

PHODIS ST - Design and Integration of Carl Zeiss Digital Stereoplotter

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ABSTRACT

Photogrammetry is currently undergoing a dramatic change from analytical to digital techniques. For the manufacturer of a photogrammetric workstation, this necessitates a critical assessment of both worlds, with the aim of optimally adapting the new methods to practical requirements. Carl Zeiss has entered this new era with the launching of the PHODIS digital photogrammetric system.

The PHODIS system comprises all components required in digital photogrammetry - from image generation and image processing right up to image output. The latest module in this package is the PHODIS ST digital stereoplotter. PHODIS ST is used for the generation, visualization and plotting of digital stereomodels. Data acquisition packages such as PHOCUS or CADMAP are interfaced with the stereoplotter for photogrammetric plotting. As a result, the digital stereoplotter is increasingly becoming a genuine alternative to the analytical plotter.

PHODIS ST comprises hardware and software components. The major hardware components are the P-mouse for 3D freehand guiding of the floating mark in the stereomodel and modified LCS eyewear for flicker-free viewing of the two PHODIS ST monitors. The software consists of modules for stereo representation and user guidance. PHODIS ST is available in two configurations which differ mainly in the capabilities offered by their graphic subsystems. In the more sophisticated version PHODIS ST 10, the "moving image fixed cursor" technique has been implemented by means of high-performance graphics. The version PHODIS ST 30 offers in both versions, one monitor is employed for the user interface, permitting the second monitor to be used for displaying a stereo scene of maximum size. The basic software of the digital stereoplotter comprises modules for image improvement, orientation, and display and for user guidance.

The result of image processing with PHODIS ST is stereoplotting, for which oriented image material is a vital prerequisite. In this respect, use has been made of the workflow known from analytical photogrammetry. PHODIS ST, however, fully utilizes the possibilities of automatic photogrammetric model generation offered by the digital image material. This means that fully automatic interior orientation is available to the PHODIS ST user. The basis of this method is the correlation of fiducial mark patterns with the image content. The relative orientation can also be performed automatically in PHODIS ST involving the steps "Feature Extraction", "Feature Matching", and "Feature Tracking".

The aim of the current research activities is the step-by-step automation of the photogrammetric work cycle. This may involve, for example, automatic control point recognition, semi-automatic acquisition processes or automatic aerotriangulation.

The emphasis should be placed here on the development of efficient algorithms. The forecasts of the computer manufacturers suggest, however, that the dramatic advances being made in hardware technology will continue to relativize a large number of performance problems in the future.

The advent of digital methods in photogrammetry will gain general acceptance when, with the implementation of automatic processes, digital systems can clearly prove their economic advantages over time-tested conventional methods.