

executed in the central processing unit.

These results and the high degree of overall resource exploitation obtained, make it reasonable to consider of limited efficacy any further attempts to improve program time performance on the basis of improved resource exploitation.

In the present system CPU and I/O management are realised, respectively, by fixed priority assignation and by a first-in first-out technique. Since program criticalness depends both on the state of the system and on the behaviour exhibited in the runs, it may be thought that an improvement in system time performance is possible by means of a management technique dynamically assigning priority in the use of CPU and I/O.

To this end a 'least time to go' technique has been employed which, as is known (Fineberg, 1967), assigns instant by instant maximum priority to the program with the most critical time bound.

The results obtained, shown in Fig. 4 confirm the validity of

the hypothesis; the response times for critical programs, remarkably reduced, are now within limits imposed by the process.

Naturally this improvement brings an increase in the response times of the non-critical programs, which are not discussed in this paper, and a lower level of resource utilisation.

A further investigation has been carried out to examine the effects due to the introduction of the 'least time to go' algorithm alone leaving unchanged the memory allocation policy.

The results relative to the utilisation of the resource are reported in Table 3 and show again the trend in increasing the overhead and decreasing the time available for off-line work.

However, in this situation the introduction of the 'least time to go' algorithm has not brought any noteworthy variations in the response times which substantially remain the same as those in Fig. 3 unlike what happened with the memory compaction policy.

## References

- BOARI, M., NERI, G., and PELLIZZARDI, P. (1972). Performance evaluation of process control systems, *XII Convegno internazionale dell'automazione e strumentazione*, 1972.
- CHENG, P. S. (1969). Trace driven system modelling, *IBM System J.*, Vol. 8, No. 4, pp. 280-289, 1969.
- FINEBERG, M. S., and SERLIN, O. (1967). Multiprogramming for hybrid computation, *Proc. AFIPS, FJCC* 1967.
- LUCAS, H. C. (1971). Performance evaluation and monitoring, *ACM Computing Surveys*, Vol. 3, No. 3, September 1971.
- MANACHER, G. K. (1967). Production and stabilization of real-time task schedules, *JACM*, Vol. 14, No. 3, July 1967.
- NOE, J. D. (1971). *A Petri net model of the CDC 6400 - Workshop on system performance evaluation*, Harvard University, April 1971.
- NOETZEL, A. S. (1971). The design of a meta-system, *SJCC*.

## Book reviews

*Topics in Numerical Analysis*, edited by J. J. H. Miller, 1974; 348 pages. (Published for the Royal Irish Academy by Academic Press, £7.00.)

This text is sub-titled 'Proceedings of the Royal Irish Academy Conference on Numerical Analysis, 1972'. Of the nineteen papers published in the text, sixteen were given as one-hour invited papers at the conference. The remaining three are contributed by workers who were invited to speak but were unable to attend. Two invited papers are *not* included and are to appear elsewhere. These are 'Schwarz Functions and Iteration Theory' by P. J. Davis and 'The Hypercircle Method' by J. L. Synge. All papers are in English with the exception of that in French by R. Glowinski. This, at fifty pages, is also the longest.

Those who attended the conference were fortunate to hear two talks by Cornelius Lanczos. In addition to his invited paper 'Legendre versus Chebyshev polynomials' he gave a delightful evening lecture of a non-technical nature entitled 'Computing through the ages'. The full text of this excellent talk is presented as an introduction to this volume of research papers.

The overall standard of this collection of papers is high. They are arranged by alphabetical order of authors. As usual, partial differential equations are well to the fore, with papers by L. Collatz, E. G. D'jakonov, E. Schechter, R. Glowinski, P. A. Raviart, V. Thomée. The latter three papers are concerned with the finite element method. Ordinary differential equations are also well represented, with papers by R. K. Brayton and C. C. Conley, J. C. Butcher, J. Douglas and T. Dupont (a Galerkin approach, using splines), L. Fox *et al.*, H. O. Kreiss, H. Stetter. The latter paper is on discretisation theory, as is the paper which follows it, by F. Stummel. There are two papers on numerical linear algebra: one is by R. S. Varga with applications to the finite element method; the other is an attractive paper by G. H. Golub concerning the Lanczos algorithm for finding eigenvalues. There remain three papers: one on quadrature formulae by G. Freud, one on control theory by J. L. Lions and one on Fredholm integral equations, a notable paper by B. Noble.

The editor has done his job well, although some would wish to have seen more material on linear algebra and rather more than the solitary contribution (from Lanczos) on approximation theory.

G. M. PHILLIPS (St. Andrews)

*The Skyline of Information Processing*. Proceedings of the Tenth Anniversary Celebration of IFIP, edited by H. Zemanek, 1972; 146 pages. (North Holland Publishing Co., \$7.00.)

In Amsterdam in October 1970, IFIP celebrated its tenth anniversary by means of a set of eight lectures given by speakers, most of whom had been prominent members of the IFIP organisation during its formative years. This book records those lectures in print.

The lectures fall primarily into two categories, historical and philosophical. In the first category fall topics such as 'Ten years of IFIP' and 'Computers and Technology', into the second come 'Need for an information systems theory' and 'Some philosophical aspects of information processing', while one paper 'IFIP and the expanding world of computers' falls neatly into both camps.

The majority of lecturers are from non-English-speaking countries, yet the style is uniform and the use of English is immaculate; one must assume that an excellent job of editing has been done. The style also is one that makes the entire book very easy to read. Nevertheless, it is difficult to see who would want to buy the book or where it would fit on one's bookshelves. The historical information is too lacking in detail either to be useful as a definitive account of the early history of IFIP or to provide a textbook in any aspect of computer science. The philosophical offerings again, are too generalised to show the direction in which one should direct one's efforts in the future, while the information content about current practice is not such that any on-going project is likely to be changed as a consequence. Although the sets of references given at the end of two of the lectures are comprehensive, many better ones have appeared before.

Naturally, if one wishes to have a printed record of a historic event, or to refer to the current thoughts of some of our most distinguished colleagues, or even to be given some hints on how to begin a new approach to computing's problems, then here is a purchase well worth making. I fear, however, that the potential market in this area is likely to be small.

Some of the papers could serve as introductory reading for executive appreciation although here, again, the cover is not sufficiently wide to be valuable.

P. HAMMERSLEY (Cambridge)