K-Map Minimizer Project

Digital Design I

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Project Description:

The project covers three main parts:

1. Getting the input from the user and validating it.
2. Printing the K-Map equivalent to the minterms given.
3. Getting and printing the simplified boolean function depending on the minterms given.

1. Getting & Validating the input:

Function used: “validate ( )“

A) Validate the number of variables entered by the user. The number of variables should be between 1 and 3 inclusive.

B) Validate the number of minterms entered by the user. The number of minterms should be between 0 and 2^number of variables inclusive.

C) Validate the values of the minterms. Their values should be between 0 and (2^number of variables)-1 inclusive. Also, there is an extra validation if the user entered two similar minterms.

2. Printing K-Map:

Functions used: “flip ( ) and function_simplification ( )”

A) “flip ( )” function helps me in printing the k-Map and getting the simplified function. It simply flips columns 2 and 3 in order to get the correct order of K-Map in the case of a 3-input variable.

B) “function_simplification ( )” function is responsible for printing and simplifying. The first part is responsible for printing the K-Map corresponding to 1-input, 2-input, or 3-input variables.

3- Getting the simplified function:

Functions used: “flip ( ) ,”valid_kmap ( )”, and “function_simplification ( )”

A) If the user gives the maximum number of minterms, the function is simply 1. On the other hand, if the number of minterms is 0, the function outputs 0.

B) If the user enters a random number of minterms, I am following the following strategy. I will loop over all possible combinations (4,2,1) in this order. I start by the rows, then every 4 columns vertically, then every 2 columns vertically, then every 2 columns horizontally, and then every single cell.

C) After each check of these, I am assigning the checked cells as don’t cares. “Valid_kmap ( )” helps me in knowing if I am dealing with a 1 or 1 and a don’t care in order to proceed combining minterms. At the end of the “function_simplification ( )”, I return the simplified boolean function.

Problems in the Program:

Nothing is wrong with it. It works efficiently in all cases.

Instructions to use:

A) Run the program

B) Enter the number of variables

C) Enter the number of minterms

D) Enter the values of minterms

Output: You have your K-Map along with the simplified boolean function.

```
Please enter the number of variables
3
Please enter the number of minterms
5
Enter your minterm
0
Enter your minterm
1
Enter your minterm
2
Enter your minterm
3
Enter your minterm
5
K-Map =
1   1   1   1
0   1   0   0
F = A + B'C
Program ended with exit code: 0
```