

calling sequence is LAC X, STAK, LAW HTRAV, ENTER with X being anywhere in the head of the parent element.

HTRAV, UNSTAK /traverse head  
 DAC Y /deposit accumulator as contents of Y  
 LAW Y  
 FINDN  
 CDR  
 CAR /move Y to top of head  
 LAC I Y /load the contents of the contents of Y  
 AND (140000 /logic AND octal literal 140000 into Acc.  
 SAD (140000 /skip if Acc. different from 140000  
 JMP . 10 /jump if ringstart to 10th octal location on  
 SAD (40000  
 EXIT /exit if traverse complete  
 LAC Y  
 STAK /save ringpointer on stack  
 LAW Y  
 CDR /next in head  
 JMP . -12 /loop, jump to 12th octal location back  
 LAC Y

STAK  
 LAC Y  
 STAK /save ringstart  
 LAW RTRAV  
 ENTER /traverse ring  
 UNSTAK  
 DAC Y  
 JMP . -13 /loop  
 RTRAV, UNSTAK /traverse ring  
 DAC Z  
 LAW Z  
 CAR /next in ring  
 LAC I Z  
 AND (140000  
 SAD (140000  
 EXIT /exit if traverse complete  
 LAC Z  
 STAK /save ringpointer  
 LAC Z  
 STAK  
 LAW HTRAV  
 ENTER /traverse head  
 UNSTAK  
 DAC Z  
 JMP . -16 /loop

## Book Review

*Machine Intelligence 1*, edited by N. L. Collins and D. Michie, 1967; 278 pages. (Edinburgh: *Oliver and Boyd*, 63s.)

This book reports the proceedings of the first Machine Intelligence Workshop organized by Professor Donald Michie at the University of Edinburgh in September 1965. Here the term "machine intelligence" covers a wider field than the better-known term "artificial intelligence". Heuristic problem solving, analogies between human perception and machine pattern recognition are there, but in addition there is also a survey of mathematical methods for proving theorems about particular programs, and papers on compiler-compilers. There are seventeen contributions, far too many to summarize individually. Work in the field can be roughly classified into three areas, theorem proving heuristics and combinatorics, information classification and retrieval, and extensions to programming and display techniques aimed at improving man-machine communications.

Work in theorem proving, game playing, graph theory, and other combinatorial heuristics is well represented. Progress in the area has never been spectacular, and improved algorithms are the usual result. An exceptional step forward was the introduction of the Resolution Principle by J. A. Robinson, and an excellent exposition of it is given here. There is no paper dealing directly with information classification, storage and retrieval. At first this is surprising, for none of the contributors seems unaware of the ultimate importance of large scale, mechanized, data handling. Then the reader begins to make guesses, but more of this later.

Better man-machine communication can take place at many levels. The simplest level is to provide more effective

programming languages; the classic example here is the development of LISP to program the Advice-Taker. Several ideas for advancing compiler techniques are described here. The next level is to make programming more flexible. This can be done by giving the user an on-line console, and visual displays, and then letting the computer answer back. Some interesting, but limited, experiments are described. The ultimate level is reached when the computer can respond to voice, or visual, signals in a way resembling that of a human, and several contributors discuss the difficulties and propose solutions to some of them.

This book gives an excellent, fair, snapshot of work in the field in the middle of the decade in Britain. There, at the end, is the vital, and disturbing, qualification. Across the Atlantic there is a ferment of work on man-machine communication, much more extensive than that described here. There is also a large effort in the field of information retrieval, although a sobering re-assessment of its value took place recently. The contrast is certainly not a reflection of a disparate quality of thought, or energy; it is caused quite simply by a lack of machines in Britain. Very few researchers in Britain have the use of large, random access, files; even fewer have interactive, personal, computer consoles. Surely, the personal console will become the focus, and stimulus, of work on man-machine communication for the next few years. Adding a 1967 postscript to a 1965 meeting it is worth noticing that Edinburgh University is indeed experimenting with more than one system for personal consoles; but elsewhere one must still note a severe general shortage of up-to-date machines.

J. J. FLORENTIN (London)