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EVALUATION OF THE FUNCTIONAL CAPABILITIES OF PROGRAMMABLE LOGIC ARRAYS

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The authors propose a method of evaluating the functional capabilities of programmable logic arrays in the class of normal Boolean formulas in the AND/OR basis. Estimates are obtained for the number of inputs, terms, and outputs in realizing arbitrary bracket formulas and the corresponding disjunctive normal forms. A method of repeated use of PLA's and ROM's is proposed.

At present there are numbers of studies dealing with methods of efficient utilization of programmable logic arrays (PLA's) [1, 2].

However, problems of evaluating the functional capabilities of PLA's considered as multifunctional logic modules [3] have yet to be adequately examined. The aim of this paper is to at least partially fill this gap.

Let us assume that we have a PLA with only direct inputs and outputs.

Let us evaluate the characteristics of this PLA for the case in which it implements an arbitrary normal h-letter formula in AND/OR basis, and the disjunctive normal form (DNF) that results from this formula, by removing brackets.

REALIZATION OF BRACKET FORMULA

A bracket formula is implemented in the PLA by representing it in the form of a system of (c/2) + 1 DNF, which are subformulas, where c is the number of brackets in the formula.

Then each DNF is realized at the corresponding output, and each of these outputs (except for the last, at which the entire formula as a whole is realized) is connected to the corresponding input.

The most inferior parameters (s, q, and t, the number of inputs, terms, and outputs, respectively) will be displayed by the PLA that realizes a nonrepeating normal formula in AND/OR basis, containing the maximum number of brackets, whose letters are combined only by means of an OR operation.

For example, for h = 16 the corresponding formula has an arithmetic polynomial [4] of the following form:

$$f=((1+1)(1+1)+(1+1)(1+1))((1+1)(1+1)+(1+1)(1+1)).$$

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