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TITLE:

AN AUTOMATED DATA COLLECTION - PROCESSING AND PLOTTING SYSTEM

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ABSTRACT

An integrated mapping system consisting of three data collectors,an EK22 acting as temporary tape storage,a minicomputer shared with other peripherals and a flat bed plotter,has been developed.

Photogrammetric data are collected either by an appropriately modified Zeiss Topocart,or by an encoder fitted and reconditioned Cambridge comparator.Thematic data are collected using a hand digitiser.

A Wild EK22 with magnetic tape facilities acts as an information store, storing data from any or all the collectors.

A PDP 11-34A with 192 K-bite memory is the processor.It is shared with other peripherals.

A Data Technology plotting table connected to the minicomputer caters for graphical output while numerical output can be obtained from a line printer or a hard copy terminal.

The software can be loaded either by a card reader or from any of the terminals.A tape reader will be incorporated later.

Existing software is being improved and new software developed.

INTRODUCTION

The system described is still at the developmental stage and breakdowns due to operator inexperience are being encountered. Utilization at optimum capacity, therefore, is still some way off. Final conclusions regarding versatility and potential require further testing.

1. DATA COLLECTORS

(a) Zeiss Topocart B.

A Zeiss Topocart B has been fitted with *X*, *Y*, and Z encoders (see Fig. 1 and 2) giving an accuracy of 10 micro-metres.

The impulses are fed into a Wild EK22 digitiser displaying the *X*, *Y*, and *Z* values of the position of the floating mark in space. When observing single points, point numbers may be assigned by the operator. When working in time or distance mode (see next paragraph for detailed explanation) sequential numbering may be assigned to each point.

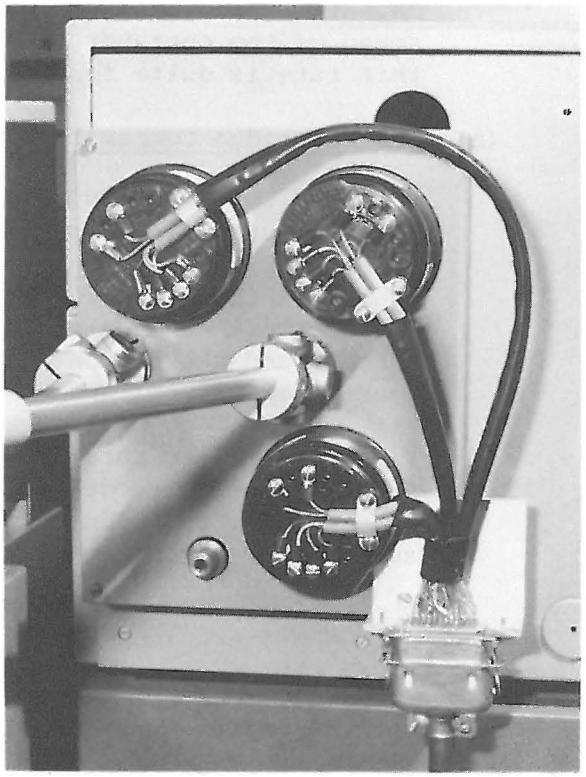

Figure 1.

Figure 2.

Observations may be printed out on an IBM typewriter attached to the Wild EK22. The observational data may also be recorded directly onto the magnetic tape unit of the Wild EK22.

Rapid recording by the magnetic tape unit of the Wild EK22 also allows the operator the option of time or distance mode of recording. Thus, by specifying a time or distance interval, it is possible to scan the photographic model in either *X*, *Y* or any other direction and record co-ordinates *X*, *Y*, *Z* at certain distances or time intervals. To enable registration on to the magnetic tape, the number of recorded points is limited by the speed of the operator only. Obviously typewritten output at this rate is quite impossible.

(b) The Cambridge Comparator

(Fig. 3) Observations of data for aerotriangulation may be acquired utilizing a modified Cambridge Comparator. The comparator is altered to output numerical data utilizing, once again, the Wild EK22. The quantities registered are *X'* and *Y'* for the left hand camera recorded directly from the left hand *X* encoder and the common *Y* encoder. The additional observed quantities are *by"* and *X"* where *by"* represents the difference between the *Y* co-ordinates, i.e. *Y"* - *Y'*. Hence by adding *by"* to *Y'* the *Y"* co-ordinate is obtained. *X"* is directly recorded from the *X"* spindle encoder. *by"* is recorded in the space usually reserved for the point number on the Wild EK22, thus disallowing automatic recording of the point number onto the magnetic tape.

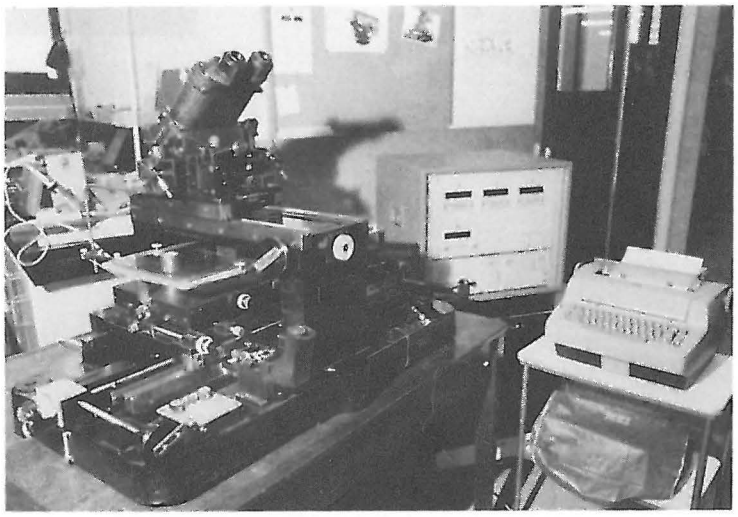

Figure 3.

(c) The Hand Digitizer

(Fig. 4) To digitize information from a variety of sources (often non-conventional) a hand digitizer is used. The hand digitizer consists of two encoders located at the pivots of two connected polar pantographs, and interfaced with the Wild EK22.

Figure 4.

Digitized information is stored on magnetic tape for later processing. The hand digitizer is a useful addition particularly as a gatherer of thematic and other such information for subsequent superimposition onto maps produced from the photogrammetric models in the Topocart and which have been stored on magnetic tape.

A potential application, other than maps, is the superimposition of information onto three-dimensional block diagrams. Such superimposition will significantly assist predictions of, for example, future development, particularly through the planning stages where visual representations may be obtained of various alternatives before large sums of money need to be expended.

It should be recognized that the hand digitizer may also be used for all conventional purposes.

Figure 5.

2. THE PROCESSOR

(Fig. 5) Information assembled by the data collectors is processed either on or off-line. A PDP 11-34A computer, with a 192 K-byte memory of 8 bit words, is employed. The data collectors seldom require the full capacity of the mini-computer and, as a consequence, several peripherals may be operated concurrently.

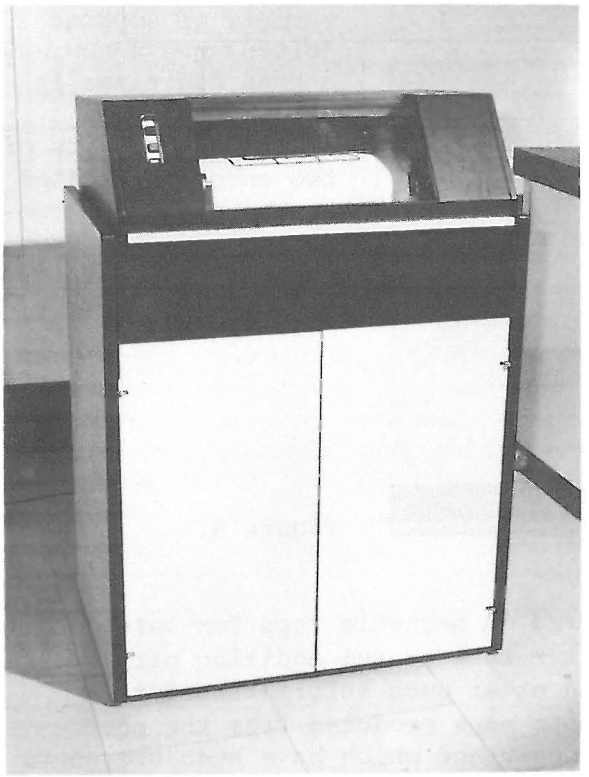

Figure 6.

Collected data, after processing by the computer, is printed out in a numerical form either by the line printer (Fig. 6) or by one of the hard copy output terminals. (Fig. 7) Graphical output is achieved by utilizing a flat bed plotter interfaced to the mini-computer.

The mini-computer is equiped with four discs, each having 2.5 mega-bytes capacity. Two of the discs are fixed, the other two are each removable. The discs enable the computer to store information for later processing or for outputting at a convenient time.

Figure 7.

3. THE FLAT BED PLOTTER (Fig. 8 and 9)

A Data Technology flat bed plotter caters for the graphical output of the system. The table, in its present form, has the facility to draw in two colours and there is provision to increase this to four by the use of an alternative drawing head. The plotting speed of the table is low compared with the processing ability of the computer, and as a consequence, information to be plotted may be stored on disc and when sufficient has been gathered the plotter may be activated. This would normally be in a low use period, such as overnight, when plotting backlogs can be eliminated.

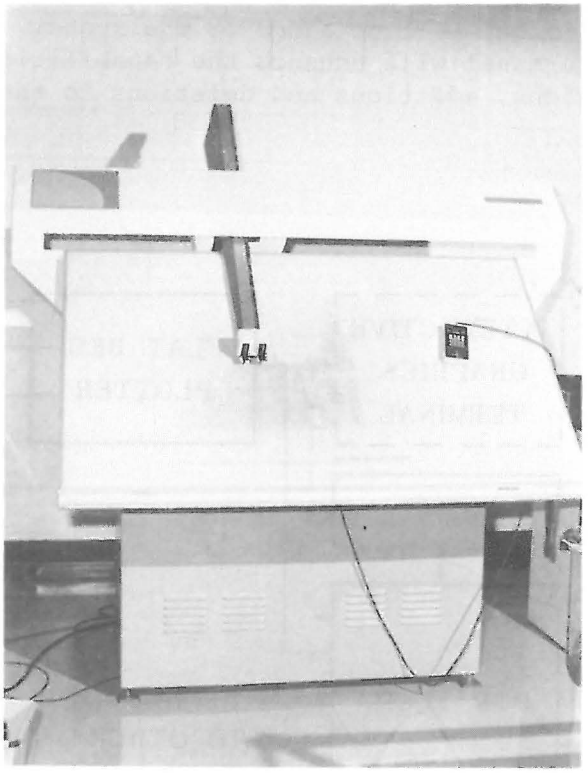

Figure 8.

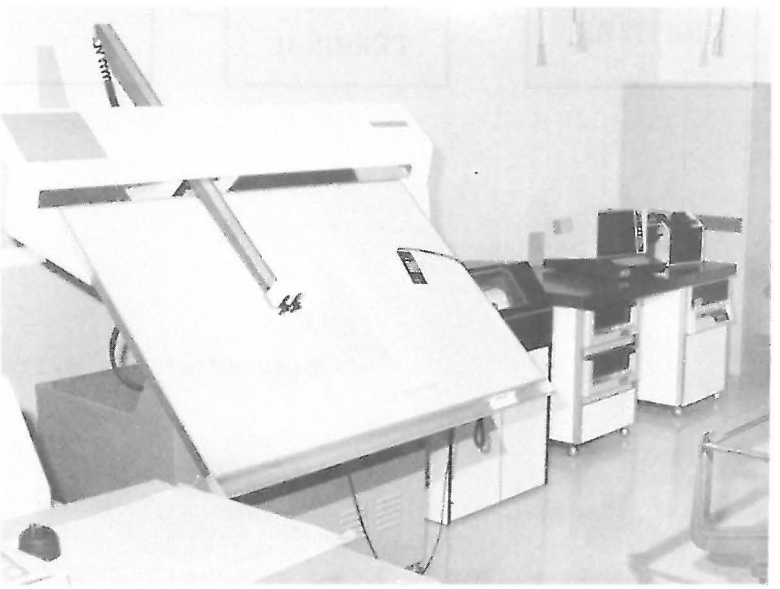

Figure 9.

4. SOFTWARE

A FORTRAN and MACRO compiler are available.

Software may be loaded by cards using a card reader or from a terminal. Initially programs from a variety of sources, but particularly developed at the Royal Melbourne Institute of Technology, have been used. These have been and will continue to be gradually modified and improved to suit the particular system. New programs are continually being developed.

5. PLANNED ADDITIONS TO THE SYSTEM

An interactive graphics display terminal will be added to the system as soon as funds are available. This terminal will enhance the capabilities of graphical output by allowing corrections, additions and deletions to the output.

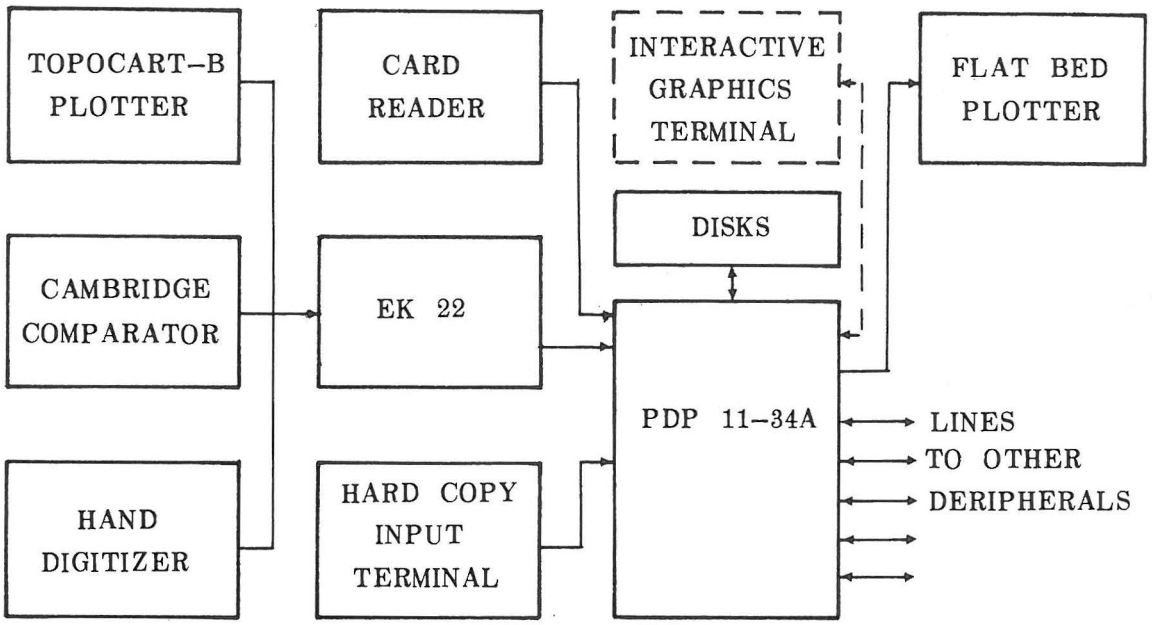

Diagram of the System.