

On an ALGOL Compiler

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This auto-coding system is a kind of compiler and produces the object program according to the source program written in ALGOL 60 [1], [2]. And this compiler consists of 3 routines:

$$\text{compiler} \left\{ \begin{array}{l} \text{routine 1,} \\ \text{routine 2,} \\ \text{routine 3} \end{array} \right. \left\{ \begin{array}{l} \text{phase 1,} \\ \text{phase 2.} \end{array} \right.$$

Routine 1 comes from "H. Kanner's algebraic translator [3]" but can deal with logical operations and iterations of calculations although Kanner's translator deals with arithmetic operations only.

The compiler carries on the level analysis of operators with 10-level hierarchy (Table 1) containing relative operators and logical operators.

Table 1

Operator	Hierarchy number
standard functions	10
↑	9
×, /	8
+, -	7
<, ≤, =, ≥, >, ≠	6
⌋	5
∧	4
∨	3
⊂	2
≡	1

Routine 2 specifies data given for symbolic parameters in the source program.

Routine 3 translates 3-address pseudo-instructions made by routine 1 into machine language, practises the economy of instructions, makes the required object program and has 2 phases; one makes a rough object program and the other completes it.

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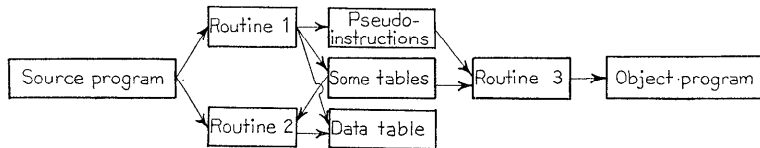


Fig. 1

Fig. 1 shows the process of the translation with this compiler.

But this compiler cannot deal with all the program written in ALGOL 60; i.e. it imposes the following limitations to the grammar of ALGOL.

- (1) An identifier is formed of less than 3 characters.
- (2) When some identifiers are continuously shown, they must be separated with the separator '#'.
- (3) A delimiter which delimits the parameters of a function designator must be a comma.
- (4) As for the type declarators and array declarators we can use them only once for one identifier, and as for 'integer', one of the type declarators, we can use it only for the identifiers showing the subscripts of arrays.

(5) It can deal with arrays of less than 3 dimensions. It is necessary for the subscripts to show finite arithmetic progressions of which initial values are zero and of which common differences are one, and when subscripts are identifiers they are formed with one character and 1, 2, 3 or 4 can be added to or subtracted from them, if necessary.

But it is impossible to use numbers and identifiers in the same subscript part simultaneously.

(6) It is necessary that the statement following a for clause is parenthesized with statement brackets.

(7) It is necessary that conditional statements are parenthesized with statement brackets.

(8) The opening place of a source program must be shown explicitly with the special label 'BOP'.

(9) We cannot use arithmetic expressions in a for clause except as a while element and cannot use a step-until element, a while element and so on in the same for clause simultaneously.

(10) It is impossible to draw a line between the name replacement and the value assignment in the procedure statement, i.e. we cannot make use of the name replacement.

The author tried to make this system operate with Type NEAC-2203 basic computer and could complete its small model.

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References

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