

## News from Trimble GeoSpatial

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### ABSTRACT

Over the last two years Trimble has formed the new GeoSpatial division to strengthen and expand its position for data collection and processing product lines. The paper describes the business strategy and the product portfolio of the division offering a broad range of solutions for the geoinformation market place.

### 1. TRIMBLE GEOSPATIAL DIVISION

During the last Photogrammetric Week back in 2007 INPHO reported about the acquisition by Trimble. In the meantime Trimble has acquired three more companies being active in the field of geospatial data acquisition systems and solutions. These companies are Geo-3D based near Montreal, Quebec, Canada and two Germany based companies namely Rollei-Metric GmbH in Braunschweig and Toposys GmbH in Biberach. All four companies are contributing to the newly formed Trimble GeoSpatial Division. The GeoSpatial Division is responsible for the marketing, engineering, operation, sales and support of its entire product portfolio, therefore the existing customer base will be continuously attended by the known experts and contacts.

Trimble as the whole company is covering four major market segments: Engineering and Construction, Precision Agriculture, Mobile Resource Management (fleet management and mobile workers), and Advanced Devices (GNSS chipsets, boards, and technology licensing). There are significant opportunities for geospatial information in the first three of these four market segments. And this is also a unique chance to expand from the traditional airborne photogrammetric mapping market. Trimble is expecting a further integration of technologies and solutions for the land survey market and the airborne mapping market to serve the needs of the users of geospatial information who are increasingly demanding integrated solutions to address their business challenges.

Applanix, another wholly owned subsidiary of Trimble, is offering high end solutions for positioning and direct georeferencing of airborne and terrestrial sensors based on GNSS/INS technology. Although being managed as a separate division within Trimble, products and technology is interchanged and shared in close cooperation between both organizational entities. Therefore mobile mapping technology, imaging technology and well as data processing technology is available in the market segments the individuals groups are focusing on.

In the following an overview of the product portfolio is given covering solutions for various data acquisitions systems as well as the subsequent data processing modules. Airborne and ground based solutions are available. As ground based solutions are also topic of paper Ken Spratlin(2009) this presentation will focus on airborne systems.

## 2. AIRBORNE SENSOR SYSTEMS

### 2.1. Positioning and Direct Georeferencing

Since many years, Applanix is setting the industry standard for high end GNSS/INS navigation systems used for direct georeferencing applications and mobile mapping solutions.

POS AV offers a real-time solution for pilot guidance, sensor control and 3-axis mount stabilization information. An accuracy of better than 30 cm can be achieved in real time applications fulfilling the requirements of many projects.

The post-processing solution is used to directly georeference sensors to high accuracy like LIDAR sensors, photogrammetric pushbroom line scanners and frame imaging sensors.

POS AV is not only used in sensors supplied by Trimble, but also compatible with sensors systems from various manufactures like Intergraph, Microsoft, Wehrli & Associates, Jena-Optronik and others.

POS AV solutions are available as five different models to address the customer needs concerning accuracy levels and price/performance considerations.

### 2.2. Medium Format Digital Camera

The Trimble Aerial Camera is well known in the market place as a robust camera with excellent performance especially in LIDAR applications when digital imagery is needed in addition to the LIDAR sensor information. Interfaces to commonly used GNSS/INS systems, flight management systems and mountings are available for easy system integration.

The main characteristics of the camera are a ruggedized body, interchangeable professional calibrated lenses of various focal distances with electronic shutter and three different sensor resolutions with up to 60 megapixels and pixel size of 6  $\mu\text{m}$ .

The available choice out of focal length options from 60mm up to 100mm allows a configuration where the opening angle or swath width matches well with the scan width of the LIDAR system.

In addition to use it in combination with LIDAR scanners



Fig. 1: POS AV real-time Computer System with embedded GNSS receiver and data logger.



Fig. 2: Trimble Aerial Camera.

the Trimble Aerial Camera is as well suited for all kind of corridor mapping work such as mapping and data acquisition for highways, railroads, pipelines and other utilities. In order to achieve larger footprints across flight lines and therefore minimizing flight expenses, a dual head configuration is available. By using a four head set-up, the camera system can be applied for photogrammetric large area mapping projects like orthophoto map production.



Fig. 3: Dual Head Trimble Aerial Camera.



Fig. 4: Four Head Trimble Aerial Camera.

For specific applications in urban mapping and visualization projects the Trimble Aerial Camera is also available as an oblique version to get forward, backward and sideward looking views.

### 2.3. Trimble Harrier LIDAR System

The Trimble Harrier Corridor Mapping System sets a new standard for digital image acquisition and LIDAR scanning. Designed for both aircraft and helicopter operation, the Trimble Harrier is ideal for corridor mapping, area mapping, and remote sensing.

The system design is based on an extremely stiff construction holding all sensors in a closed shock mounted housing maintaining the required accuracy under all flight conditions.

The main components are:

- Laser Scanning system
- GNSS/INS Navigation system
- Medium format camera
- Data recording unit
- UPS unit
- Post-processing software



Fig. 5: Trimble Harrier Corridor Mapping System.

The modular design allows the selection of various components such as two different full wave form laser scanner types, single or dual head medium format frame camera configurations and an also available four channel push broom sensor. Therefore the system can be perfectly tuned to the varying needs of different customers. A basic configuration can be extended according to upcoming requirements when expanding the business.



Fig. 6: Power Line Corridor scanned by using Trimble Harrier.

#### 2.4. Applanix DSS Imaging Solution

The Applanix DSS is an “end-to-end” solution for producing highly accurate, high-resolution color and color-infrared imagery including digital orthophotos and orthomosaics.

The fully integrated hard- and software components are:

- POS AV Direct georeferencing system
- USGS certified metric imaging camera
- Computer for airborne environment
- Camera mount
- Flight management system
- Power unit
- POS Pac MMS post-processing software
- RapidOrtho image processing software



Fig. 7: Applanix DSS Imaging Solution.

The turn-key DSS imaging solution with focus on the direct georeferencing capabilities is mainly designed for rapid response and disaster management applications where the main focus is on speed rather than on the highest accuracy. However, without neglecting the requirements for geometrically correct information as the generated results are also further used as overlays in subsequent GIS system applications. Self evident, the high quality of the imagery is well suited to fulfill the needs of agriculture, forestry, coastal zone monitoring and other remote sensing applications.

### 3. INPHO DATA PROCESSING SOLUTIONS

INPHO is well known for its digital photogrammetric and terrain modeling software products. The excellent reputation is based on providing highly accurate and powerful solutions, not to forget the work of skilled employees with the end users during comprehensive training courses and technical support sessions.

The performance of the products is based on continuous development work for meeting the demands out of the world wide customer base and for paying constantly attention to the future trends of computer technologies.

Following modules are available

- **MATCH-AT:**  
Automated digital aerotriangulation
- **MATCH-T DSM:**  
Automatic surface model extraction
- **DTMaster:**  
Interactive DTM editing
- **OrthoMaster:**  
Ortho rectification
- **OrthoVista:**  
Ortho mosaicking
- **Summit Evolution**  
Digital stereoplotter
- **SCOP++:**  
DTM modeling including LIDAR processing
- **BuildingGenerator:**  
Building extraction from point clouds
- **PictoVera:**  
High performance push broom processing



Fig. 8: INPHO's data processing solutions.

The main focus in the last releases was set on further enhancing the productivity of the complete system by increasing both the processing speed and the number of images handled in one project. A productivity boost was reached by efficient utilization of multi-core, multi-processor technology and 64bit operating systems available with up-to-date computer systems.

Within the ApplicationsMaster modules very large projects of about 20.000 images per block can be handled efficiently. As a rule of thumb, the processing time is cut to halve compared to previous versions, however this is depending on the processing and data storage technology used.

Besides using nadir looking imagery only during the photogrammetric processing, which was and still is the standard approach in mapping projects, the software has been enhanced to work also with oblique imagery nowadays widely available of urban areas. Until now that type of imagery is primarily used for visualization tasks or measurement of basic geometric elements. Now it can be used to support the various feature extraction steps.

In addition, substantial progress has been achieved in the automated point cloud generation out of digital imagery with MATCH-T DSM. The quality of the resulting surface model is well suited for orthophoto generation with considerable reduction in interactive editing work by operators. The highly accurate und dense point cloud opens up new opportunities for subsequent applications, like automated building extraction for city models. The paper E. Gülch (2009) reports about the results of studies at the Stuttgart University of Applied Science.

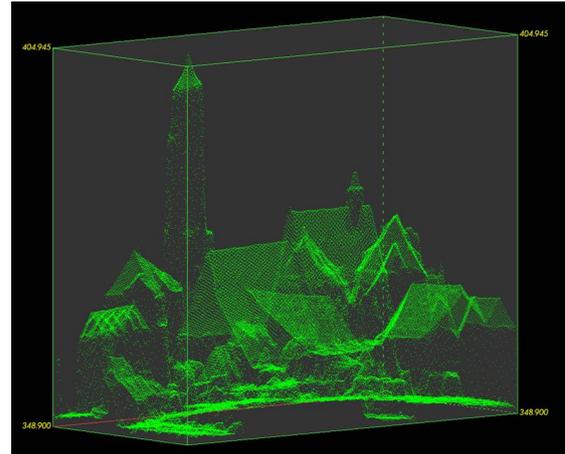


Fig. 9: Surface model generated by MATCH-T DSM.

#### 4. SUMMARY

Although it is only possible to touch the most important products of the complete portfolio at this point, the power of Trimble GeoSpatial Division data acquisition systems and processing solutions integrated into complete workflows is shown following Trimble's focus to provide robust and ubiquitous information solutions that meet the needs of our defined market segments.

Over the next years a convergence of aerial mapping, land survey and GIS segments can be expected, all of them using geospatial imaging already. By applying the Trimble's Connected Site™ ideas Trimble Geospatial Division will contribute to this convergence by creating seamless working relationships among the Trimble products and technologies.

#### 5. REFERENCES

- Gülch, Eberhard (2009): Advanced Matching Techniques for High Precision Surface and Terrain Models, Photogrammetric Week 2009
- Spratlin, Ken (2009): Integrating Various Terrestrial and Aerial Sensor Data for Transportation Projects, Photogrammetric Week 2009

For further information see also:

[www.trimble.com/geospatial](http://www.trimble.com/geospatial)  
[www.applanix.com](http://www.applanix.com)  
[www.inpho.de](http://www.inpho.de)