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METHOD OF CONSTRUCTING FLOWCHARTS OF SIMPLE BINARY PROGRAMS FOR SYSTEMS OF BOOLEAN FUNCTIONS

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A method of direct construction of one-input flowcharts of simple binary programs for systems of Boolean functions defined by a truth table is developed. An optimization procedure is described, and estimates are calculated to evaluate the complexity of such flowcharts. The method can be used in programs design for programmed logical devices.

In program realizations of Boolean function systems (BFS), binary programs (BP) are among the various types of programs used [1]. Binary programs consist of a set of instructions, where the conditional transfer operation is the main instruction performed on the basis of the values of single independent binary variables x and the values of dependent variables y.

Two subclasses of BP are known: generalized BP (GBP) and simple BP (SBP) [2].

A GBP consists of a set of instructions of unconditional transfer, one- and/or two-address conditional transfer, and assignment of constants 0 and 1 to dependent variables; the assignment instructions may occur at any point in the program. The terminal instructions are assigned the symbol "end."

Flowcharts (FC) of BP have a single input, and contain conditional and operator nodes ($y_i = 0$; $y_i = 1$).

A feature of GBP is the fact that operator nodes in their FC may occur at any point; SBP are more structured, with all of their operator nodes situated after the conditional nodes at the end of FC.

A method of construction of FC for GBP [GBP FC] has been studied in [2], where a method for the construction of FC for simple BP (SBP FC) for a single Boolean function was also suggested.

For BFS in [3], a method of construction of multi-input SBP FC was offered, which can be used in the realization of Boolean functions by means of subprograms [4,5].

The methods of construction of single-input SBP FC for BFS have not, however, been investigated until now, although the class of these SBP FC is of interest because, among other things, they can be used for the parallel formation of the values of all functions of the system, so as to increase the operation speed.

SBP FC can be constructed of GBP FC by "shifting" the operator nodes to the end of the graph, by means of fairly complex rearrangements.

In this article, we suggest a simple method for a direct construction of single-input SBP FC for BFS defined by truth tables.

In [3], a method of FC construction from a canonical table (CT) for a single arithmetic function (AF) was described.

The following strategy is an extension of this method to BFS. Suppose a system of N Boolean functions is given, which depend on n variables, in the form of a truth table con-