THE UNIVERSITY OF NOTTINGHAM

FACULTY OF APPLIED SCIENCE

Applications of Computers

LECTURE 19

"THE ORGANISATION OF A COMPUTING CENTRE"

by

T. VICKERS, M.A.

THE ORGANISATION OF A COMPUTING CENTRE

INTRODUCTION

One of the functions of the Mathematics Division of N. P. L. is to develop new techniques of numerical analysis which can be of general use and one method of doing this has been to exploit the commercially available calculating machine. In the past, use has been made of desk calculators, accounting machines, punched card equipment, differential analysers and of course the electronic computer. From the early ACE pilot model built at the Laboratory has developed the DEUCE which is available commercially and the full scale ACE now nearing completion.

SUITABLE PROBLEMS

Certain problems of computation can conveniently be passed to a computer elsewhere for the calculations to be undertaken. The following examples, which are typical, are taken from the scientific or engineering field.

(a) Problems of matrix algebra - solution of simultaneous equations, evaluation of latent roots, curve-fitting.

(b) Roots of polynomials. These arise in electrical design, etc.

(c) Systems of differential equations.

(d) Crystallographic calculations. Crystal structure is derived from three main types of calculations and fortunately the methods employed are fairly universal.

(e) Ray-tracing for lens design.

(f) Aircraft design calculations which are normally reduced to a standard form.

(g) Linear programming and applications arising from Operational Research. It seems likely that many problems of a simulation nature can be put in a standard form.

(h) The analysis of market research data.

THE SOLUTION OF THE RIGHT PROBLEM

When using an electronic computer considerable care is needed to ensure that (a) the problem has been stated correctly and (b) that it has been processed correctly. Judging by the number of errors spotted in primary data, it appears that the first condition is very difficult to achieve. Examples will be given of typical errors. It is no less easy to ensure that the calculations have been carried out correctly. However, much can be done by the use of check sums, parity digits, recalculation by alternative methods and by doing spot calculations on a desk calculator.

STAFF REQUIRED

The staffing of a computing group will vary enormously from machine to machine but it is important that these functions should not be overlooked:-

(a) Organisation of time -avoiding the waste of too much staff time and of computer time.

(b) Organisation of information -keeping subroutine library up-to-date, circulation of information among staff and liaison with computers of same type.

(c) Keeping of records - for costing purposes, etc.

(d) Arrangements for the rapid processing of calculations. Many problems are better handled centrally by an expert in simplified coding rather than by several individuals away from the computer who are doing it at infrequent intervals.

(e) Adequate servicing of the computer and liaison with other engineers.

COSTING OF PROBLEMS

For standard problems for which little programming is required, the charge for a problem is frequently based on the computer time involved. For the larger machines, this is in the range £25- £70 per hour. This figure usually covers staff time, depreciation, spare parts, buildings. When extensive programming effort is required the extra cost can be based on the staff time of the programmers involved.

PROBLEMS WITH A "DEAD-LINE"

Of common problems of this sort, two will be discussed. The first example is the calculation of a weekly payroll on a service basis. The basic information must be available to the computer not later than a certain time each week whilst the results of the calculations must be produced in time for payment to take place. By careful organisation, dealing with overtime in arrears, and other devices it is possible for such work to proceed very smoothly and one computer is at present handling 3 or 4 large payrolls.

The second type of problem is the processing of data from an experiment - say a wind tunnel - in which the cost of running and setting up the equipment is high. Here it is important that the calculations are carried out speedily so that any decisions about succeeding experiments may be taken. In assessing priorities, a problem of this type would have first call on the machine.

Our experience of such methods of operation is very limited but the determination of priorities is still necessary for jobs being processed by the computer. One rule which is easy to apply is that the jobs shall be undertaken in chronological order. Unfortunately a job which requires 100 hours of computer time is likely to delay a number of small trivial jobs. This is overcome at N. P. L. by imposing an upper limit to the time per week allocated to such problems so that those involving a few minutes of machine time can still be carried out quickly.

The details of the organisation of any particular computing centre will inevitably be very individual. However, much can be gained from discussions with members of existing groups and from reading case-histories. Four such papers are quoted.

REFERENCES

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3. - And how to avoid them. D.T. Caminer - as for ref. 2.