TUITION CONCEPT AND LEARNING AIDS IN MODERN APPLICATION SOFTWARE USING PHOCUS AS AN EXAMPLE

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ABSTRACT

PHOCUS and the Zeiss P-Series Planicomp are a versatile and comprehensive system for photogrammetric and cartographic data processing. The general handling and efficient use of this sophisticated application software require an advanced tuition and training concept. Integrated learning aids (tutorials and help functions) are used in addition to the traditional learning aids like reference manuals and operating instructions. The general training concept provides for the training of operators, project managers and application programmers.

1. DEMANDS ON MODERN PHOTOGRAMMETRIC/CARTOGRAPHIC APPLICATION SOFTWARE

The continuously increasing computer performance accommodates the users' desire to collect, store and process even 3D data in digital form. Terms like land information system (LIS) and geographical information system (GIS) are nowadays everyday terminology in cartography and photogrammetry.

Centralized or distributed software systems for creating and managing land information systems have already been set up in several countries. The number of these systems, some of which differ widely in performance, is increasing continuously.

Topographic data acquisition by means of analytical photogrammetry plays an ever greater role in this development. The current methods of cartographic on-line processing of photogrammetrically collected data considerably reduce the time required for converting aerial survey photos into (digital) maps. If open input and output interfaces are also available (3D and 2D data, tacheometric data, attributes, data exchange format), an enhanced photogrammetric/cartographic information system is obtained that affords both

- comprehensive processing of topographical data right up to digital and/or analog output and
- data interchange with other information systems.

However, a future-oriented software system for photogrammetry and cartography must not only provide a comprehensive range of functions but also user-friendly and easy handling. These apparently contradictory demands are detailed in Fig. 1.

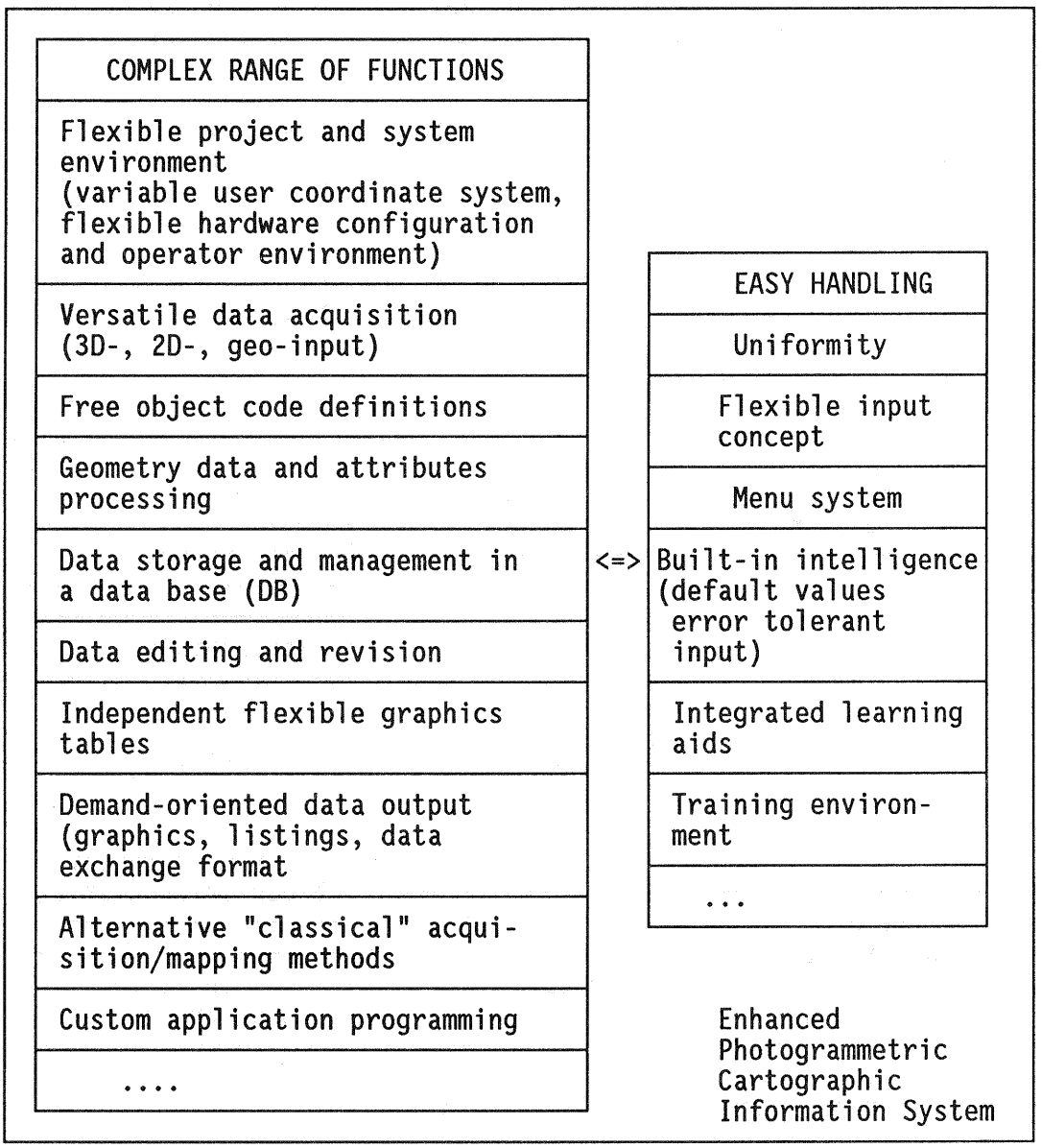

Fig. 1: Performance and Handling Demands on Modern Software

The demands for a comprehensive range of functions and easy handling are of particular significance if a software product is to be accepted and used all over the world by users with different backgrounds. The tuition concept of the **PHOCUS** software system developed by Carl Zeiss, West Ger-many, is used to illustrate how the handling of complex application soft-ware can be learnt quickly and efficiently in an operator-friendly environment.

2. UNIVERSAL PHOTOGRAMMETRIC/CARTOGRAPHIC DATA PROCESSING WITH PHOCUS

Carl Zeiss has gained experience in the design and marketing of photogrammetric instruments for decades. The development of modular application programs that led right up to the **PLANIMAP** digital mapping system began when the C 100 Planicomp analytical plotter was introduced at the 13th ISP Congress at Helsinki in 1976.

A milestone in this development came in 1987, when the data-base-oriented **PHOCUS** photogrammetric and cartographic information system was introduced together with the P-Series Planicomp, the second generation of analytical plotters.

The **PHOCUS** software product fully satisfies the demands listed in Fig. 1. The fields of application listed in Fig. 2 illustrate the current range of functions.

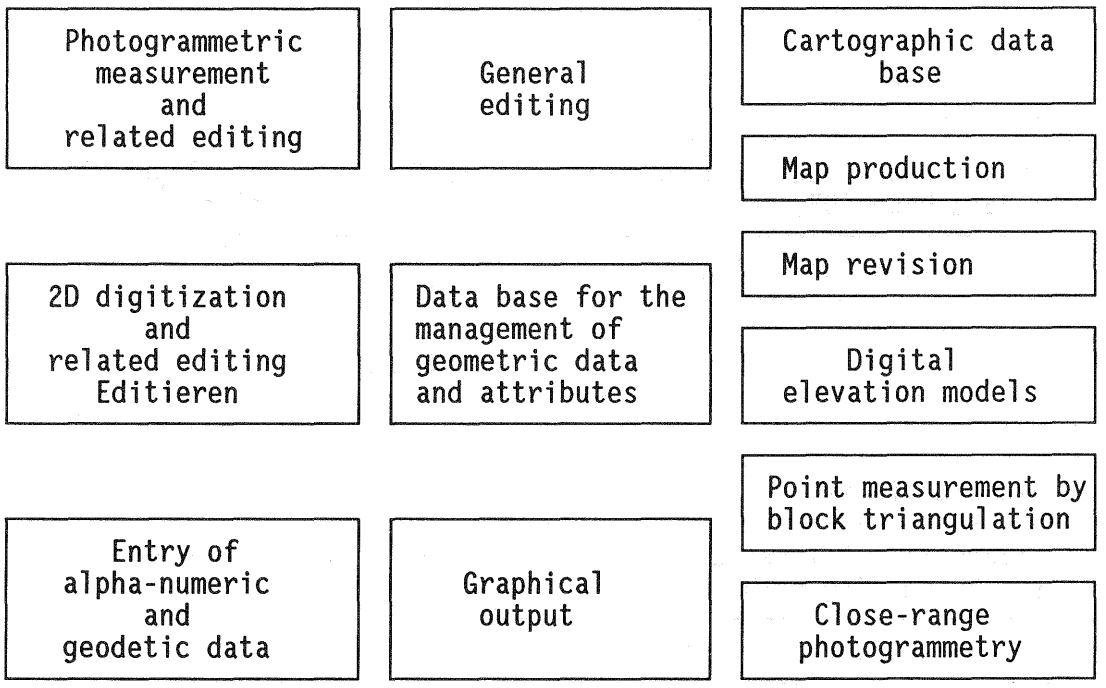

Fig. 2: Major Current **PHOCUS** Applications

PHOCUS is based on the structured management of geometric and non-geometric data in a data base (DB). The **PHOCUS** software structure is characterized by the fact that all functions are activated and controlled by the integrated **PHOCUS** operating system.

The software system can be used on HP 1000 A Series and DEC MicroVAX workstation computers. **PHOCUS** supports the following general hardware environments:

- P-Series Planicomp (including additional periphery, in particular graphics equipment) for photogrammetric data acquisition and editing by means of the **VIDEOMAP** optical superimposition system.

- **PD** digitizing subsystem (including additional periphery, in particular graphics equipment) for collecting 2D data, and

- **PE** editing subsystem for editing **PHOCUS** object data.

A major **PHOCUS** feature is its user-friendliness. The tuition and training concept that ensures this user-friendliness is described in the following.

3. PHOCUS TUITION CONCEPT

Fast familiarization and efficient handling are major performance assessment criteria for a highly functional software product. The development of **PHOCUS** was therefore based on a versatile tuition concept that ensures fast and efficient familiarization with the software by different users and for different tasks (e. g. data acquisition by operators, project management by system managers).

The overall concept provides for two training areas:

- Productive use of **PHOCUS**
- Application programming in the **PHOCUS** environment

This differentiation is required because each area places different demands on the users' background. The result is the tuition concept shown in Fig. 3. Details on the tuition methods for the productive use of **PHOCUS** are given in section 4.

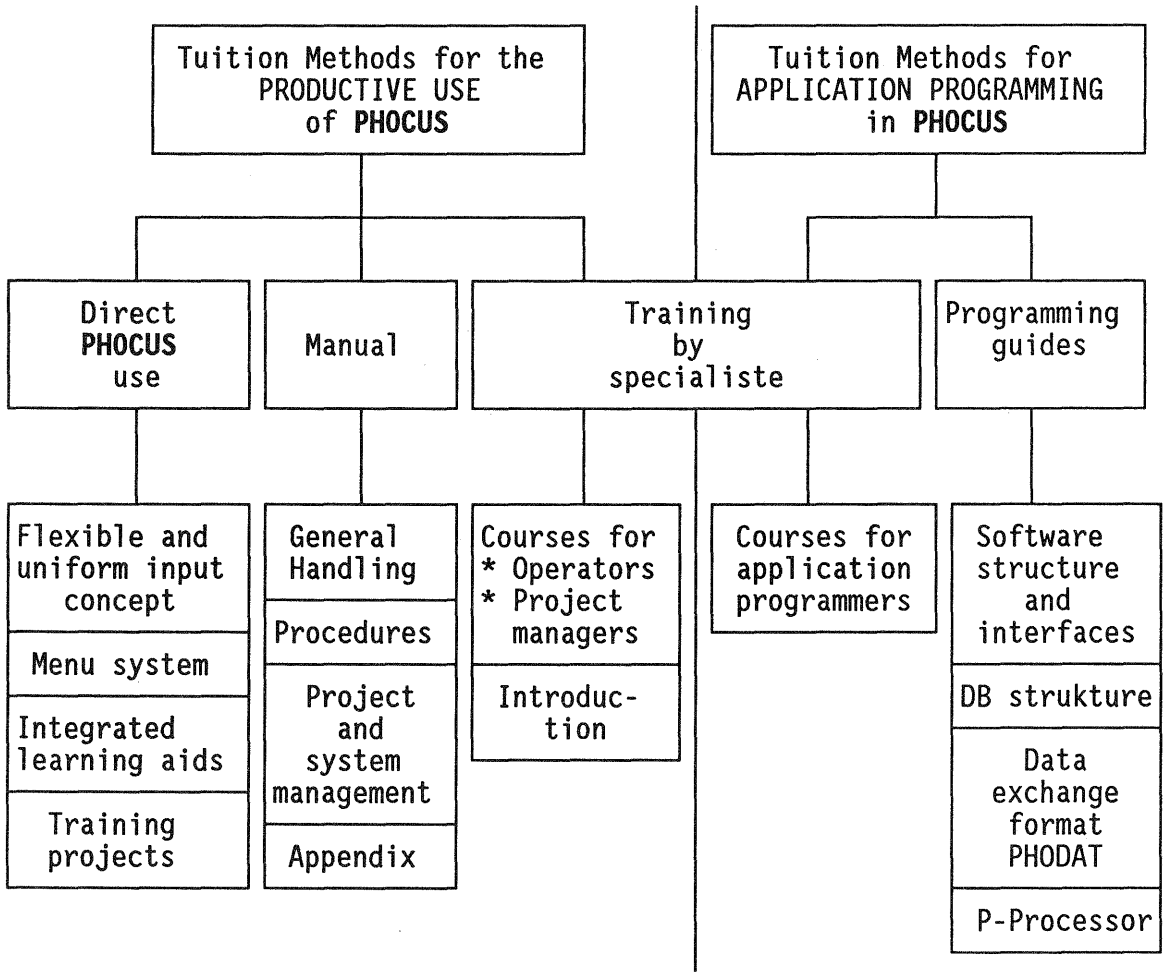

Fig. 3: Tuition Concept for **PHOCUS** Training

The operators responsible for the *PRODUCTIVE USE* of **PHOCUS** need only little EDP training and no detailed **PHOCUS** system knowledge. They are first of all required to master the application tasks.

- Use of the P1, P2 or P3 Planicomp analytical plotter for topographical data acquisition and editing, for measuring digital terrain models, and for photogrammetric point measurement for block or model adjustment.

- Digitization of 2-dimensional data.

- Graphical data output with drum plotters or precision tracing tables as a preparation for map production.

The project and system environment for the operator is established by the **PHOCUS** project manager. This work requires some familiarity with electronic data processing (file management, screen editor) and profound familiarity with photogrammetry and cartography. Some project manager tasks are listed below:

- System management (**PHOCUS** system files, device tables, project and operator names).

- Project installation (user coordinate system, object code table, data base).

- Preparing menus.

- Establishing graphics tables.

- Data interchange e.g. with the PE editing subsystem or with other information systems

If trained properly, the operator can perform some or all project manager tasks. Introduction to and training in these fields are the subject of the training courses integrated in the tuition concept (refer also to section 4.3). If desired, Zeiss specialists can establish an initial custom project and system environment in the field.

The high functional versatility of **PHOCUS** opens up a comprehensive range of applications in photogrammetry and cartography. Even so **PHOCUS** is an open software system that affords user *APPLICATION PROGRAMMING* of special tasks. This work requires programming experience and computer knowhow (HP, DEC). The additional knowledge of the **PHOCUS** software structure (opera-ting system, interfaces, program libraries) is given in special courses.

4. PHOCUS LEARNING AIDS

The tuition and work methods for the productive use of **PHOCUS** are most certainly the major components of the tuition concept (Fig. 3). They comprise:

- *Direct* use of **PHOCUS** and its integrated learning aids.
- The *manual*.
- *Training* by specialists in training courses.

The targets and contents of these methods, which differ from the conventional ones, are exemplified below.

4.1 DIRECT **PHOCUS** USE

When he starts **PHOCUS**, the user is confronted with an operating system-like environment in which he can call and process individual tasks (Fig. 4). The project and system environment used last is re-established each time **PHOCUS** is started.

```
CMD> (Command prompt of the PHOCUS operating system)
     - Parameter entry and function specification (i. a. HELP)
     - Normal termination (EX) or abortion (AB) of PHOCUS
     - Entry of temporary computer commands in the PHOCUS
       environment
     - Calling application functions (INOR, REOR, ABOR etc.)
       Example:
CMD> MEOD              (Measure object data)
MEOD>     (Command prompt of the application function)
          - Parameters and functions (i. a. also HELP, TUTORIAL)
          - Work (measuring and editing in this instance)
          - Temporary PHOCUS and computer commands
          - Application program termination:
MEOD> EX
CMD>
```

Fig. 4: **PHOCUS** Input Concept

Task handling is facilitated considerably by system-specific features and integrated learning aids. The intelligence and wealth of help information built into **PHOCUS** largely replace the continued use of manuals required by other systems.

The flexible but *uniform input concept* enables the user to enter all or individual parameters for an application program either in the command mode or in the dialog mode. The readiness of the system to accept entries is indicated by a program-specific prompt (e.g. INOR>, REOR>, ABOR> for the **PHOCUS** program components for interior, relative and absolute photo pair orientation with the Planicomp; refer also to Fig. 4).

The intelligence of the command interpreter also ensures error-tolerant input. Input requests are backed up by appropriate default values.

Efficient input means are

- menus (especially for object-structured data acquisition and editing),
- macro commands for frequently recurring operations, and
- manual entry.

The menu system in particular is a user-friendly entry method. The photogrammetric operator or cartographic editor can concentrate on the task on hand without concerning himself with input commands or object structures. **PHOCUS** therefore contains a versatile menu system. It comprises:

- The TABLET menu, an overlay that can be arranged freely on the tablet of the P1/P3 Planicomp or the PD digitizing subsystem (up to 4 overlays).
- The Planicomp menu for defining the soft keys of the Planicomp P-Cursor (Fig. 5) or the foot switches, if available.
- The DIGITIZER menu for defining the soft keys of the so-called D-Cursor of the PD digitizing subsystem.
- The GRAPHICS menu, a menu line on a graphics screen.
- The PANEL menu for defining the soft keys of an additional command panel (**PHOCUS** Panel).
- The SOFT-KEY menu for defining the soft keys of an alphanumeric terminal (e.g. the system console).

At system installation time, the user is provided with a large number of ready-made menus that facilitate general handling (calling application functions, parameter entry, help) and support special applications (e.g. measurement and editing functions).

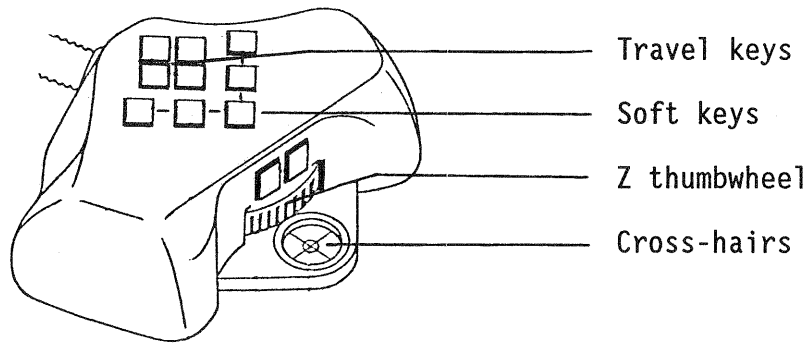

Fig. 5: The P-Cursor -
The main control element for the P1/P3 Planicomp Operator

The **PHOCUS** input concept is furthermore characterized by permanently available integrated learning aids like tutorials and help functions. The tutorials in particular enable the **PHOCUS** novice to directly request information on the purpose and execution of an application task. The help functions provide

- a survey of the existing and currently available functions and parameters of an application program, and

- detailed information on the purpose, range and syntax of each command.

The help functions can be called both in the command mode and in the dialog mode. Fig. 6 shows an example.

```
INOR> ?          (call of HELP information in "interior orientation")

FIDUCIALS   NF    : PARAMETER  to set the number of fiducials
TYP         TY    : PARAMETER  to specify the type of transformation
SETTINGS    NS    : PARAMETER  to specify the number of settings
    ...
REJECT      RE *  : FUNCTION   to reject this fiducial
CALCULATE   CC *  : FUNCTION   to calculate the interior orientation
SET         SE *  : FUNCTION   to set parameters
    ...

INOR> SE                                          (set parameter in INOR)

CARRIER      CA = >BOTH
FIDUCIALS    NF = >4
TYP          TY = >1
SETTINGS     NS = >/H                (call of HELP information for NS)
   Usage    :  NS = par
               par : Number of settings for each fiducial
   Purpose  :  If NS = 2 , then the programm expects two settings of
               each fiducial.    ...
SETTINGS     NS = >1
TORES        TO = >0.010
CAMERA       CM = >/E                        (to terminate the dialogue)

INOR>
```

Fig. 6: **PHOCUS** Help Functions (Example)

An important component of the **PHOCUS** system are ready-made *training projects*, i.e. installed work environments for both the operator and the project manager (menus, system files) for different applications:

Project	Application
DEMO	Object-oriented data acquisition and editing; data output with specialized graphics tables
PLOTTING	Graphics-oriented editing and output (simple digital mapping)
TRAINING	Establishment of a project environment by the user with the "Typical Applications" described in the manual.
...	Further projects are being prepared for "DTM Measurement" and "Aerotriangulation"

The training projects are provided not only for initial familiarization with **PHOCUS** and for training courses, but also for direct productive use.

4.2 THE MANUAL

The **PHOCUS** input concept and the integrated learning aids have changed the conventional role of the manual considerably. This is why the **PHOCUS** operating manual does not list the complete range of functions and parameters of all **PHOCUS** application programs. Instead it describes:

- *General handling* (starting and terminating, **PHOCUS** Base, input and output, system files).
- Practical handling of *typical applications* (model orientation, work preparation; collecting, editing and outputting data).
- *Project and system management* by the project manager.

The manual thus provides the required information on the appropriate use of the **PHOCUS** application programs. In combination with the installed training projects (see above), the numerous examples assist in learning and consolidating major procedures.

4.3 TRAINING BY SPECIALISTS

As a complement to the learning aids described in sections 4.1 and 4.2, there are optional training courses for

- operators and
- project managers

that provide intensive training in the general handling and productive use of **PHOCUS**. These one-week courses are given by application specialists.

To ensure efficient training, only a limited number of participants are admitted to each course. Direct training at the customer's site is also possible.

The training targets correspond to the operator and project manager tasks detailed in section 3.

Courses for application programmers by **PHOCUS** development specialists are available upon demand. They confer **PHOCUS** system knowhow for programming special applications in the **PHOCUS** environment.

5. PROSPECTS

Important criteria for the assessment of modern application software are not only its high functional versatility but also short training times and user-friendly handling. The tuition concept of the universal **PHOCUS** photogrammetric and cartographic information system meets these requirements. The sophisticated tuition concept includes comprehensive integrated tuition aids, a manual, and training courses.

Even so, the general handling and the work environment will be further improved, e. g. by adding further training projects and project environments tailored to regional particularities like national coordinate systems and object code tables.

LITERATURE

/1/ HOBBIE, D.: Introduction into the New Product Generation from Zeiss: P-Series Planicomp/**PHOCUS**
Proceedings of the 41st Photogrammetric Week at Stuttgart University, Vol. 12, Stuttgart 1987

/2/ LEIDEL, W.: The Principles of **PHOCUS** Software
Proceedings of the 41st Photogrammetric Week at Stuttgart University, Vol. 12, Stuttgart 1987

/3/ MENKE, K.: Production and Revision of Topographic Maps with **PHOCUS**
Proceedings of the 41st Photogrammetric Week at Stuttgart University, Vol. 12, Stuttgart 1987

/4/ MENKE, K.: Map Production and Map Revision by **PHOCUS**
Presented paper 16th ISPRS Congress, Commission IV, Kyoto 1988

/5/ SAILE, J.: The Special Features and Versitale Interfaces of the Planicomp P-Series.
Presented paper 16th ISPRS Congress, Commission II, Kyoto 1988