

On the Computerization of Minimizing the Switching Function by the MASK  
Method

DONG SUB CHO, HEE YEUNG HWANG

COLLEGE OF ENGINEERING, SEOUL NATIONAL UNIVERSITY

ABSTRACT : This paper deals with the computer method of finding the minimal sum of products for a switching function by using the MASK method derived from the characteristics of the Boolean algebra.

The experiments with the program which is dissimilar to the previous computer programs show that the algorithm presented will be more efficient.

I INTRODUCTION

The minimization of a switching function make an important role in the logic design. There exist numerous algorithms for obtaining the minimal sum of products [1]-[5]. But the established computer programs for the minimization of a switching function have the limitations such as memory capacity and execution time.

In this paper, the prime implicants are simply generated by using the bit by bit operation (i.e., AND, OR and EXCLUSIVE-OR operation) called the MASK method.

II METHOD OF GENERATING PRIME IMPLICANT

An algorithm for finding all the prime implicants of a switching function is given as follows.

If the given minterms are reducible to one prime implicant, it is clear that they satisfy the following conditions,

(1)  $M(i) \text{ .AND. } M(f) = M(i)$

(2)  $M(t) \text{ .OR. } T = M(f)$  (for  $t=i, i+1, \dots, f$ , and  $T=M(i) \text{ .EX-OR. } M(f)$ )

where  $M(i)$  and  $M(f)$  represent the initial minterm and the final minterm, respectively.

\* Note that the operators such as AND, EX-OR and OR perform the bit-by-bit operation, for example of the AND.

	1 0 1 0 1 1
AND	<u>0 1 1 0 1 0</u>
	0 0 1 0 1 0

- (3) If the number of the eliminated bits is  $n$ , there must exist  $2^n$  minterms which satisfy condition (2).

### III PROGRAMMING

The flow chart for the programming of this algorithm is shown in Fig. 1.

### REFERENCES

- [1] V.T. Rhyne, Fundamentals of Digital Systems Design, Englewood Cliffs, NJ : Prentice-Hall, 1973.
- [2] M.N. Necula, "A numerical procedure for determination of the prime implicants of a Boolean function," IEEE Trans. Electronic Computers (Correspondence), Vol. EC-16, pp. 687-689, October 1967.
- [3] V.T. Rhyne, P. Noe, M. McKinney and U.W. Pooch, "A new technique for the fast minimization of switching functions," IEEE Trans. Comput., Vol. C-26, pp. 757-764, Aug. 1977.
- [4] H.R. Hwa, "A method for generating prime implicants of a Boolean expression," IEEE Trans. Comput., Vol. C-23, pp. 637-644, June 1974.
- [5] J.R. Slagle, C. L. Chang, and R.C.T. Lee, "A new algorithm for generating prime implicants," IEEE Trans. Comput., Vol. C-19, pp. 304-310, Apr. 1970.

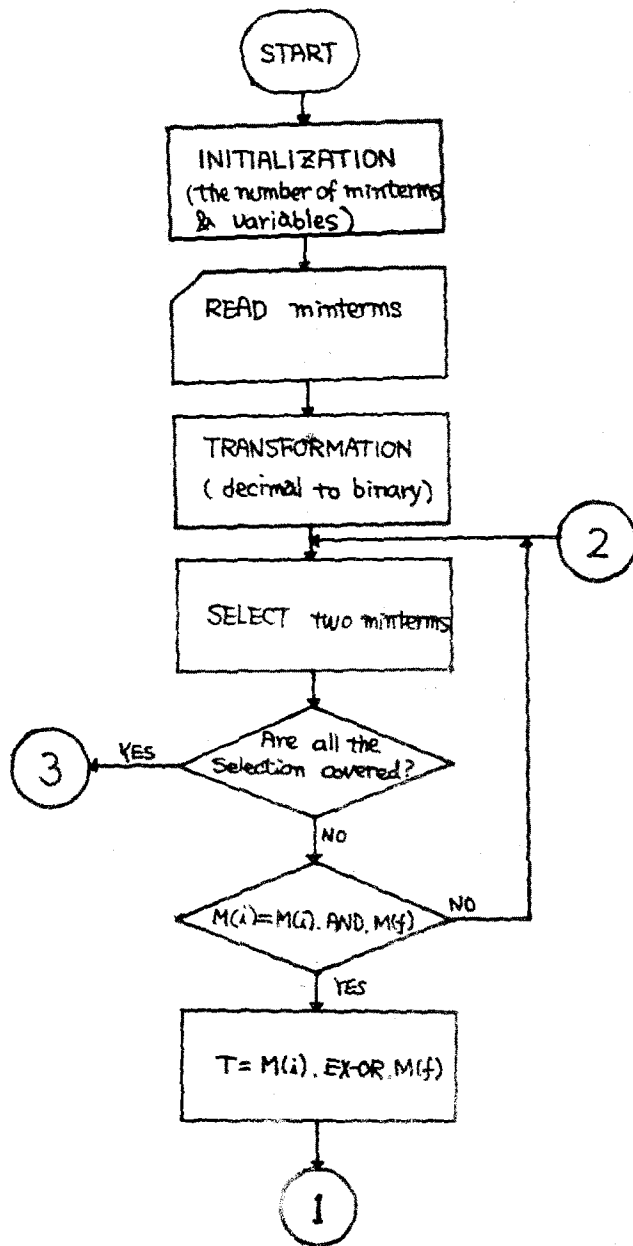


Fig. 1. The flow chart for the programming of finding the prime implicants.

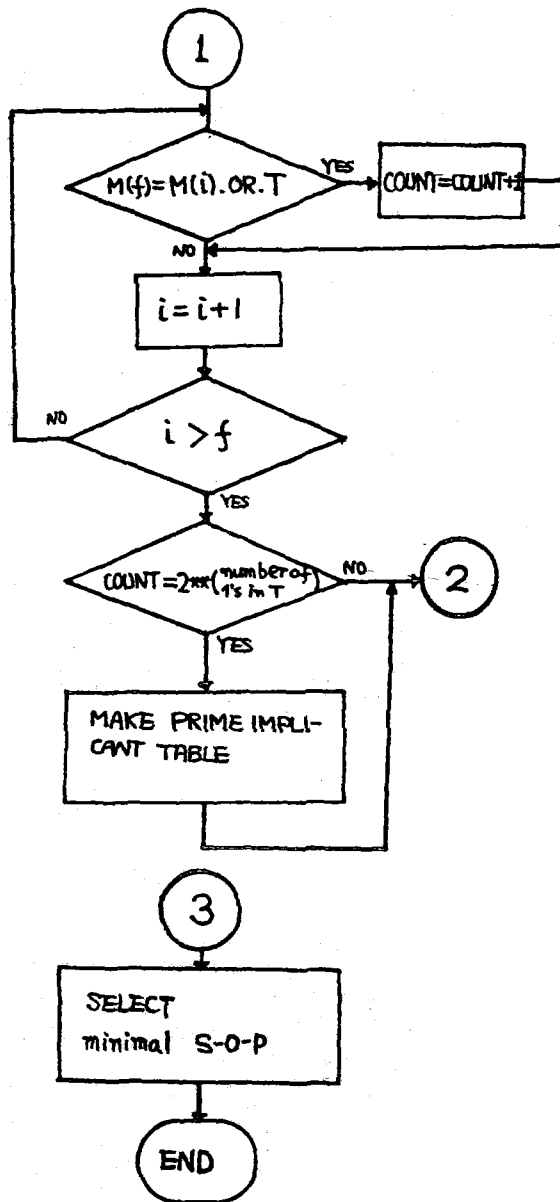


Fig.1 (Continued)