

Innovations and upgrades for analytical stereoplotting

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ABSTRACT

Upgrading in the field of analytical stereoplotters has mainly centered on the PHOCUS software for photogrammetric plotting. With many users being aware of the trend towards central data storage and data organization, the concept of the central data base is now growing in importance. The Carl Zeiss product spectrum for analytical photogrammetry has been extended by the recent products VIDEOMAP 30 and CADMAP. A further addition to the instrument family for digital photogrammetry is the PHODIS ST digital stereoplotter.

1. INTRODUCTION

Carl Zeiss has implemented several major upgrades in the field of analytical stereoplotting and has launched new products in both the hardware and software areas. These will be dealt with in greater detail in this paper. In addition, a brief rundown will be given on the PHODIS digital image processing system from Carl Zeiss. This topic is discussed in more detail in the papers by W. Kresse and Dr. W. Mayr.

2. ANALYTICAL INSTRUMENTS

2.1 VISOPRET photo interpretation instrument

VISOPRET is the name given to the family of photo interpretation systems within the range of stereoplotters.

In its basic version (VISOPRET 20) the instrument enables the user to view stereo photos in the mirror stereoscope. The photo illumination by both incident and transmitted light permits the use of transparencies, negatives or paper prints. The maximum photo size is 240 x 240 mm.

An upgraded version of this basic instrument is VISOPRET 10, with a high-resolution zoom system as its outstanding feature. The selectable viewing magnification of 3.5x to 15.5x or 7x to 31x provides the user with the possibility of performing detailed interpretation. The optional co-observer eyepiece is a valuable training aid if instruction is to be given in stereoscopic viewing in combination with practical interpretation jobs.

The possibility of connection to the PC world (VISOPRET 10 DIG, VISOPRET 20 DIG) opens up a wide range of applications to the user. Their accuracy of $\pm 10 \mu$ makes the instruments ideal for photogrammetric measurement and plotting. A mechanical joystick allows the user to reach exactly the required position in the photo; the x and y parallaxes can be corrected at any time.

The V-CAP data management and orientation software using state-of-the-art PC software tools is backed by the long-standing experience of Carl Zeiss in the field of analytical plotters. V-CAP for VISOPRET has been developed on the basis of the successful P-CAP software for P-Series Planicomp. A convenient user interface is provided by MicroSoft Windows. The self-explanatory user guidance, callable help functions and programmable input keys permit even a relatively unexperienced user to work efficiently with the system after only a short familiarization period.

When connected to time-tried CAD and GIS systems (MicroStation PC, AutoCAD), VISOPRET can be used for a great variety of applications ranging from environmental protection and remote sensing to archaeology and architecture.

2.2 P-Series Planicomp

The P3/P33 Planicomp has become the standard instrument for analytical photogrammetric plotting worldwide. It features the multifunctional P-cursor with its tablet, and has been designed to ensure optimum operating convenience, high reliability and outstanding quality.

The efficiency of photogrammetric plotting is largely dependent on the convenient design and user friendliness of the workstation. In the P3/P33 Planicomp, the major control elements for photogrammetric data acquisition - the photogrammetric P-cursor, the large, high-resolution tablet and the new stylus for free menu selection - have been concentrated in one central area.

Not only its ease of operation, but also the product quality deserves special attention. With an approximate measuring accuracy of $\pm 1.5 \mu$ (P1 Planicomp) and $\pm 2 \mu$ (P3 and P33 Planicomp), the Carl Zeiss analytical stereoplotters must be ranked in the category of precision measuring systems. The service-friendly design, the possibility of remote diagnostic in the case of malfunctions and a dense service network provide the customer with an optimum backup service worldwide.

The open-ended interface of the P-processor ensures high versatility in the connection of hardware and software. Recent implementations are the interface with VIDEOMAP 30, a system for the optical superimposition of photo and graphics (see chapter 2.3) and the connection of the CADMAP photogrammetric software package (see chapter 3.2).

2.3 VIDEOMAP 30

A major function of photogrammetry is the acquisition of data from aerial photos for the production of new maps or the updating of existing maps. This procedure can be considerably facilitated and accelerated by the direct visualization of the acquired graphics in the aerial photo.

The new VIDEOMAP 30 hardware and software package which interfaces with P-Series Planicomp performs this task in an ideal way and at a very attractive price.

One outstanding feature is the combination of the high line resolution of 24μ in the image with the almost complete superimposition over the entire eyepiece field of view, even at low magnifications. Due to the particularly high brightness and excellent contrast of the special monitor, the vector graphics are clearly visible even with normal illumination of the image.

VIDEOMAP 30 can be controlled via two different interfaces: IEEE-488 interface (HPIB) and Centronix. The open-ended command interface adopted from VIDEOMAP 2 permits fast adaptation of the driver to different external systems.

Carl Zeiss offers the complete integration of VIDEOMAP 30 for the systems PHOCUS, CADMAP, MicroStation PC and AutoCAD.

The centrepiece of VIDEOMAP 30 is a standard PC of the 486 type. The PC technology is used here very effectively to ensure optimum adaptation, fast communication with the host computer and faster data representation in the VIDEOMAP 30 itself.

Full three-dimensional support of the graphics allows correct display in the aerial photo.

The data capacity is virtually only limited by the disk storage capacity of the PC. As in VIDEOMAP 2, the graphic elements can be switched to visible and invisible, highlighted by flashing or deleted. This permits the interactive graphics known from customary graphic systems. In addition, any type of text (e.g. important system messages) and graphic elements can be displayed at a selectable position within the field of view.

3. SOFTWARE

3.1 PHOCUS Revision 5

PHOCUS is an allround system for the acquisition, management and transmission of spatial data in geographic information systems. It therefore includes all components required for object-oriented structuring at several levels, the automatic generation of topology, for the processing of three-dimensional coordinates and the processing of attributes using the relational data model. Major new functions have been implemented in Revision 5, providing a valuable addition to PHOCUS capabilities.

One important new feature concerns the data base management. Thanks to the central data base module, the acquisition, updating and management of large data quantities have become considerably easier and more reliable. Data is copied from a central data base onto smaller work data bases which can be utilized simultaneously on several different PHOCUS workstations. When the work data bases are transferred back again, all changes and new entries are automatically stored in the central data base. All plausibility checks required for this copying procedure are performed by PHOCUS.

The functions of the data output program have also been extended. The map frame and map contents can now be displayed together on the monitor, permitting the complete map to be checked before being output on the plotter.

Data translation into the ASCII format PHODAT now also permits the complete graphics to be converted into an ASCII file. This is mainly used for data translation into DXF files, e.g. to transfer slope hachures, point symbols etc. unchanged and complete to other systems.

The UNIX computer world from SILICON GRAPHICS opens up further new possibilities to the PHOCUS user. On the basis of the digital orthophoto, the PHOCUS user is now able to transfer his digitizing work from the tablet to the monitor. The technique of monoplotting using digital orthophotos is explained in greater detail in the paper by W. Kresse.

3.2 CADMAP

CADMAP is a graphics-oriented plotting and mapping system which places special emphasis on photogrammetric data acquisition. It offers all measuring and editing functions required, data storage and management, flexible cartographic representation and data transfer to other systems. The computer platform is a PC with MS-DOS and SILICON GRAPHICS with UNIX.

Salient features of CADMAP:

- Acquisition of 3D coordinates in analytical plotters or analog instruments and of 2D coordinates using digitizing tables
- Acquisition-related photogrammetric measuring and editing functions
- Interactive editing and batch editing
- Graphic representation of the plotting result in VIDEOMAP
- SNAP and PICK functions with automatic guiding of the floating mark in the analytical stereoplotter
- Upward and downward movement of the floating mark by the amount of the contour line interval
- Automatic positioning of the floating mark to known points
- Simultaneous opening of two work files for model matching
- Measurement of profiles, cross sections and regular grids for digital elevation models with full graphic support

- Classification of elements in 500 layers
- Fast setting up of graphics
- Freely definable symbols for points, lines and area representation
- Free design of the map frame
- Output in HP-GL, PostScript etc.

The conversion programs from and into DXF, in particular, are extremely versatile, permitting the complete transfer of information, including the entire graphics.

CADMAP has been developed to meet the requirements of practical photogrammetry, it can be learnt quickly and is easy to use.

4. PHODIS ST

At the 1993 Photogrammetric Week Carl Zeiss is not only presenting analytical stereoplotting, but also, and for the first time, a system for digital stereoplotting: PHODIS ST.

PHODIS ST is one of the principal components incorporated into the overall concept of PHODIS, the photogrammetric digital image processing system from Carl Zeiss. The primary objective of the digital product line at Carl Zeiss is to ensure an uninterrupted digital data flow from the scanning of the photos (PS1 PhotoScan), plotting and processing of the digital information (TopoSURF, PHODIS OP, PHODIS ST, PHODIS MO) to the output stage (BARCO, IRIS).

PHODIS ST, the digital stereoplotter, uses Silicon Graphics computers with UNIX operating system and the "crystal eyes" technique to achieve the stereo effect directly on the monitor. A more detailed description of digital stereoplotting is given in the paper by Dr. W. Mayr.

The PHODIS ST software comprises all orientation modules required by the user for the generation of the stereomodel. The procedure is very efficiently supported by automatization processes in the orientation programs. This permits the user to utilize the digital image processing technique implemented in the system and thus to reduce the time required for processing on the instrument. Plotting of stereomodels on the PHODIS ST is already possible by the connection to the PHOCUS and CADMAP program packages. In much the same way as in analytical plotting with Planicom, further software packages can be adapted without difficulty, due to the open-ended and easy-to-use interface.

5. REFERENCES

- Kresse, W. (1993): Digital Orthophoto Production with PHODIS, Proceedings of the 44th Photogrammetric Week.
- Mayr, W. (1993): Photogrammetric Digital Image Processing at Carl Zeiss, Proceedings of the 44th Photogrammetric Week.