INPHO GmbH- System Provider for Digital Photogrammetry

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ABSTRACT

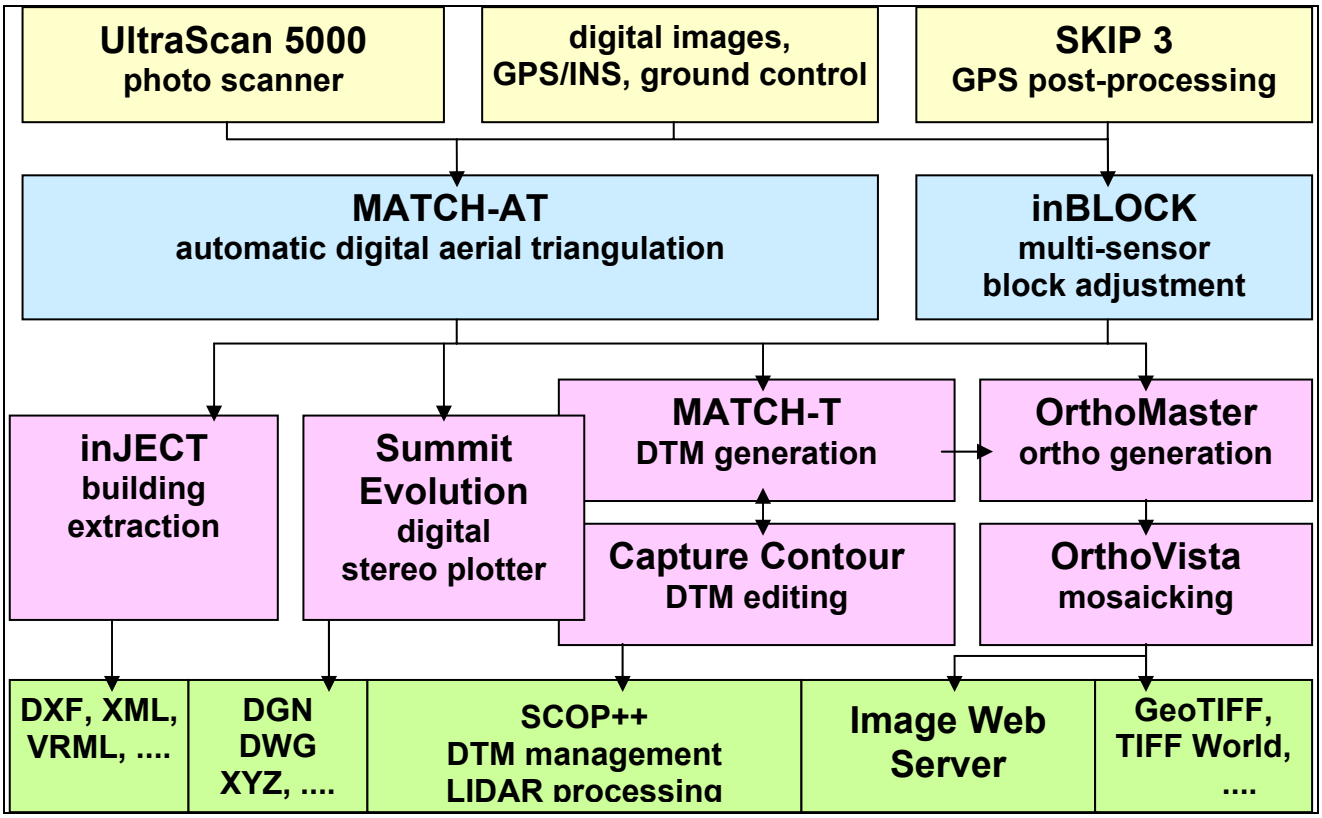
Since the 19th ISPRS Congress (Amsterdam,2000) INPHO is acting as a full system provider in digital photogrammetry. INPHO offers a complete photogrammetric product suite ranging from image capturing to orthophoto generation and mosaicking. INPHO has extended its own product line by innovative new developments, and teamed up with strong partners offering complementary products to the product suite. INPHO has already gained excellent reputation as reliable system provider in large number of international projects supplying full digital production lines to high end photogrammetric organisations.

1. INTRODUCTION

Since the ISPRS Congress July 2000 in Amsterdam, INPHO GmbH has gained a strong reputation as professional and reliable system provider in the market of digital photogrammetry. Together with its partners, INPHO offers a full range of advanced products for processing digital imagery images:

- Photogrammetric Scanner (UltraScan 5000, Vexcel Imaging, Graz)
- Automatic digital Aerotriangulation
- Advanced Digital Stereo Workstation with automatic DTM Generation (DAT/EM & INPHO)
- Semi-automatic buildung extraction
- Orthophoto production modules
- DTM Management system

2. PHOTogrammetric SUITE From INPHO



2.1. MATCH-AT – automatic digital aerial trinagulation

Aerial triangulation is the corner stone and the basis for quality assurance in any photogrammetric project. Without redundancy there is no way to guarantee the quality, i.e. the precision and reliability of the results.

MATCH-AT is INPHO's advanced solution for highly automated aerial triangulation.
TIt incorporates leading edge image matching technology that provides a high number of redundant tie-points over the entire block. This ensures very strong block geometry resulting in high precision and reliability. The time-consuming manual measuring and editing actions is reduced to a minimum.
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All components of the INPHO product suite have smooth interface with MATCH-AT as it delivers the quality controlled orientation data sets for most of processing steps in a photogrammetric project.

The main features are:

- Handling of very large blocks
- Sub-block handling with free block adjustment
- Integrated block adjustment
- GPS/INS data handling
- Graphical representation of results for analyis of block
- Support of various interfaces used in the photogrammetic communitiy

2.2. inBLOCK – second generation bundle block adjustment

inBLOCK is the new bundle block adjustment from INPHO. inBLOCK combines advanced mathematical modelling of multi-sensor systems and up-to-date matrix technology, the landmarks of INPHO, with easiness-of-use and excellent interactive analysing capabilities supported by strong graphics. Special attention has been paid in inBLOCK to the precise and sophisticated mathematical modelling of the imaging process.

inBLOCK incorporates the Advanced Adjustment Engine offering high processing speed, alternative methods for performing the block adjustment, self-calibration with additional parameter sets, effective multi-phase blunder detection and excellent graphical tools for monitoring the status of the block after the adjustment, and more. For thorough analyzing of the results the complete statistical information of the block is available, as well, including variance component analysis, precision & reliability analysis and sensitivity analysis, among others.

inBLOCK has already demonstrated its effectiveness by excellent results in the recent OEEPE test "Integrated sensor orientation" (Heipke et al, 2001).

2.3. Summit Evolution & MATCH-T – advanced digital stereo workstation

Summit Evolution, from our partner DAT/EM Systems International, Anchorage USA, offers a wide range of tools for data acquisition from of digital stereo models. The system software is very flexible in handling various image types; not only imagery from analog aerial cameras is supported, but also imagery from digital cameras and satellite images can be used with Summit Evolution.

For feature collection the choice is between MicroStation® or AutoCAD®, which are the classical systems for CAD-oriented information extraction. Recently Summit Evolution has been interfaced Evolution to the ArcMap® GIS System. The possibility for direct updating of large GIS databases using a digital stereo plotter will open up new interesting fields for stereoplotting in the GIS community.

For interfacing the Summit Evolution to local systems or other CAD and GIS-systems, an easy-to-handle API interface is available. Several system suppliers have already implemented such a connection for their data acquisition systems.

MATCH-T, INPHO's fully automatic DTM generation software is tightly integrated into Summit Evolution in cooperation with DAT/EM. It provides very efficient generation of digital terrain models. In order to generate DTM's of highest quality, MATCH-T can utilize additional morphological data, like manually measured break lines, form lines or spot heights. Effective tools for stereoscopic quality control, i.e. verification and editing of the DTM data based on the proven SCOP terrain modeling technology, are integrated in the Summit Evolution as well.

2.4. OrthoMaster – highly automatic orthorectification

OrthoMaster is INPHO's advanced software for rigorous orthorectification of digital imagery. It offers high a degree of processing automation and is optimized for high performance production. OrthoMaster accepts orientation data sets from various systems; however using project files generated by MACH-AT ensures an optimal workflow. Further, OrthoMaster has a built-in terrain modeling functionality based on the proven SCOP technology. Thus a DTM can be generated within OrthoMaster from various ASCII data sets. Morphological data, like break lines, form lines as well as arbitrarily distributed heights points, are rigorously considered in the DTM process.

The relief displacements caused by man-made objects, are effectively eliminated from the resulting imagery. The built-in DTM tools make it possible to intersect the 3D vector information of man-made objects, such as buildings and bridges, with the basic DTM. Using the resulting new DTM, the hidden areas are detected and marked on the images for post-processing with OrthoVista software that fills them with image patched from overlapping neighboring orthos..

2.5. OrthoVista – automatic color balancing and mosaicking

OrthoVista is the most powerful professional mosaicking tool. It uses advanced image processing techniques to automatically adjust and combine orthophotos of any source into one single seamless mosaic. Radiometric adjustments compensate for visual effects such as hot spots, lens vignetting, color- and intensity differences as well as geometric mismatches between adjacent mosaics.

The powerful mosaicking tools include automatic and manual seam generation along with manual seam editing functionality for achieving very high image quality in the overlapping areas.

The true-ortho production is done combination with OrthoMaster. OrthoVista will fill up the hidden areas with image patches from neighboring orthos. The result is true-ortho mosaics of highest quality thanks to the excellent image blending features of OrthoVista.

2.6. SCOP++ - The package for handling digital terrain models

SCOP++ is designed for interpolation, management analysis and visualisation of digital terrain models. It is the successor of the well known SCOP Digital Terrain Model package. One of the most important benefits of SCOP++ is the handling of large DTM data sets, with up to one billion points, and the interpolation methods, which are taking morphological information into account. This happens during the interpolation as well as during the application, eg. volume calculations, profile generation or visualisation.

The major developments within the SCOP++ product family has taken place in processing LIDAR data sets. SCOP++ LIDAR is a module for advanced filtering and automatic classification of LIDAR points. This is achieved by means of robust interpolation technique. The filtering steps can be adopted to the requirements of varying projects. The final result is the separation between ground and off-ground points.

GVE is a DTM data editing tool providing special functionality for very fast quality control. Features are on-the-fly contouring, shading or z-coding in files with several million points.

3. Hardware SUPPLY and CONSULTING

In order to supply complete systems, INPHO offers powerful computer hardware to run all the software packages in an efficient way. Worldwide delivery including installation and training by qualified engineers results in a very fast production line setup at customer’s site.

4. Customer-care

INPHO has an experienced group of support engineers. They are closely co-operating with the developers. So INPHO can offer qualified support services and training courses. Numerous customers rely on INPHO's maintenance services including the regular delivery of new software releases and support by phone and E-Mail. INPHO offers training courses at the customer's site or at INPHO. Our goal is to provide you with the best support within the photogrammetric community aimed at answering your questions and solving problems as quickly as possible.

5. REFERENCES

Heipke C., Jacobson K., Wegmann H. (2001*)* The OEEPE test on integrated sensor orientation – results of phase 1, in: Photogrammetric Week 2001

Kraus K., Pfeiffer N. (2001) Advanced DTM Generation from Lidar Data. International Archives of Photogrammetry and Remote Sensing, Volume XXXIV-3/W4, Annapolis, Maryland