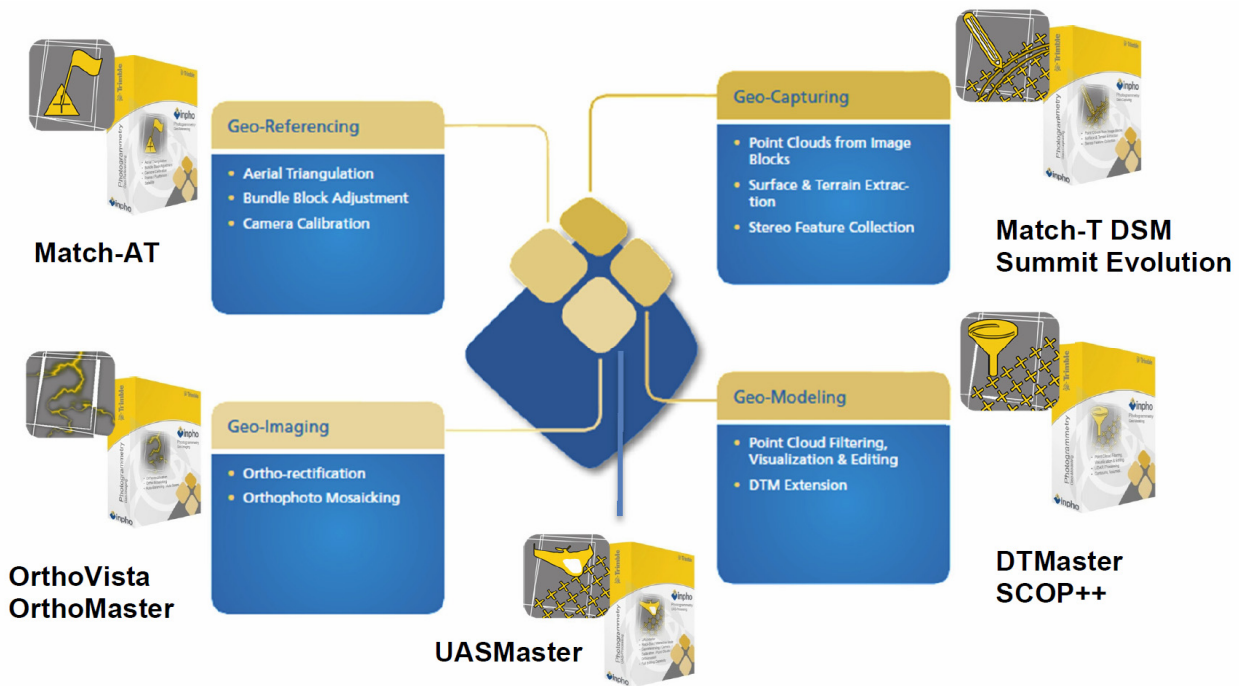


Figure 1.2 – Trimble Inpho Software Suite.

3.2. MATCH-T DSM

Match-T DSM automatically creates digital terrain and surface models from aerial or satellite image blocks. Acquire very dense point clouds and high quality surface models directly from stereo imagery using image matching techniques.

Remove non-ground objects and achieve bare earth digital terrain models (DTMs) using robust filter methods.

3.3. DTMaster

Powerful digital terrain, surface model and LiDAR editing station. Easily handle efficient checking, editing and classification of huge DTM and LiDAR projects consisting of billions of points using a tiled data structure. Numerous DTM applications are covered, such as contouring, hill-shading, profiling, volume calculations, or slope analysis.

3.4. OrthoMaster

OrthoMaster provides a professional package for high-quality ortho-rectification of digital aerial or satellite imagery, generating true orthophotos for both single images and complete image blocks. Optimized for automated, high-performance orthophoto production using state-of-the-art multi-threading and distributed processing. In combination with OrthoVista, OrthoMaster is able to generate true orthomosaics, in which all man-made 3D objects are presented in their true locations, without disturbing relief displacements.

3.5. OrthoVista

OrthoVista allows users to adjust and combine thousands of orthophotos from any source into perfect, seamless, color-balanced and geometrically correct orthomosaics without any subdivision.

Compute radiometric adjustments that compensate for a wide range of visual effects within individual images, such as intensity, hot spots, lens vignetting, brightness or color variations.

3.6. Summit Evolution

Digital photogrammetric stereo workstation to collect 3D features directly into ArcGIS, AutoCAD or MicroStation from aerial frame and pushbroom, close-range, satellite, IFSAR, LiDAR intensity and orthophoto imagery.

3.7. UASMaster

The UASMaster module bridges the gap between simple near black-box workflows for non-photogrammetrists and photogrammetry expert workflows. It combines very intuitive guided workflows with flexibility, highly effective interactive editing tools and thorough quality assurance reports required by the advanced user. It works with fixed-wing vehicles as well as with helicopter-type machines. The software proved successful processing even with survey-balloons and other types of unmanned aerial systems.

4. EARTH OBSERVATION INFORMATION EXTRACTION AND ANALYTICS

From a foundation of high quality and accurate earth observation data, valuable information can be rapidly extracted to produce enhanced data layers to be deployed in a GIS environment or to be used for immediate action

4.1. Trimble eCognition Software Suite

Trimble eCognition Suite is an advanced analysis software available for the development of geospatial applications. It is design to improve, accelerate and automate the interpretation of a variety of geospatial data and enables users to design feature extraction or change detection solutions to extract valuable information from earth observation imagery. By using automated object-based image analysis software, complex projects can be executed even with limited budgets, as most cost-intensive human operator work is no longer needed or reduced to a minimum. Professionals using eCognition can extract information for a variety of applications, such as:

- Mapping trees and shrubs near power lines
- Land cover mapping for various object classes
- Urban tree canopy assessment
- Impervious surface for private and commercial properties
- Solar suitability mapping
- Change detection

4.2. Trimble eCognition Essentials

Leveraging the power of eCognition, the eCognition Essentials solution (Figure 1.3) allows users of any skill level to quickly produce high-quality, GIS-ready deliverables from satellite imagery. eCognition Essentials' guided workflow makes analysis of remote sensing data faster, saving time in parameterization.

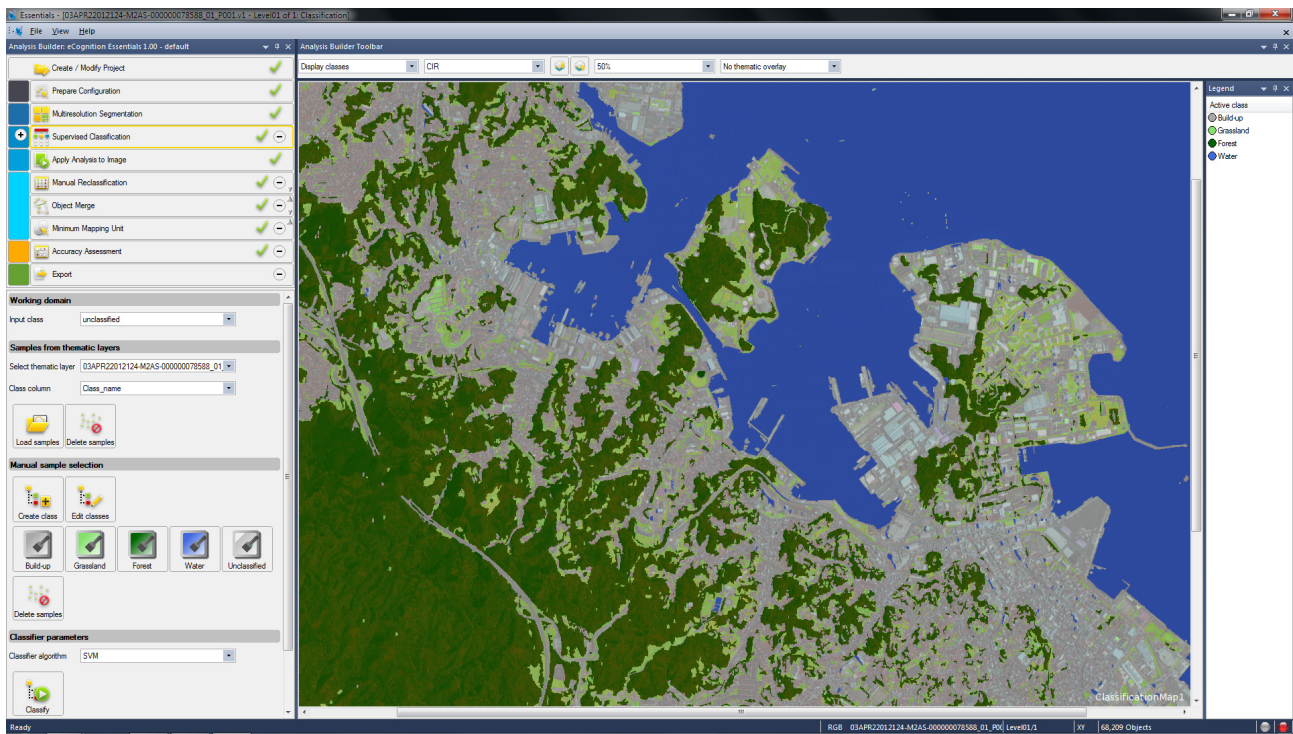


Figure 1.3 – Trimble eCognition Essentials.

5. SUMMARY

Trimble continues to develop innovative solutions to support the data capture, processing, modeling and analytic needs of photogrammetrists and remote sensing professionals. The array of solutions provides a wide range of flexibility while ensuring data quality and accuracy.

For more information on the Trimble solutions for Photogrammetry and Remote Sensing Professionals visit <http://www.trimble.com/Imaging>.