with its larger initial overheads but quicker operation once the initial set-up has been carried out.

There are further cases of this necessity to break down records or groups into their constituent parts in the input and output commands such as PRINT and FILE. The translation of these commands, do, of course, make use of the standard INTERCODE input/output facilities, enjoyed by all LEO users. Despite this assistance, however, the formation of the relevant object coding to deal with such commands is relatively speaking a matter of hard work and much coding in the latter passes.

At the end of the compiling process an INTERCODE object program has been produced, and from then on the process of reaching computer code is as for INTERCODE.

Conclusion

The case for automatic programming is well known; the two main disadvantages, inefficiency in the object program and the length of time it takes to compile, are probably equally well known. Unfortunately, these two disadvantages tend to pull in opposite directions. If the compilation process took longer one could have a more efficient object program.

Further, compilers usually have to be written for minimal configurations. This tends to reduce the amount of store available to the compiler writer and hence the number of instructions, and this means that the number of passes must be increased.

The inefficiency factor arises partly from the need to deal with situations in a general way. For example, at the entry to any routine one cannot make any assumptions about what is in any of the accumulators or modifiers or what radix is set. Therefore the compiler writer has to take precautions and perhaps insert some extra instructions, in case the correct values are not in the relevant registers. Any hand coder would probably only do this where necessary.

Furthermore a compiler can make no assumptions about the likelihood or otherwise of any particular routine of a program being obeyed. To a compiler they are all one. And it is probably because of this that compilers for machines with two levels of storage have tended to be less efficient than others.

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Book Review

Excitation Control, by G. M. Ulanov, 1964; 100 pages. (Oxford: *Pergamon Press Ltd.*, 30s.) (International Series of Monographs on Electronics and Instrumentation, Volume 29.)

The *Pergamon Press* has established a high reputation for its valuable work in publishing translations of Russian technological works, especially in the field of control. It will lose that reputation if it publishes more translations as bad as that of *Excitation Control*. The book has more errors in it than a colander has holes. They abound in the text, in the mathematical equations and in the diagrams; on one page alone there are seven errors. The post-translation editor says: "In the main the author's terminology has been retained except in the cases where some ambiguity of ideas occurred, but it is hoped that in this, the edited versions [*sic*] of the translation, any errors and imperfections have been reduced to a minimum." A post-translation editor should, above all, be technically knowledgeable in the field covered by the book; it is hard to believe this of one who can, to mention a few examples, print "feeding voltage" for "input voltage," "extreme" for "extremum," "transfer" for "transient" (many times), "multiplier" for "factor," "hydroscopic" for "hydraulic," and "pressing device" for "screw-down" of a rolling mill. And what can one think of editing which allows the German mathematician Weierstrass to appear, after a double transliteration, as Veiershtrass?

With all these errors it becomes really hard work to find out what the book is all about, and the title certainly does not help the English reader. In the broad, it concerns the application of the principle of invariance, or the use of feed-forward, open-loop control paths to compensate for disturbances, including load variations (when they can be measured), and to make for improved following of input signals. Chapter I is a brief historical survey, mostly of developments in the Soviet Union, Chapter II a series of descriptions of control systems using the method, Chapter III a short run-down of the theory, and Chapter IV examples of calculations. The major part of the work, in Chapter II, consists of a brief précis of each of a number of published works describing control systems. These are mostly much too brief for the reader to get a good idea even of the broad outlines. There is, however, a full list of references, 42 out of 43 of them to Russian publications.

The book would be of use to the reader whose prime interest is in studying the state of the art in the Soviet Union, to whom the survey and bibliography of published work would be of value. He would probably find it worth while to consult the original, and it would be interesting to know how many of the errors in diagrams and in equations are to be found there. The book is not recommended to those whose interests in the field are purely technological. Perhaps the reference to itself, on two occasions, as a "brochure" is not, after all, one of the mis-translations.

R. H. TIZARD