

C.S.I.R.O.

COMPUTING RESEARCH SECTION

NEWSLETTER NO. 15 - 1.8.66

I. GENERAL

Publications Issued this Month

- NL Newsletter No. 15
- TM Technical Note No. 17 - Paper Tape Facilities on the
 Control Data 3200. D. Ross, C.R.S., Adelaide.
- TM Technical Note No. 18 - Papadata.. C. Billington,
 Division of Chemical Physics. Melbourne.

Application for Subroutine Writeups etc.

Would users please include their name and address when
applying for subroutine writeups, decks etc.

Library, Canberra

During the period August 5th to September 9th the library
will be short staffed. Users are reminded that there may be
delays during that period.

New CSIR Subroutines

C2 CSIR VIETA Explicit Solution of the General Cubic
 equation with real coefficients.
 A.M. Simpson, C.R.S. Adelaide
 (This is based on the CO-OP routine by
 F.B. Carronito).

C3 CSIR VELLQ) Seismic Surface Wave Velocities
and C3 CSIR VELLR) L. Thomas, Adelaide.

C3 CSIR BESHLEFI)
C3 CSIR BESHLEFJ) Bessel Functions.
C3 CSIR BESHLEFK) P.W. Milne and J.J. Russell, C.R.S.,
C3 CSIR BESHLEFY) Melbourne.

Evaluates $I_{\pm}(n+\frac{1}{2}); J_{\pm}(n+\frac{1}{2}); K_{\pm}(n+\frac{1}{2}); Y_{\pm}(n+\frac{1}{2})$
for $n = 0, 1, 2, \dots$

- F2 CSIR IG 178 The Least Squares Adjustment of Conditioned
or Unconditioned Observations - Small Problems.
D.C. Knight, A. Simpson, Adelaide.
- F2 CSIR IG 179 The Least Squares Adjustment of Conditioned or
Unconditioned Observations - Large Problems.
D.C. Knight, A. Simpson, Adelaide.
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R2 CSIR Matrix Algebra.

Mtrxpack. S. Elhay, Adelaide.

(This subroutine is derived from MTRXPack by R.H. Hudson,
C.R.S., and is designed for use on the 3200 machines)

Symposium on Collection and Processing of Field Data

A Symposium on this topic will be held at the Academy of Science
from August 30th to September 2nd, 1966 under the auspices of the
C.S.I.R.O.

The meeting will include discussion of the instrumental, sampling
and data treatment problems peculiar to measurement in field environment,
and contributions by electronics and systems engineers on recent
technological developments relevant to these problems.

It is intended that the Symposium foster collaboration in this
direction between the engineering sciences and field workers in
micrometeorology, hydrology, ecology, oceanography, animal physiology
and allied disciplines.

Further information may be obtained from Dr. E.F. Bradley,
Division of Plant Industry, C.S.I.R.O. P.O. Box 109, Canberra City,
A.C.T. A registration fee of \$12 is payable by participants.

II. 3600

DAD Manual for Fortran Users

The preliminary edition of Memorandum No. 5 "DAD Manual for Fortran Users" is being used in connection with the DAD Seminars already held in Adelaide, Melbourne and Sydney and to be held in Canberra on August 10th, see this page.

The first proper edition is now in preparation and should be available by mid-August. It will be in loose leaf form to facilitate updating. Holders of the preliminary edition should obtain the new issue from their local centre when it is issued as the new edition has several important changes.

Memorandum No. 5 will be issued automatically to those who filled in the TM section of the Mailing List reply forms. This issue is expected to be made with the September Newsletter.

R - option Fortran and Compass Control Cards

A useful facility, particularly when debugging programs, in the cross-reference table produced by the addition of the option R on the Fortran control card.

e.g. $\begin{smallmatrix} 7 \\ 9 \end{smallmatrix}$ FTN, X, L, A, R, *

will produce an assembly language listing of the program together with a table showing the locations in the program where the variable names used in the program will be found.

Canberra - DAD Seminar

A seminar on "The DAD System for the Fortran User", will be given at 2.00 p.m. on Wednesday, August 10th in the Lecture Room of the Computer Building, Clunies Ross Street. The relevant manual is obtainable from the C.R.S. Library.

Advanced Fortran Lectures

Canberra	9th August	Use of Magnetic Tape
	16th August	Errors, Diagnostics and Debugging
	23rd August	Interpretation of Compass Listings of Fortran Programs.

All the lectures are held in the Lecture Room, Computer Building, Clunies Ross Street at 10.30 a.m.

Keyboard Consoles Display Units - Canberra

With the DAD system in operation on a daily basis the six keyboard console units can now be used in a time-shared mode. Initial practical instruction in the use of the units will be given to small groups of about ten people. If you wish to join a group would you please ask the Librarian, C.R.S. for Miscellaneous Publication No. 9 which is an enrolment form for the practical instruction.

III. 3200

Basic Fortran Courses

General Note. The Basic Fortran Programming Courses are only available to C.S.I.R.O. and other personnel who intend to use the facilities of the C.S.I.R.O. Computing Network.

Adelaide 29th August - 2nd September.

Details from D. Ross, C.R.S. Adelaide. Ph. 235511

Advanced Fortran Course

Adelaide Monday 5th September - Wednesday 7th.
From 9.00 a.m. to 5.00 p.m. daily.

Topic "Advanced Fortran Debugging including
Elementary 3200 Compass"

Details from and application to D. Ross, Phone 235511

SPECIAL SUPPLEMENT

The "Reading" and Interpretation of Pictorial Information

A research group within the Computing Research Section is developing techniques for the automatic interpretation of pictorial information. "Pictures" to be processed might be photographs (for example, aerial photographs, photomicrographs, electron micrographs), drawings or complex graphs. To many people, the computer is a tool which accepts and operates on information which is solely alphabetic or numeric in nature. Quite often however, alphanumeric information which is processed has first been recovered manually from a pictorial source, for example, by converting a waveform to a series of numbers. It now seems likely that within a few years research workers will be able to submit their information in pictorial form directly to the computer.

Let us consider two examples. The first of these deals with the analysis of chromosome micrographs, an application which has already been successfully handled by automatic means (Ledley, 1964). Figure 1 * shows a photomicrograph of chromosomes in the metaphase stage of mitosis. A normative description of the standard complement of chromosomes (the karotype) is statistical in nature and can only be arrived at by processing large numbers of chromosome sets. Ledley suggests that this statistical technique may be the only way to uncover small variations, which may prove important in relating chromosome karotypes to diseases. Ledley and others have made an encouraging start on this problem using FIDAC (Film Input to Digital Automatic Computer), in association with a computer system, to analyse large numbers of cells with respect to total chromosome complement and to make quantitative measurements of individual chromosome arm-length ratios, densities, areas and other morphological characteristics. Needless to say the time saved over manual methods is enormous and the serious problem of training competent microscopists is avoided.

* Because of the cost involved in reproducing the photographs, they are included in only half the newsletters prepared. Readers who are particularly interested in this topic may obtain the figures from the Librarian, C.R.S., Canberra. . . .

A second example is illustrated by Figures 2a and 2b. Figures 2b shows a drainage net recovered by hand tracing from a stereo pair of aerial photographs (Figure 2a). From measurements taken on these tracings are calculated statistical parameters - the number of streams of given orders, their orientations, their lengths, the scatter of various lengths and so on. By relating these parameters for some areas to measured rainfall and stream flows for these areas, it is hoped that techniques can be developed whereby hydrological characteristics of other basins can be evaluated from photographs without direct hydrological measurement. There seems little doubt that these tracings can be scanned and the metrical information required recovered automatically. This would in itself be a significant advance.

The question then naturally arises as to whether it would be possible automatically to recover drainage nets directly from the stereo pair of aerial photographs. Elaborate special-purpose computers, teamed with optical scanners very similar to those available for input to general-purpose computers, are already used to produce contour maps from stereo pairs of aerial photographs. Since information analogous to the drainage net has been recovered from a stereo pair, it seems likely that the hand-tracing stage could be eliminated. The powerful and versatile general-purpose digital computer, with its associated information storage, retrieval and processing capability, could prove a most efficient tool for this sort of work. The recovery of many other types of information from aerial photographs - for example, identification of vegetation types in land survey work, the measurement of tree crown sizes and timber density to estimate timber potential - may also be feasible.

The process of picture scanning and interpretation will, in many cases, be wholly automatic. However, any picture handling facility should be organised in a way which allows the user to communicate with the computer at various stages in his problem, and perhaps to show some aspect of his picture graphically. The time-sharing facilities now becoming available on C.S.I.R.O.'s Control Data 3600 machine make such on-line work an economic proposition.

The on-line user might first recover a schematic diagram - for example, a contour map - from his picture, and then have this information displayed on the 14" graphical display tube (VISTA). He could indicate sections of this diagram with the "light pen" and initiate reprocessing of parts of the picture to recover additional information for special purposes (e.g. tree cover). He might type annotations for the diagram on a keyboard and with the light pen indicate positions at which these annotations should appear. Completed diagrams could be photographed from the display tube, reproduced on the plotter or encoded on magnetic tape for storage or reproduction on some off-line device.

We have discovered several projects both within and outside C.S.I.R.O. for which picture processing techniques could have potential value. More often than not, we have become aware of these projects purely by accident when discussing other problems with individuals using the C.S.I.R.O. computers. We are interested in acquiring wider knowledge of potential applications in this area.

We propose to conduct a workshop on Picture Interpretation later this year. An invitation to participate will be extended to any individuals with existing or potential picture interpretation problems. Though members of the Computing Research Section will discuss aspects of what it is hoped they can achieve, it is not expected that other contributions need be in any way computer-oriented. In most cases, the theme should be the problem itself.

Persons who would like to take part in the symposium, or who would like to discuss problems in this field of research, are invited to contact either personally or by letter any member of the research team.

M.B. Clowes,
P.H. Frost,
D.J. Langridge,
J.P. Penny.

Reference: Ledley Robert S. (1964). "The High-speed Automatic Analysis of Biomedical Pictures." Science; Vol. 146 and Sci.Amer., April 1966.

Footnote: Aerial photographs are tricky! If you think Fig. 2(b) really represents a ridge pattern, turn the picture upside down. See: Tolansky "Optical Illusions", pp146-149.

