

DTM-3 MEASUREMENT SYSTEM FOR PLANIMAT AND PLANICART

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1. Introduction

Digital terrain models are gaining ever greater importance in surveying and planning. The mathematical problems have been solved, and complete program systems are already available, which are put to practical use on a constantly increasing scale. In photogrammetry, digital height models are used, moreover, in orthoprojection applications.

As early as 1971, CARL ZEISS presented the DTM-1, a system for measuring grid-type digital terrain models in conjunction with a D-2 PLANIMAT and ECOMAT-11 [1]. The DTM-3 is an improved version designed for use with an ECOMAT-12 [2].

2. Equipment

The DTM-3 Measurement System (Fig. 1) consists of the following major components:

- a) Digital servosystems for x and y with DC motor assemblies for PLANIMAT and PLANICART analog plotters as well as the corresponding amplifier unit.
- b) An electronic control unit with various presetting controls.
- c) An operator control panel serving to control the different parameters during use of the system (Fig. 2).

The data are recorded in an ECOMAT-12. The different operating procedures, including the following of inclined profiles and the recording of data, are microprocessor-controlled, with a resolution and accuracy of 1/100 mm. Ground coordinates can be recorded in conjunction with the CASP program system. The technical data are summarized in Fig. 3.

3. Procedure for grid-type measurement

As in the DTM-1, planimetric motion is automatically controlled. The only thing the operator has to do is adjust the floating mark vertically with the aid of a handwheel. In addition to a square or rectangular planimetric grid, recordings can be triggered at intervals of height or time (Fig. 4). Blocks may be limited digitally by giving the length and number of profiles or in an analog manner with the aid of contact strips. Profiles are followed either continuously with variable speed or incrementally, by automatic advance from point to point, recording being triggered by foot control after the floating mark has been placed on the model surface. In the incremental mode, single-point height-measurement accuracy is attained. The profiling direction may be rotated in relation to the model-coordinate system, angular resolution being 0.01° , equivalent to a maximum error of ± 0.04 mm in the model for a profile length of 500 mm.

If errors are noticed during profiling, for example in guiding of the floating mark, an error signal may be entered to mark the erroneous profile, and the profiling run will be automatically repeated.

4. Cross-sectioning

By rotating the profiling direction in relation to the model system it is possible to measure profiles or cross sections of any desired orientation. Measurement is started either at the beginning or in the center of the cross section (see Fig. 5). Travel along the cross section may be incremental or continuous, recording being triggered at constant intervals of travel. Additional recording of topographically interesting points is possible. This considerably facilitates cross-sectioning as compared with the conventional, manual approach of the different profile points.

References

- [1] SCHWEBEL, R.: Neue Instrumente zur Digitalisierung von photogrammetrischen Modellen, Bildmessung und Luftbildwesen 39, S. 48-54, 1971.
- [2] SCHWEBEL, R.: Das neue photogrammetrische Datenerfassungs- und Übertragungssystem ECOMAT-12, Bildmessung und Luftbildwesen 44, S.151-158, 1976.

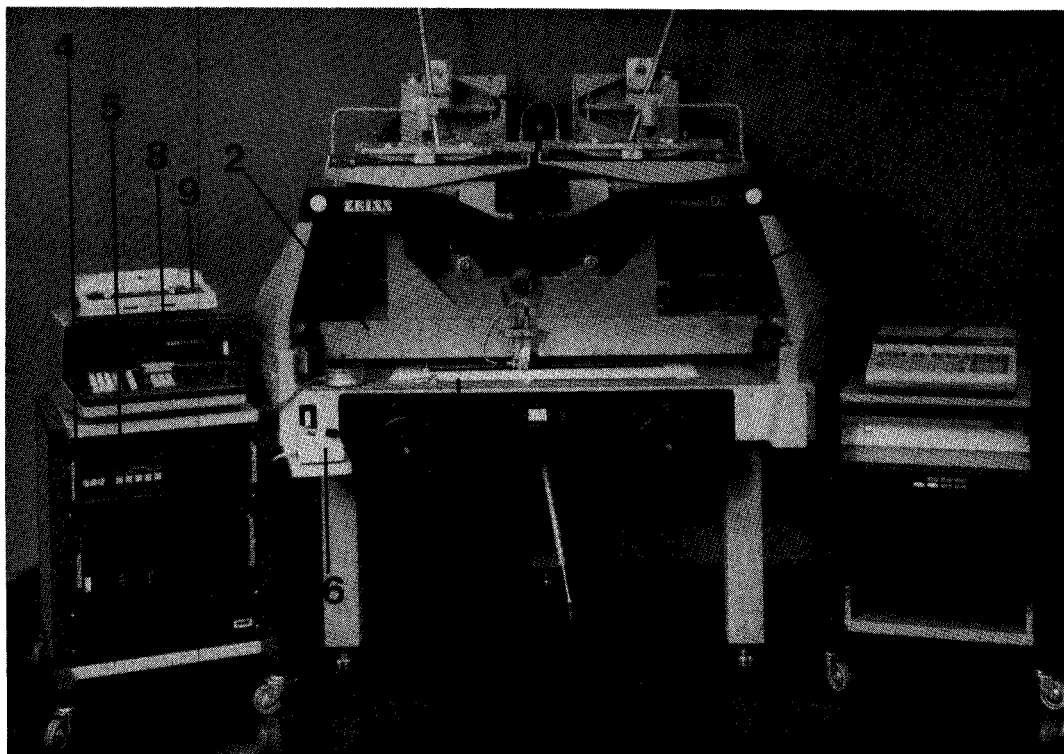


Fig. 1 D-2 PLANIMAT with DTM-3 and ECOMAT-12

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|---|-------------------------|----|---------------------|
| 1 | D-2 PLANIMAT | 6 | DTM-3 control panel |
| 2 | x-drive assembly | 7 | Contact strips |
| 3 | y-drive assembly | 8 | ECOMAT-12 |
| 4 | Slide-in amplifier unit | 9 | Printer |
| 5 | DTM-3 control unit | 10 | HP 9825 calculator |
| | | 11 | Magnetic tape deck |

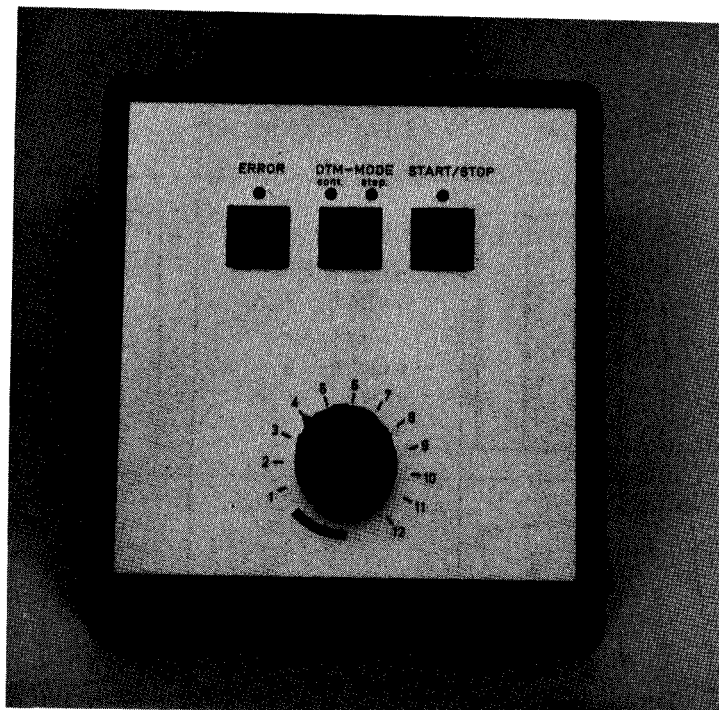


Fig. 2 DTM-3 control panel

Profiling direction:

Parallel to model system
(x,y-system).
Rotated in relation to model system
(q,l-system).
 $\alpha = 0 - 400^\circ$, resolution 0.01°.

Limitation of blocks:

Digital by giving length and number
of profiles.
Analog with contact strips.

Operating modes:

Continuous on profile.
Incremental from point to point,
resolution 0.01 mm,
back-and-forth or comb pattern.

Profile interval:

in x or y 0.01 mm to 10 mm,
in increments of 0.01 mm.

Point interval:

In y or l 0.1 mm to 10 mm,
in increments of 0.1 mm.

Triggering of recording:

Individually by hand or foot control.
Automatically in increments of Δy or Δl .
Erroneous recordings can be marked.
Automatically in increments of Δh or Δt
(Δ -accessory).

Speed:

Measuring speed 0 - 10 mm/s.
Traveling speed 0 - 25 mm/s.

Cross-sectioning:

With α -accessory, starting at be-
ginning or in center of cross
section.

Fig. 3

Technical data of DTM-3

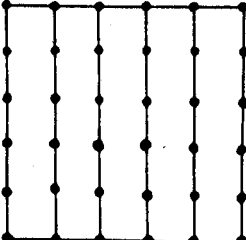
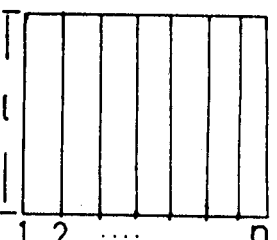
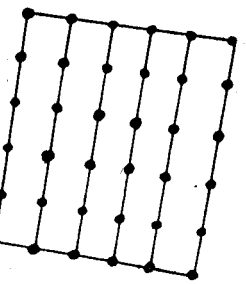
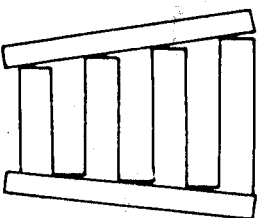
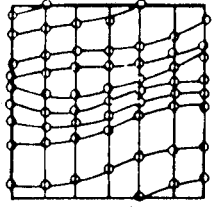
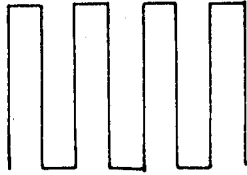
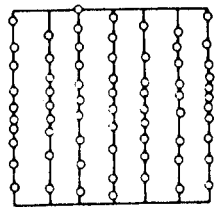
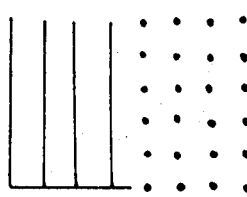
Designation	Grid type	Limitation	—
x,y-planimetric grid, triggering Δy		Digital, profile length 1, profile number n	
l,q-planimetric grid, triggering Δl		Analog with contact strips	
Vertical grid, triggering Δh		Operating mode: Back-and-forth, continuous	
Time grid, triggering Δt		Comb pattern, incremental	

Fig. 4 Grid types and operating modes

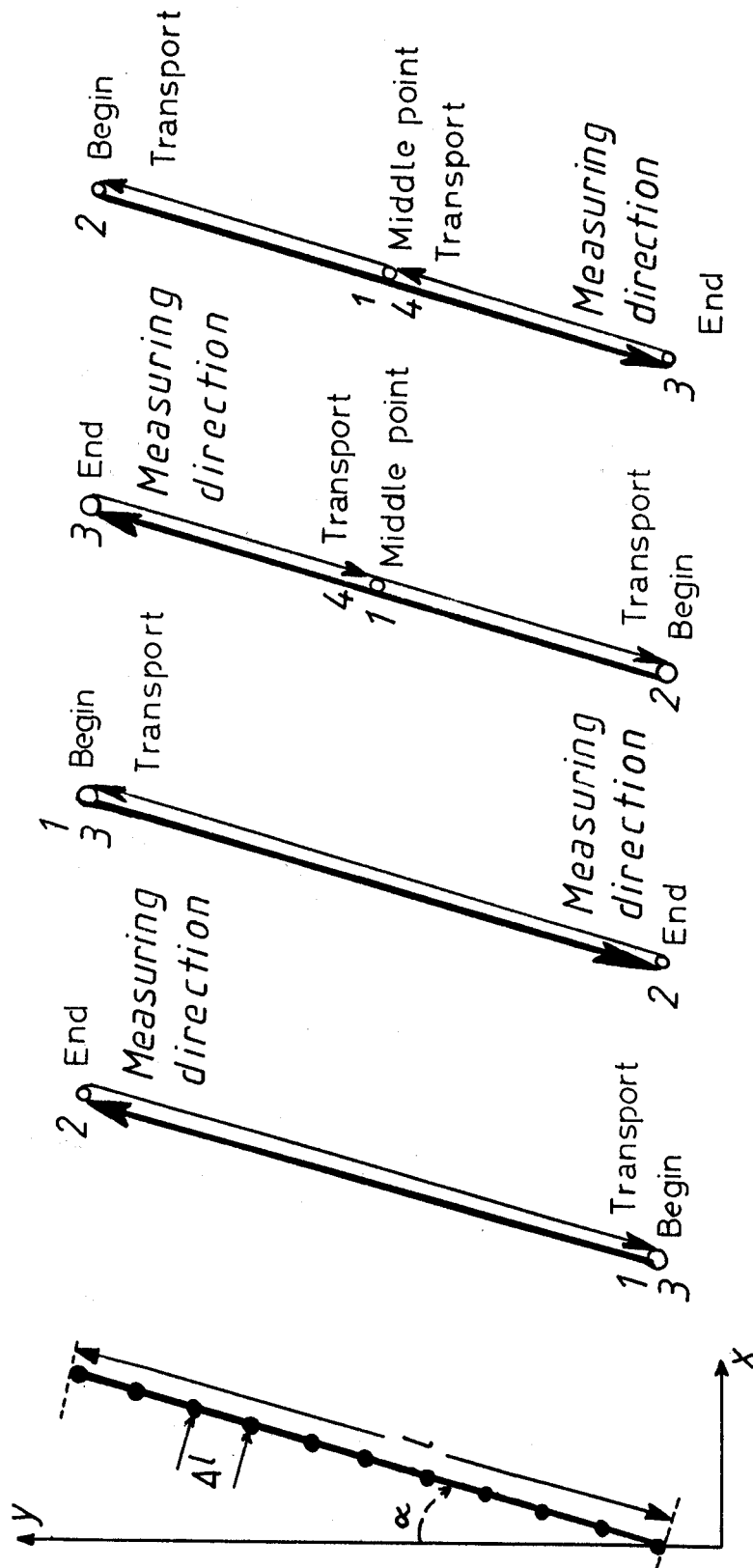


Fig. 5 Cross-sectioning with DTM-3

Abstract

CARL ZEISS of Oberkochen present the DTM-3 Measurement System which in conjunction with a PLANIMAT or PLANICART and an ECOMAT-12 allows measurement of grid-type digital terrain models and cross sections of any orientation.

Meßeinrichtung DTM-3 für PLANIMAT und PLANICART

Zusammenfassung

CARL ZEISS stellt die Meßeinrichtung DTM-3 vor, die in Verbindung mit PLANIMAT und PLANICART sowie ECOMAT-12 die Messung rasterförmiger digitaler Geländemodelle und die Messung von Einzelprofilen in beliebigen Richtungen erlaubt.

Résumé

La maison CARL ZEISS présente l'ensemble de mesure DTM-3 qui permet, en combinaison avec le PLANIMAT, le PLANICART et l'ECOMAT 12 la mesure de modèles de terrain digitaux en forme de trame et la mesure de profils isolés dans des directions au choix.

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